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AMERICAN SOCIETY FOR TESTING AND MATERIALS
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Standard Specification for Prediluted Aqueous Ethylene Glycol Base Engine Coolant (50 Volume % Minimum) for Automobiles and Light-Duty Service¹

This standard is issued under the fixed designation D 4656; 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 (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This specification covers the requirements for a prediluted aqueous ethylene glycol (50 volume % minimum) base engine coolant for use in automobiles and light duty vehicles. When used without further dilution, this product functions effectively during both summer and winter in automotive and other light-duty engine cooling systems to provide adequate cooling system performance.

1.2 The units quoted in this specification are to be regarded as standard. The values given in parentheses are approximate equivalents provided for information purposes only.

1.3 *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 1—This specification applies to automobiles and light-duty service. A separate specification for a prediluted ethylene glycol base coolant for heavy-duty engine service is under development with D 5345.

2. Referenced Documents

2.1 ASTM Standards:

- D 512 Test Methods for Chloride Ion in Water²
- D 516 Test Method for Sulfate Ion in Water²
- D 1119 Test Method for Ash Content of Engine Coolants and Antirusts³
- D 1120 Test Method for Boiling Point of Engine Coolants³
- D 1121 Test Method for Reserve Alkalinity of Engine Coolants and Antirusts³
- D 1122 Test Method for Density or Relative Density of Engine Coolant Concentrates and Engine Coolants by the Hydrometer³
- D 1126 Test Method for Hardness in Water²
- D 1177 Test Method for Freezing Point of Aqueous Engine Coolants³
- D 1193 Specification for Reagent Water²

¹ This specification is under the jurisdiction of ASTM Committee D-15 on Engine Coolants and is the direct responsibility of Subcommittee D15.07 on Prediluted Engine Coolant.

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² Annual Book of ASTM Standards, Vol 11.01.

³ Annual Book of ASTM Standards, Vol 15.05.

D 1287 Test Method for pH of Engine Coolants and Antirusts³

D 1293 Test Methods for pH of Water²

D 1384 Test Method for Corrosion Test for Engine Coolants in Glassware³

D 1881 Test Method for Foaming Tendencies of Engine Coolants in Glassware³

D 1882 Test Method for Effect of Cooling System Chemical Solutions on Organic Finishes for Automotive Vehicles³

D 1888 Test Methods for Particulate and Dissolved Matter in Water⁴

D 2570 Test Method for Simulated Service Corrosion Testing of Engine Coolants³

D 2809 Test Method for Cavitation Erosion-Corrosion Characteristics of Aluminum Pumps with Engine Coolants³

D 3306 Specification for Ethylene Glycol Base Engine Coolant for Automobile and Light Duty Service³

D 3634 Test Method for Trace Chloride Ion in Engine Coolants³

D 4327 Test Method for Anions in Water by Chemically Suppressed Ion Chromatography²

D 4340 Test Method for Corrosion of Cast Aluminum Alloys in Engine Coolants Under Heat-Rejecting Conditions³

D 4725 Terminology for Engine Coolants³

D 5345 Specification for Prediluted Aqueous Ethylene Glycol Base Low-Silicate Engine Coolant (50 Volume Percent Minimum) for Heavy-Duty Engines Requiring an Initial Charge of Supplemental Coolant Additive (SCA)³

D 5827 Test Method for Analysis of Engine Coolant for Chloride and Other Anions by Ion Chromatography³

D 5931 Test Method for Density and Relative Density of Engine Coolant Concentrates and Aqueous Engine Coolants by Digital Density Meter³

3. General Requirements

3.1 Prediluted aqueous ethylene glycol base engine coolant shall consist essentially of water and ethylene glycol and shall contain suitable corrosion inhibitors, dye and a foam suppressor. Other glycols, such as propylene and diethylene, may be

⁴ Discontinued—See 1990 Annual Book of ASTM Standards, Vol 11.01.

included up to a maximum of 15 % of the glycols contained in the product, if the chemical and physical properties in Table 1 are met. For example, 15 % of a 50 % aqueous glycol solution could contain up to 7.5 % of glycols other than ethylene glycol. The coolant also shall conform to the general requirements in Table 2.

3.2 This product shall be prepared using deionized water that meets Type IV reagent water specifications (see Specification D 1193). This practice minimizes the formation of hard water scale and avoids the introduction of mineral components, such as chlorides and sulfates, which can increase the corrosion rate of aluminum and iron.

