

**SURFACE
VEHICLE
RECOMMENDED
PRACTICE**

Submitted for recognition as an American National Standard

SAE J1034

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**(R) AUTOMOTIVE AND LIGHT TRUCK ENGINE COOLANT CONCENTRATE
ETHYLENE GLYCOL TYPE**

1. Scope

- 1.1 This SAE Recommended Practice applies to engine coolant concentrate, ethylene glycol base, for use in automotive and light truck engine cooling systems.
- 1.2 This document applies to engine coolant concentrates for aluminum compatible requirements. Please refer to SAE J1941 for coolants used in heavy-duty diesel engine cooling systems.
- 1.3 For further information on engine coolants, see SAE J814.

2. References

- 2.1 **Applicable Documents**—The following publications form a part of this specification to the extent specified herein. The latest issue of SAE publications shall apply.
- 2.1.1 **SAE PUBLICATIONS**—Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.
- SAE J20—Coolant System Hoses
 - SAE J814—Engine Coolants
 - SAE J1941—Coolant Concentrate (Low Silicate, Ethylene Glycol Type Requiring an Initial Charge of Supplemental Coolant Additive) for Heavy-Duty Engines
- 2.1.2 **ASTM PUBLICATIONS**—Available from ASTM, 1916 Race Street, Philadelphia, PA 19103.
- ASTM D 1119—Standard Test Method for Ash Content of Engine Coolants and Antirusts
 - ASTM D 1120—Standard Test Method for Boiling Point of Engine Coolants
 - ASTM D 1121—Standard Test Method for Reserve Alkalinity of Engine Coolants and Antirusts
 - ASTM D 1122—Standard Test Method for Specific Gravity of Engine Coolants Concentrates and Engine Coolants by the Hydrometer
 - ASTM D 1123—Standard Test Method for Water in Engine Coolant Concentrate by the Karl Fischer Reagent Method
 - ASTM D 1176—Standard Method for Sampling and Preparing Aqueous Solutions of Engine Coolants or Antirusts for Testing Purposes
 - ASTM D 1177—Standard Test Method for Freezing Point of Aqueous Engine Coolants
 - ASTM D 1384—Standard Method for Corrosion Test for Engine Coolants in Glassware
 - ASTM D 1881—Standard Test Method for Foaming Tendencies of Engine Coolants in Glassware
 - ASTM D 1882—Standard Test Method for Effect of Cooling System Chemical Solutions on Organic Finishes for Automotive Vehicles

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- ASTM D 2570—Standard Method for Simulated Service Corrosion Testing of Engine Coolants
- ASTM D 2809—Standard Test Method for Cavitation Erosion-Corrosion Characteristics of Aluminum Pumps with Engine Coolants
- ASTM D 3306—Specification for Ethylene Glycol Base Engine Coolant for Automobile and Light Duty Service
- ASTM D 3634—Standard Test Method for Trace Chloride Ion in Engine Coolants
- ASTM D 4340—Standard Test Method for Corrosion of Cast Aluminum Alloys in Engine Coolants Under Heat Rejecting Conditions
- ASTM D 4725—Standard Terminology for Engine Coolants
- ASTM E 29—Standard Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications
- ASTM E 202—Standard Test Methods for Analysis of Ethylene Glycols and Propylene Glycols

2.2 Related Publications—The following publications are provided for information purposes only and are not a required part of this document.

- 2.2.1 SAE PUBLICATIONS—Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.
SAE HS-40—Maintenance of Automotive Engine Cooling Systems
- 2.2.2 ASTM PUBLICATIONS—Available from ASTM, 1916 Race Street, Philadelphia, PA 19103.
ASTM STP 120C—Selection and Use of Engine Coolants

2.3 Terminology

- 2.3.1 LIFE EXPECTANCY—The time period for which the engine coolant is suitable for use in internal-combustion engine cooling systems without adversely affecting coolant flow and heat transfer.
- 2.3.2 ENGINE COOLANT CONCENTRATE—A mixture of ethylene glycol and additives, such as corrosion inhibitors and a foam suppressor, which is used to prepare an engine coolant for use in internal combustion engine cooling systems.
- 2.3.3 ENGINE COOLANT—A heat transfer solution used in an engine cooling system to transfer heat from the engine to the radiator, which provides adequate protection against freezing, boiling and corrosion. The solution is comprised of 40 to 70% coolant concentrate and water.

3. General Requirements

- 3.1 The coolant concentrate shall consist of ethylene glycol containing additives (such as corrosion inhibitors and a foam suppressor) required to provide corrosion and freeze protection to the engine cooling system components. Other glycols such as propylene and diethylene may be included providing the physical and performance properties are met.
 - 3.1.1 The coolant concentrate shall contain sufficient water to ensure continued solution of the additives.
 - 3.1.2 The coolant concentrate is intended to be diluted with water at the point of use to produce the desired engine coolant operation requirements.
- 3.2 The coolant concentrate shall be clear and free from solids.
- 3.3 The coolant concentrate shall have an identifying color (preferably green-blue green).
- 3.4 The coolant concentrate shall not affect nor be affected by its container after storage for one year when exposed to temperatures ranging from 0 °F (−18 °C) to 122 °F (50 °C).
- 3.5 The water used for preparing engine coolants for service shall be of such quality that it does not contain excessive solids, hardness salts, sulfates, or chlorides. Water containing excessive hard-

ness salts may be softened to minimize formation of hard water scale. Excessive amounts of chloride and sulfate may increase the corrosion rate of the engine cooling system metals. The chloride and sulfate may be removed by deionization or distillation.

