



Designation: D2570 – 24

Standard Test Method for Simulated Service Corrosion Testing of Engine Coolants¹

This standard is issued under the fixed designation D2570; 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 test method evaluates the effect of a circulating engine coolant on metal test specimens and automotive cooling system components under controlled, essentially isothermal laboratory conditions.

1.2 This test method specifies test material, cooling system components, type of coolant, and coolant flow conditions that are considered typical of current automotive use.

1.3 The values stated in foot-pound-second units are to be regarded as the standard. The values given in parentheses (SI units) are approximate equivalents 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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.* Specific precautionary statements are given in Section 6.

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 ASTM Standards:²

- D1121 Test Method for Reserve Alkalinity of Engine Coolants and Antirusts
- D1176 Practice for Sampling and Preparing Aqueous Solutions of Engine Coolants or Antirusts for Testing Purposes
- D1193 Specification for Reagent Water
- D1287 Test Method for pH of Engine Coolants and Antirusts
- D1384 Test Method for Corrosion Test for Engine Coolants in Glassware

¹ This test method is under the jurisdiction of ASTM Committee D15 on Engine Coolants and Related Fluids and is the direct responsibility of Subcommittee D15.09 on Simulated Service Tests.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at www.astm.org/contact. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

D2758 Test Method for Engine Coolants by Engine Dynamometer (Withdrawn 2022)³

D2847 Practice for Testing Engine Coolants in Car and Light Truck Service

D3306 Specification for Glycol Base Engine Coolant for Automobile and Light-Duty Service

D4985 Specification for Low Silicate Ethylene Glycol Base Engine Coolant for Heavy Duty Engines Requiring a Pre-Charge of Supplemental Coolant Additive (SCA)

2.2 SAE Standard:⁴

SAE J20 Standard for Coolant System Hoses

2.3 ASTM Adjuncts:

Coolant reservoir (1 drawing)⁵

Framework for test equipment (3 drawings and B/M)⁶

3. Summary of Test Method

3.1 An engine coolant is circulated for 1064 h at 190 °F (88 °C) in a flow loop consisting of a metal reservoir, an automotive coolant pump, an automotive radiator, and connecting rubber hoses. Test specimens representative of engine cooling system metals are mounted inside the reservoir, which simulates an engine cylinder block. At the end of the test period, the corrosion-inhibiting properties of the coolant are determined by measuring the mass losses of the test specimens and by visual examination of the interior surfaces of the components.

4. Significance and Use

4.1 This test method, by a closer approach to engine cooling system conditions, provides better evaluation and selective screening of engine coolants than is possible from glassware testing (Test Method D1384). The improvement is achieved by controlled circulation of the coolant, by the use of automotive cooling system components, and by a greater ratio of metal surface area to coolant volume.

³ The last approved version of this historical standard is referenced on www.astm.org.

⁴ Available from SAE International (SAE), 400 Commonwealth Dr., Warrendale, PA 15096, <http://www.sae.org>.

⁵ Available from ASTM International Headquarters. Order Adjunct No. ADJD257001.

⁶ Available from ASTM International Headquarters. Order Adjunct No. ADJD257002.