3.3 This product, when installed in accordance with the vehicle manufacturers' recommendations and those on the product label, shall be suitable for use in a properly maintained cooling system (see Appendix X1) in normal passenger car service for a minimum of one year without adversely affecting fluid flow and heat transfer.

4. Detailed Requirements

4.1 Prediluted aqueous ethylene glycol base engine coolant shall conform to the chemical and physical property requirements prescribed in Table 1.

4.2 Prediluted aqueous ethylene glycol base engine coolant shall conform to the laboratory test performance requirements prescribed in Table 3, after adjustment.

4.3 Report the freezing point of the prediluted aqueous ethylene glycol base coolant as packaged. This freezing point shall be -34°F (-37°C) or lower.

4.4 Adjust the freezing point of the prediluted aqueous ethylene glycol base coolant to -34°F (-37°C) with deionized water. Use this concentration-adjusted product for all of the performance requirement testing specified under this specification and listed in Table 3.

TABLE 1 Chemical and Physical Requirements of the Unadjusted Prediluted Product

Property	Specified Values	ASTM Test Method
Relative density, 60/60°F (15.5°C)	1.0650 min	D 1122, D 5931
Freezing point, °F (°C)	-34 (-37) max or lower	D 1177
Boiling point, °F (°C)	226 (108) min	D 1120
Effect on automotive finish	no effect	D 1882
Ash content, mass %	2.5 max	D 1119
pH	7.5 to 11.0 ^A	D 1287
Reserve alkalinity, mL	report ^{A,B}	D 1121
Chloride, ppm	25 max	D 3634, D 5827

^AReport on the adjusted product also.

^BAgreed value between supplier and customer.

TABLE 2 General Requirements of the Unadjusted Prediluted Product

Property	Specified Values	ASTM Test Method
Color	distinctive ^A	...
Effect on non-metals	no adverse affect	...
Foaming:		D 1881
Volume, mL	150 max	
Break time, s	5 max	

^APreferred color: green to blue-green.

TABLE 3 Performance Requirements of the Adjusted^A Prediluted Product

Property	Specific Values	ASTM Test Method
Corrosion in glassware weight loss, mg/specimen		D 1384 ^B
Copper	10 max	
Solder	30 max	
Brass	10 max	
Steel	10 max	
Cast iron	10 max	
Aluminum	30 max	
Simulated service test weight loss, mg/specimen		D 2570 ^C
Copper	20 max	
Solder	60 max	
Brass	20 max	
Steel	20 max	
Cast iron	20 max	
Aluminum	60 max	
Corrosion of cast aluminum alloys at heat rejecting surfaces, mg/cm ² /week	1.0 max	D 4340 ^D
Foaming		D 1881
Volume, mL	150 max	
Break time, s	5 max	
Cavitation-erosion rating for pitting cavitation or erosion of the water pump	8 min	D 2809 ^E

^ASee Section 4.4.

^BThe adjusted product shall be mixed with the proper quantity of ASTM Type IV reagent water (Specification D 1193) to give the resulting solution a freezing point of $0 \pm 2^{\circ}\text{F}$ ($-18^{\circ} \pm 1^{\circ}\text{C}$). To each litre of test solution add 99 mg of sodium sulfate, 110 mg of sodium chloride and 92 mg of sodium bicarbonate.

^CThe adjusted product shall be mixed with the proper quantity of ASTM Type IV reagent water (Specification D 1193) to give the resulting solution a freezing point of $-20 \pm 2^{\circ}\text{F}$ ($-29 \pm 1^{\circ}\text{C}$). To each litre of test solution add 83 mg of sodium sulfate, 92 mg of sodium chloride and 77 mg of sodium bicarbonate.

^DThe adjusted product shall be mixed with an equal volume of ASTM Type IV reagent water (Specification D 1193). To each litre of test solution add 165 mg of sodium chloride.

^EOne volume of the adjusted product shall be mixed with two volumes of ASTM Type IV reagent water (Specification D 1193). To each litre of test solution add 123 mg of sodium sulfate, 137 mg of sodium chloride and 115 mg of sodium bicarbonate.

5. Keywords

5.1 auto and light-duty service; engine coolant; ethylene glycol; prediluted