Water meeting the requirements of Appendix A is considered acceptable for service.

4. Detail Requirements—The engine coolant shall comply with the detail requirements of Table 1, the limits of which are absolute and not subject to interpretation based on the precision and bias of the test methods. The recommended practices for indicating which places of figures are to be considered significant shall be ASTM E 29.

4.1 Effects on Painted Finishes—There shall be no discoloration, loss of gloss, softening, swelling, or other visible effects when tested in accordance with ASTM D 1882.

4.2 Compatibility with Cooling System Nonmetals—Solutions of the coolant concentrate as normally used in cooling systems shall not have deleterious effects on the nonmetallic components, as determined from examination of the nonmetallic components used in conjunction with ASTM D 2570 corrosion test. The hoses used in the test shall conform to SAE J20. After test, the coolant hose must meet the physical requirements of the coolant immersion test of SAE J20 (J20R4, Class D-1).

5. Inspection

5.1 Sampling—When testing to the requirements of this standard a sample size of not less than 5 gallons shall be obtained for testing in accordance with ASTM D 1176 unless otherwise specified.

6. Notes

6.1 Marginal Indicia—The (R) is for the convenience of the user in locating areas where technical revisions have been made to the previous issue of the report. If the symbol is next to the report title, it indicates a complete revision of the report.

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TABLE 1—PHYSICAL, CHEMICAL AND PERFORMANCE REQUIREMENTS

	min	max	Test Method ASTM
Other glycols, %mass	—	15.0	E 202
Specific Gravity at 60/60 °F (15.6/15.6 °C)	1.110	1.145	D 1122
Freezing Point, 50% by volume in distilled H ₂ O, °F (°C)	—	-34 (-37)	D 1177
Boiling Point, °F (°C)			D 1120
Concentrate	325 (163)	—	
Dilute, 50% by volume in distilled H ₂ O	226 (108)	—	
pH			D 1287
Dilute, 50% by volume in distilled H ₂ O	7.5	11.0	
Chloride, ppm	—	25	D 3634
Total Apparent Water, %mass	—	5	D 1123
Ash content, % mass	—	5	D 1119
Foaming Tendency			D 1881
Foam Volume, mL	—	150	
Break Time, s	—	5	
Corrosion (Glassware)			D 1384
loss in mass, mg			
Copper	—	10	
Solder	—	30	
Brass	—	10	
Steel	—	10	
Cast Iron	—	10	
Aluminum	—	30	
Corrosion (Simulated Service) ²			D 2570
loss in mass, mg.			
Copper	—	20	
Solder	—	60	
Brass	—	20	
Steel	—	20	
Cast Iron	—	20	
Aluminum	—	60	
Corrosion of Heat Rejecting Cast Aluminum Alloy Surfaces ³ , mg/cm ² /week	—	1.0	D 4340
Cavitation Erosion-Corrosion (Rating)	8	—	D 2809

¹ Temperatures throughout this document are expressed in Fahrenheit. The approximate Celsius temperature follows in parentheses.

² Crevice and pitting corrosion of aluminum can be evaluated with the optional use of an aluminum radiator subjected to tank removal and tube sectioning for inspection at the completion of the test. The extent of corrosion can be quantified and reported using the internal corrosion rating system shown in Appendix B.

³ This test requirement is applicable only to engine coolants intended for use in engines having aluminum heat rejecting surfaces such as cylinder heads and/or blocks.

APPENDIX A
WATER QUALITY

TABLE A1—WATER QUALITY

Property	Requirement	ASTM Test Method
Total Solids (max)	340 ppm (19.9 gr/gal)	D 1888
Total Hardness (as CaCO ₃ , max)	170 ppm (9.9 gr/gal)	D 1126
Chloride (as Cl, max)	40 ppm (2.3 gr/gal)	D 512
Sulfate (as SO ₄ , max)	100 ppm (5.8 gr/gal)	D 516
pH	5.5 to 9.0	D 1293

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APPENDIX B

ALUMINUM RADIATOR INTERNAL CORROSION RATING SYSTEM

TABLE B1—ALUMINUM RADIATOR INTERNAL CORROSION RATING SYSTEM

Excellent	10	None	None
	9	Slight attack	No penetration into core
Very Good	8	Minor attack	No penetration into core
	7	Minor to moderate attack	Less than 2% penetration into core
Good	6	Moderate attack	Less than 5% penetration into core
	5	Moderate to fairly severe attack	5-10% penetration into core
Fair	4	Fairly severe attack	Up to 15% penetration into core
	3	Severe attack	Up to 50% penetration into core
Poor	2	Extensive attack	Over 50% penetration into core
	1	Extensive attack	Metallographic perforation, no observed leak
	0	Extensive attack	Perforation, observed leaks