



Designation: D 3147 – 94 (Reapproved 1999)

## Standard Test Method for Testing Stop-Leak Additives for Engine Coolants<sup>1</sup>

This standard is issued under the fixed designation D 3147; 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.

*This standard has been approved for use by agencies of the Department of Defense.*

### 1. Scope

1.1 This test method covers screening procedures for the preliminary evaluation of leak-stopping materials intended for use in engine cooling systems. (Heavy-duty users are referred to X1.2.21 in Specification D 4485 for additional information.)

1.2 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information 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. Specific warning statements are given in 10.1.*

### 2. Referenced Documents

#### 2.1 ASTM Standards:

D 1176 Test Method for Sampling and Preparing Aqueous Solutions of Engine Coolants or Antirusts for Testing Purposes<sup>2</sup>

D 4985 Specification for Low Silicate Ethylene Glycol Base Engine Coolant for Heavy Duty Engines Requiring an Initial Charge of Supplemental Coolant Additive (SCA)<sup>2</sup>

### 3. Terminology

#### 3.1 Definitions of Terms Specific to This Standard:

3.1.1 *leaking*—frequent drops forming (more than 5 drops/min).

3.1.2 *sealed*—completely plugged with no leaking or seeping.

3.1.3 *seeping*—occasional drops forming (fewer than 5 drops/min).

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

Current edition approved Dec. 15, 1994. Published February 1995. Originally published as D 3147 – 72. Last previous edition D 3147 – 89.

<sup>2</sup> *Annual Book of ASTM Standards*, Vol 15.05.

### 4. Summary of Test Method

4.1 A heated test solution is circulated through a pressurized cubical metal reservoir which contains a slit and holes to simulate leaks in an engine cooling system. The effectiveness of the stop-leak material is measured by its ability to seal the leaks under the prescribed conditions of flow rate, temperature, pressure, and time.

4.2 The presence of particles in the test material that are larger than 0.84 mm (0.033 in.) or the presence of gumming or gelling in stop-leak additives is determined by screening a test solution through a 850- $\mu$ m (U.S. No. 20) standard sieve. The screening is done both before and after the circulating test. Particles that remain on the sieve may be too large to pass through some passages of the cooling system.

### 5. Significance and Use

5.1 The screening procedures simulate the conditions of temperature, pressure, and circulation encountered in service. This test method will indicate whether a product is suitable for further evaluation in vehicles.

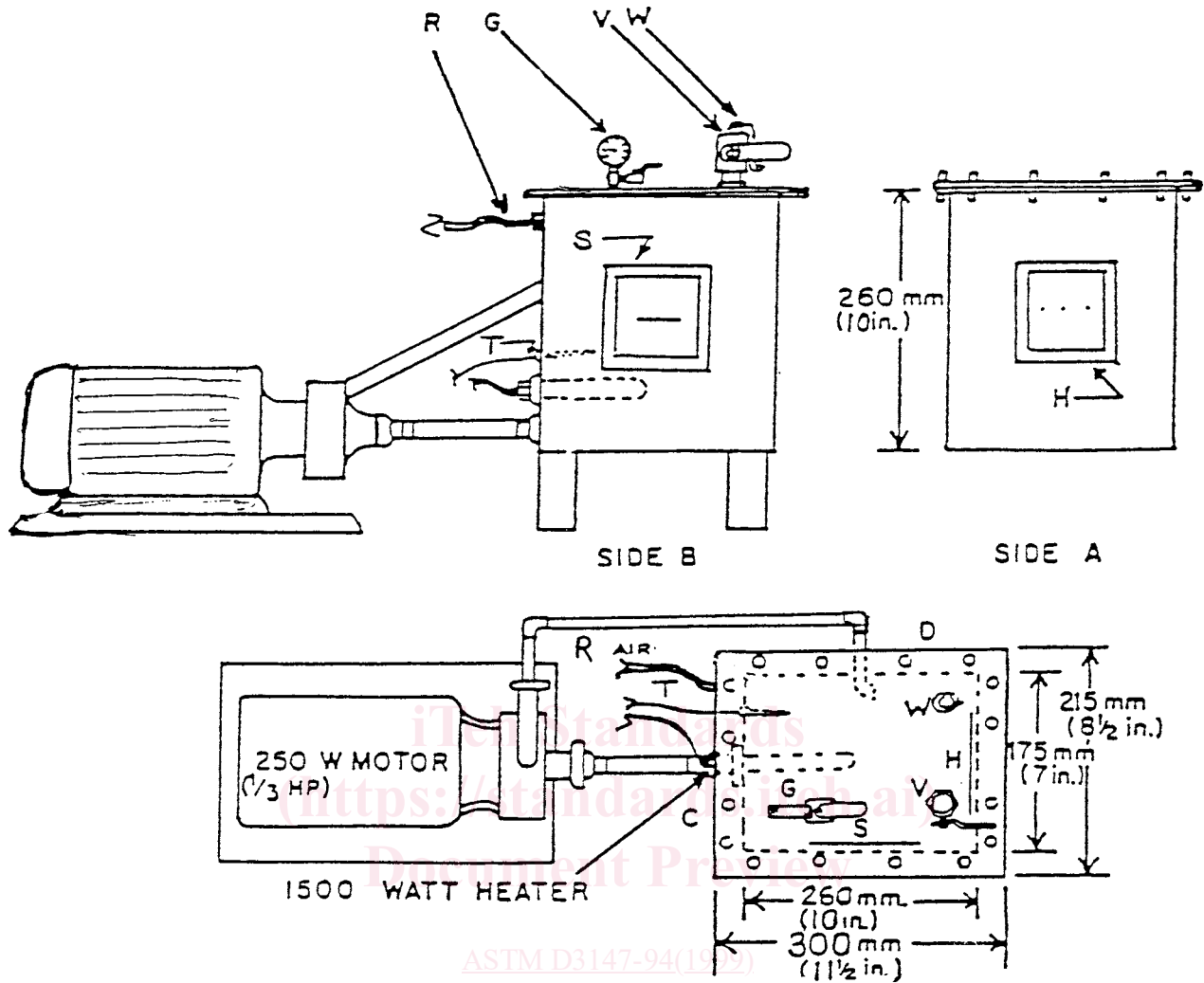
### 6. Apparatus (See Fig. 1)