*A Summary of Changes section appears at the end of this standard

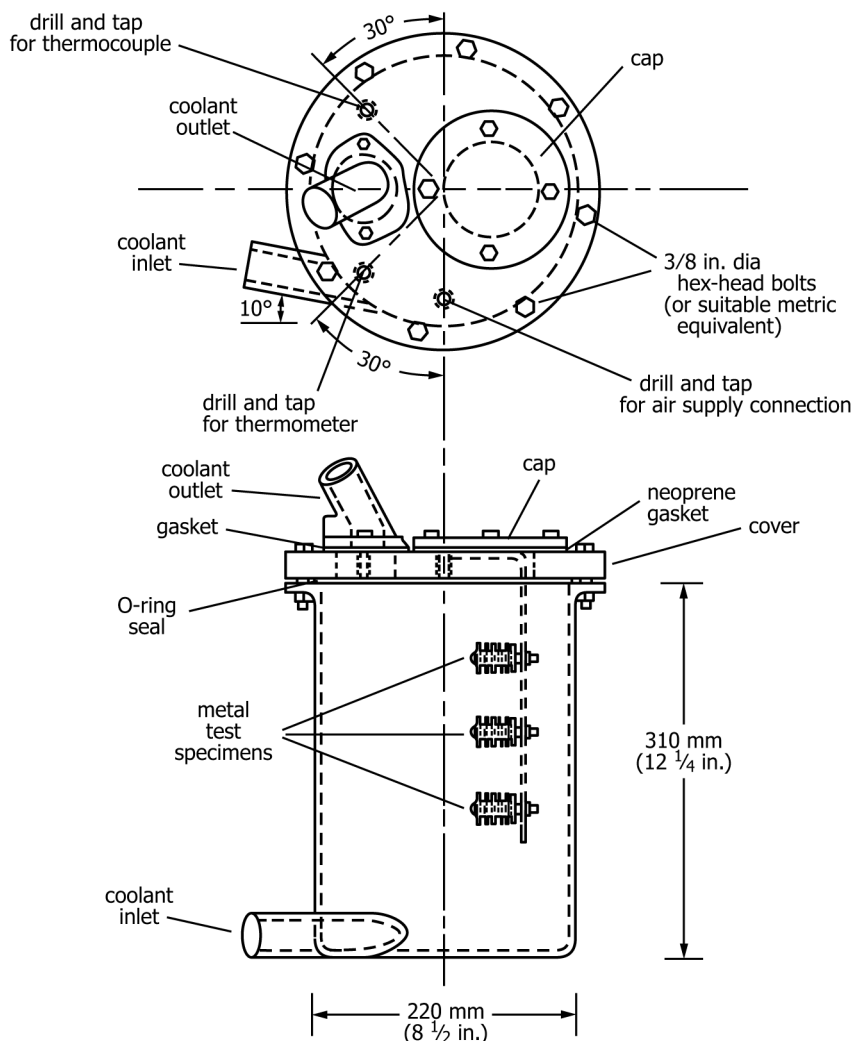


FIG. 1 Reservoir

4.2 Although this test method provides improved discrimination, it cannot conclusively predict satisfactory corrosion inhibition and service life. If greater assurance of satisfactory performance is desired, it should be obtained from full-scale engine tests (Test Method D2758) and from field testing in actual service (Practice D2847).

4.3 Significance and interpretation of the test and its limitations are discussed further in Appendix X1.

4.4 If this test method is used as a qualification test for Specification D3306 and Specification D4985, the recommended components listed in Section 5 shall be used. If it is not being used for such qualification purposes, then suitable substitution components may be used, if agreed upon between the contracting parties.

5. Apparatus

5.1 *Reservoir*—An assembly drawing of this component⁷ is shown in Fig. 1. The material of construction, representing that

of the engine cylinder block, shall be SAE G3500 Gray Iron for Automotive Castings.⁸ Install a right angle fitting on the top of the reservoir for attachment of an air line. Install a shutoff valve in the air line to avoid backing up the solution into the pressure hose.

5.2 *Automotive Components*—For Original Equipment (OE) parts,⁹ use Honda 1.5L Civic parts shown in Table 1; these are available in most global regions. A burp tee will also be required as shown. Also acceptable, though not Original Equipment, strictly aftermarket and available only regionally, are GM parts as listed in Table 2. Honda parts are preferred as they are actual original equipment from Honda 1.5L Civic. The parts to be used:

5.2.1 *Radiator*—Use OE aluminum radiator.¹⁰

⁸ Aluminum or iron may be used if mutually agreed upon between the parties involved.

⁹ OE parts are listed in Table 1.

¹⁰ 1-800-Radiator Part #: 738LO or Performance Radiator Part #: 622 has been found satisfactory and may be used subject to mutual agreement of the parties involved.

⁷ Detail drawings are available from ASTM International Headquarters. Order Adjunct No. ADJD257001. Original adjunct produced in 1982.

TABLE 1 2016-2021 Honda Civic 1.5L Engine Parts (Original Equipment)

	Part Description	Honda Part #
5.2.1	Aluminum Radiator	19010-5AA-A01
5.2.2	Radiator Cap	19045-59B-005
	Expansion/Reservoir Tank	19101-5BA-A01
	Water Pump	19200-59B-003
5.2.3	Water Passage	19410-59B-010
	Gasket	19222-59B-003
	Tube over-follow	19142-5BA-A00
5.2.4	Coolant Outlet	14033198/14092928 (original GM)

TABLE 2 1989 GM Oldsmobile Cutlass Cruiser 2.5L ENGINE PARTS (Optional)

	Part Description	GM Part #
5.2.1	Aluminum Radiator	3093506
5.2.2	Radiator Cap	6410427
5.2.3	Coolant Pump	14033483
	Pump Back cover	14033526
5.2.4	Coolant Outlet (Cover Thermostat)	14033198/14092928

5.2.2 *Pressure Cap and Degas Reservoir*—OE pressure cap that normally opens 12 psi to 15.66 psi (80 kPa to 108 kPa). For Honda parts setup, use pressure cap along with degas reservoir Honda.

