



Designation: D 3306 – 01

## Standard Specification for Glycol Base Engine Coolant for Automobile and Light-Duty Service<sup>1</sup>

This standard is issued under the fixed designation D 3306; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

### 1. Scope

1.1 This specification covers the requirements for ethylene glycol or propylene glycol base engine coolants used in automobiles or other light duty service cooling systems. When concentrates are used at 40 to 70 % concentration by volume in water, or when prediluted glycol base engine coolants (50 volume % minimum) are used without further dilution, they will function effectively to provide protection against freezing, boiling, and corrosion.

1.2 The coolants governed by this specification are categorized as follows:

Coolant Type	Description
I	Ethylene glycol base concentrate
II	Propylene glycol base concentrate
III	Ethylene glycol predilute (50 vol %)
IV	Propylene glycol predilute (50 vol %)

NOTE 1—This specification is based on the knowledge of the performance of engine coolants prepared from new or virgin ingredients. Separate specifications exist for engine coolants prepared from recycled or reprocessed used coolant or reprocessed industrial-source glycols.

1.3 The values stated in SI units are to be regarded as the standard. The values in parentheses are for information only.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

NOTE 2—This specification applies to automobiles and light duty service. Specifications D 4985, D 6210, and D 6211 exist for heavy duty engine service.

### 2. Referenced Documents

#### 2.1 ASTM Standards:

D 512 Test Methods for Chloride Ion in Water<sup>2</sup>

D 516 Test Methods for Sulfate Ion in Water<sup>2</sup>

D 1119 Test Method for Percent Ash Content of Engine

<sup>1</sup> This specification is under the jurisdiction of ASTM Committee D15 on Engine Coolants and is the direct responsibility of Subcommittee D15.07 on Specifications.

Current edition approved April 10, 2001. Published June 2001. Originally published as D 3306 – 74. Last previous edition D 3306 – 00a.

<sup>2</sup> Annual Book of ASTM Standards, Vol 11.01.

TABLE 1 General Requirements

Property	Specified Values	ASTM Test Method
Color	Distinctive	...
Effect on nonmetals	No adverse effect	under consideration

Coolants and Antirusts<sup>3</sup>

D 1120 Test Method for Boiling Point of Engine Coolants<sup>3</sup>

D 1121 Test Method for Reserve Alkalinity of Engine Coolants and Antirusts<sup>3</sup>

D 1122 Test Method for Density and Relative Density of Engine Coolant Concentrates and Engine Coolants by the Hydrometer<sup>3</sup>

D 1123 Test Methods for Water in Engine Coolant Concentrate by the Karl Fischer Reagent Method<sup>3</sup>

D 1126 Test Method for Hardness in Water<sup>2</sup>

D 1177 Test Method for Freezing Point of Aqueous Engine Coolants<sup>3</sup>

D 1193 Specification for Reagent Water<sup>2</sup>

D 1287 Test Method for pH of Engine Coolants and Antirusts<sup>3</sup>

D 1293 Test Methods for pH of Water<sup>2</sup>

D 1384 Test Method for Corrosion Test for Engine Coolants in Glassware<sup>3</sup>

D 1881 Test Method for Foaming Tendencies of Engine Coolants in Glassware<sup>3</sup>

D 1882 Test Method for Effect of Cooling System Chemical Solutions on Organic Finishes for Automotive Vehicles<sup>3</sup>

D 1888 Test Methods for Particulate and Dissolved Matter, Solids, or Residue in Water<sup>4</sup>

D 2570 Test Method for Simulated Service Corrosion Testing of Engine Coolants<sup>3</sup>

D 2809 Test Method for Cavitation Corrosion and Erosion-Corrosion Characteristics of Aluminum Pumps with Engine Coolants<sup>3</sup>

D 3321 Test Method for Use of the Refractometer for Field Test Determination of the Freezing Point of Aqueous Engine Coolants<sup>3</sup>

D 3634 Test Method for Trace Chloride Ion in Engine Coolants<sup>3</sup>

<sup>3</sup> Annual Book of ASTM Standards, Vol 15.05.

<sup>4</sup> Discontinued—See 1990 Annual Book of ASTM Standards, Vol 11.01.