#### 6.1 Reservoir:

6.1.1 The reservoir shall be constructed of stainless steel, aluminum, or brass, 260 by 175 by 260-mm (10 by 7 by 10 in.) high, and the total capacity of the assembled unit shall be between 12 to 13 L (3.2 to 3.4 gal). The reservoir shall have a 20-mm ( $\frac{3}{4}$ -in.) flange at the top to which a cover plate is fitted.

6.1.2 The reservoir and cover shall have a minimum thickness of 1.6 mm (0.06 in.) in order to withstand a pressure of 140 kPa (20 psi).

6.1.3 A drain shall be located either on one side or the bottom of the reservoir to facilitate drainage of the test solution. The reservoir outlet to the circulating pump (suction side) shall be located near the bottom of Side C. The reservoir inlet from the circulating pump (discharge side) shall be located near the top of Side D. A 13-mm ( $\frac{1}{2}$ -in.) elbow shall be welded to the reservoir inlet opening (inner surface of Side D) so that the liquid flow is directed towards Side A.



- A,B,C,D—Sides of reservoir
- G—Pressure gage, 0-210 kPa, (0-30 psi)
- H—Brass test section, holes
- S—Brass test section, slit
- R—Regulated air, 103 kPa (15 psi)
- T—Thermocouple foil, temperature controller, and well
- V—Fill opening (ball valve)
- W—Pressure relief valve, 137 kPa (20 psi)

FIG. 1 Leak Test Apparatus

6.1.4 The cover plate of the reservoir shall be attached with bolts and sealed with neoprene gasket material. Openings accommodate a pressure gage (0 to 10 kPa (0 to 30 psi minimum)/vent valve assembly.

6.1.5 Openings, 64 by 64 mm (2½ by 2½ in.), centered on Side A and Side B accommodate test plates (as described in Section 7). An inlet for regulated air at 103 ± 14 kPa (15 ± 2 psi) and a thermocouple probe are shown in Side C.

6.1.6 A liquid collection pan or pans shall be placed under the reservoir in a position that will allow collection of coolant that has leaked from test openings during operation of the apparatus. A transparent safety shield shall enclose the reservoir fully. This shield will be arranged to deflect any spray into the collection pans. The safety shield *must* be in place any time the reservoir is hot or pressurized, or both.

6.2 *Circulation Pump*,<sup>3</sup> capable of circulating a minimum of 30 L (8 gal) of water per minute against zero head pressure, shall be used. The packing seal of the pump shall be capable of withstanding 140 kPa (20 psi) and 104°C (220°F). Inlet and outlet connections shall be not less than ½ in. (12 mm) standard water pipe.

6.3 *Heating Element*, shall be of the immersion cartridge type and shall have a power rating of approximately 1500 W. It shall be installed above the suction pipe of the circulation pump and shall be capable of heating the filled system to 88°C (190°F) within 30 min. A temperature controller shall be used

<sup>3</sup> An Eastern Industries Model P34C, manufactured by Eastern Industries Division Laboratory for Electronics Inc., 1525 Concord Pike, Wilmington, DE 19803, and a Grainger's catalogue pump No. IP787 have been used successfully.