5.2.3 *Coolant Pump*—Use OE parts.

5.2.4 *Coolant Outlet*—GM part No. 14033198 (aluminum).

5.2.5 *Hoses*—Elastomer, meeting the requirements of SAE J20.

5.2.6 *Hose Clamps*—Preferably worm-screw type (constant tension may be used).

5.2.7 *Hose Sight Tube*—A borosilicate glass sight tube shall be installed in the top radiator hose. The tube should have a slight bead on each end. (The primary purpose of the sight tube is to see that there is entrained air in the system.)

5.3 *Pipe Fittings*—The preferred material for the fittings required in the hose connections between pump discharge ports and reservoir inlet is malleable cast iron. A satisfactory alternative is steel.

5.3.1 *Burp Tee Fitting*—In case Honda OE parts are used specific to parts referenced in 5.2, a burp tee fitting will be needed, and must be fabricated out of aluminum or stainless steel.

5.4 *Electric Motor*—1½ hp (1.1 kW) or larger, drip-proof or explosion-proof in accordance with local safety regulations.

5.5 *Pulleys and Drive Belt*—Sized to drive the pump at a speed that will produce a flow rate of 20 gal/min to 25 gal/min (1.3 L/s to 1.6 L/s). The flow rate at operating temperature may be determined by a flow measurement device¹¹ located between pump discharge and reservoir inlet, as indicated in Fig. 2. The pressure drop between pump discharge and reservoir inlet, measured by the pressure gages shown in Fig. 2, must be maintained when the flow measurement device is removed from the system. This can be done by substituting for the flow measurement device a variable-flow restriction, such

as a valve, which can be adjusted to produce the same pressure drop as that measured across the flow measurement device at the specified flow rate.

5.6 *Tensioner*—When using Honda OE parts, a tensioner to the motor may be helpful in order to keep the belt tight.

5.7 *Electric Heater*—About 2000 W, either a hot plate¹² installed under the reservoir or a circumferential, metal-clad heater band¹³ around the reservoir.

5.8 *Thermoregulator*—A suitable temperature regulator¹⁴ shall be used to maintain the coolant temperature between the limits specified by 9.3. The sensing unit of the regulator shall be installed in an opening on the reservoir cover.

5.9 *Temperature Measuring Device*—An instrument¹⁵ capable of indicating coolant temperature to the nearest 1 °F or 1 °C shall be installed in an opening on the reservoir cover.

5.10 *Framework*—A suitable framework shall be used to mount all the components as a unit.¹⁶

6. Safety Precautions

6.1 *Reservoir*—Protection against bursting shall be provided, either by a pressure-relief valve on the cover or by a safety enclosure.

6.2 *Pump Drive*—A safety guard for the coolant pump drive belt and pulleys shall be provided.

6.3 *Electrical*—Electrical circuits required for operation of motor, heater, and thermoregulator shall be installed with

¹² Chromalox No. ROPH-204 has been found satisfactory. Equivalent hot plates may be used.

¹³ Chromalox No. HB-8415 has been found satisfactory. Equivalent heater bands may be used.

¹⁴ Chromalox No. AR-2524P has been found satisfactory. Equivalent thermoregulators may be used.

¹⁵ Fischer Scientific No. 15-076D and Weston No. 2261 dial-type thermometers have been found satisfactory. Equivalent thermometers may be used.

¹⁶ Detail and assembly drawings of a suitable framework and arrangement of components thereon are available from ASTM International Headquarters. Order Adjunct No. ADJD257002. Original adjunct produced in 1982.

¹¹ Fischer and Porter Series 10A2235A Ratosight Flow Rate Indicator, 4 gal/min to 50 gal/min (0.3 L/s to 3.0 L/s), of bronze construction, has been found satisfactory. Equivalent flow measuring devices may be used.