**TABLE 2 Physical and Chemical Requirements**

Property	Type I	Type II	Type III	Type IV	ASTM Test Method
Relative density 15.5/15.5°C (60/60°F)	1.110 to 1.145	1.030 to 1.065	1.065 min	1.025 min	D 1122, D 5931
Freezing point, °C (°F): 50 vol % in DI water Undiluted	-37 (-34) max	-32 (-26) max	-37 (-34) max	-32 (-26) max	D 1177
Boiling point, <sup>A</sup> °C (°F): 50 vol % in DI water Undiluted	108 (226) min 163 (325) min	104 (219) min 152 (305 min)	108 (226) min	104 (219) min	D 1120
Ash content, mass %	5 max	5 max	2.5 max	2.5 max	D 1119
pH: 50 vol % in DI water Undiluted	7.5 to 11	7.5 to 11	7.5 to 11	7.5 to 11	D 1287
Chloride, ppm	25 max	25 max	25 max	25 max	D 3634, D 5827
Water, mass %	5 max	5 max	not applicable	not applicable	D 1123
Reserve alkalinity, mL	report <sup>B</sup>	report <sup>B</sup>	report <sup>B</sup>	report <sup>B</sup>	D 1121
Effect on automotive finish (use clear coat thermoset urethane or acrylic urethane finish)	no effect	no effect	no effect	no effect	D 1882 <sup>C</sup>

<sup>A</sup> Some precipitate may be observed at the end of the test. This should not be cause for rejection.

<sup>B</sup> Value as agreed upon between the supplier and the customer.

<sup>C</sup> Currently, many vehicle manufacturers prepare test panels using the specific paint finishes employed on their actual products. Coolant suppliers and vehicle manufacturers should agree on the exact test procedures and acceptance criteria on an individual basis.

D 4327 Test Method for Anions in Water by Chemically Suppressed Ion Chromatography<sup>2</sup>

D 4340 Test Method for Corrosion of Cast Aluminum Alloys in Engine Coolants Under Heat-Rejecting Conditions<sup>3</sup>

D 4725 Terminology for Engine Coolants<sup>3</sup>

D 4985 Specification for Low Silicate Ethylene Glycol Base Engine Coolants for Heavy Duty Engines Requiring a Pre-Charge of Supplemental Coolant Additive (SCA)<sup>3</sup>

D 5223 Specification for Engine Coolant Grade Propylene Glycol<sup>3</sup>

D 5827 Test Method for Determination of Chloride in Engine Coolant by Ion Chromatography<sup>3</sup>

D 5931 Test Method for Density and Relative Density of Engine Coolant Concentrates and Aqueous Engine Coolants by Digital Density Meter<sup>3</sup>

D 6210 Specification for Fully Formulated Ethylene Glycol Base Engine Coolant for Heavy Duty Engines<sup>3</sup>

D 6211 Specification for Fully Formulated Propylene Glycol Base Engine Coolant for Heavy Duty Engines<sup>3</sup>

E 1177 Specification for Engine Coolant Grade Ethylene Glycol<sup>3</sup>

## 2.2 Other Documents

SAE HS40 Maintenance of Automotive Engine Cooling Systems<sup>5</sup>

ASTM MNL 6 Manual on the Selection and Use of Engine Coolants and Cooling System Chemicals<sup>6</sup>

## 3. General Requirements

### 3.1 Engine coolant concentrates or prediluted glycol base

<sup>5</sup> SAE Handbook, available from Society of Automotive Engineers, 400 Commonwealth Dr., Warrendale, PA 15096.

<sup>6</sup> Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428.

engine coolants shall be formulated with either ethylene glycol meeting Specification E 1177 or propylene glycol meeting Specification D 5223, water, and shall contain suitable corrosion inhibitors, dye, and a foam suppressor.

3.2 Ethylene glycol base engine coolant concentrates (Type I) may contain a maximum of 15 % other glycols, as long as the physical, chemical, and performance requirements of this specification can be met. Similarly, prediluted ethylene glycol base coolants (Type III) may contain a maximum of 7.5 % other glycols as long as all of the requirements of this specification can be met.

3.3 Propylene glycol base engine coolant concentrates (Type II) may contain a combined maximum of 1 % other glycols (less than 0.5 % for prediluted propylene glycol base coolants, Type IV) and all of the physical, chemical, and performance requirements of this specification must be met.

3.4 All engine coolant concentrates or prediluted glycol base engine coolants shall conform to the general requirements given in Table 1.

3.5 Prediluted glycol base engine coolants shall be formulated using water that meets Type IV reagent water specifications (see Specification D 1193).

NOTE 3—Prediluted coolants are intended for direct addition to an engine cooling system with no further dilution. However, if circumstances require addition and prediluted aqueous engine coolant is not available, use the appropriate engine coolant concentrate (Type I or II) diluted to 50 volume % with water of at least the quality outlined in Table X1.1.

3.6 When diluting engine coolant concentrates for actual service, use a municipal (treated) water, or a low-mineral content well water (see Appendix X1, Table X1.1). If such water is not available, use deionized (demineralized) or distilled water. This procedure will minimize the formation of