Designation: D2758 – 94 (Reapproved 2009)

Standard Test Method for Engine Coolants by Engine Dynamometer[1]

This standard is issued under the fixed designation D2758; 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 covers a full-scale clean engine test designed to evaluate corrosion protection and inhibitor stability of engine coolants under simulated heavy-duty driving conditions.

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 hazards statements are given in Section 6.

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D1121 Test Method for Reserve Alkalinity of Engine Coolants and Antirusts

D1287 Test Method for pH of Engine Coolants and Antirusts

D1384 Test Method for Corrosion Test for Engine Coolants in Glassware

G1 Practice for Preparing, Cleaning, and Evaluating Corrosion Test Specimens

2.2 *Federal Standard:*[3]

CFR Title 29 OSHA Regulations

3. Summary of Test Method

3.1 This test method involves the operation of a standard passenger car engine on a dynamometer stand under constant speed, load, and coolant temperature conditions for a total of 700 h. The performance of the coolant is judged by examination of (*1*) coolant samples, (*2*) metal corrosion specimens, and (*3*) cooling system components.

4. Significance and Use

4.1 This test method provides a laboratory technique capable of reproducing the complex environmental stresses a coolant encounters under actual engine operating conditions. The test method provides improved discrimination over glassware and simulated service tests and improved correlation with field service. Although the test method is particularly valuable for developing coolants for increased service requirements, it remains that field testing is necessary to evaluate coolant performance completely.

5. Apparatus

5.1 *Test Engine*— The test engine shall be a volume production passenger car engine of cast iron or aluminum construction. Engine speed and brake horsepower should be calculated and adjusted to be equivalent to a 96.5 km/h (60 mph) level road load. Aluminum accessories, such as coolant pump and timing chain cover, are optional. The engine shall be equipped with a matching radiator and pressure cap. A coolant overflow reservoir and closed-system pressure cap are optional, except when specified by the manufacturer. Assemble the test components to provide a complete cooling system. The relative positioning of the radiator and engine should duplicate, as closely as practicable, the mounting in the automobile with the fan omitted. All radiator hose lengths should be held to a minimum. The radiator shall be cooled by forced air.

5.2 *Instrumentation and Control* (See Fig. 1)—Run the engine on a test stand coupled to an engine dynamometer with appropriate accessories for control of the designated operating conditions. Measure engine coolant temperature out of the engine at a point immediately adjacent to the coolant outlet. Measure manifold vacuum, oil pressure, and exhaust pressure at appropriate points and monitor them throughout the test in order to ensure proper engine performance. Install a pressure gage in the outlet tank of a crossflow radiator or the top tank of a downflow radiator to read the gage pressure.

5.3 *Corrosion Measurements:*

5.3.1 Evaluate corrosion protection using metal specimens. The specimen arrangement shall be basically that used in Test Method D1384. The specimen bundle is shown in Fig. 2.

[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 D15.10 on Dynamometer and Road Tests.

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

[3] Available from the Occupational Safety and Health Administration, 200 Constitution Ave., N.W., Washington, DC 20008.

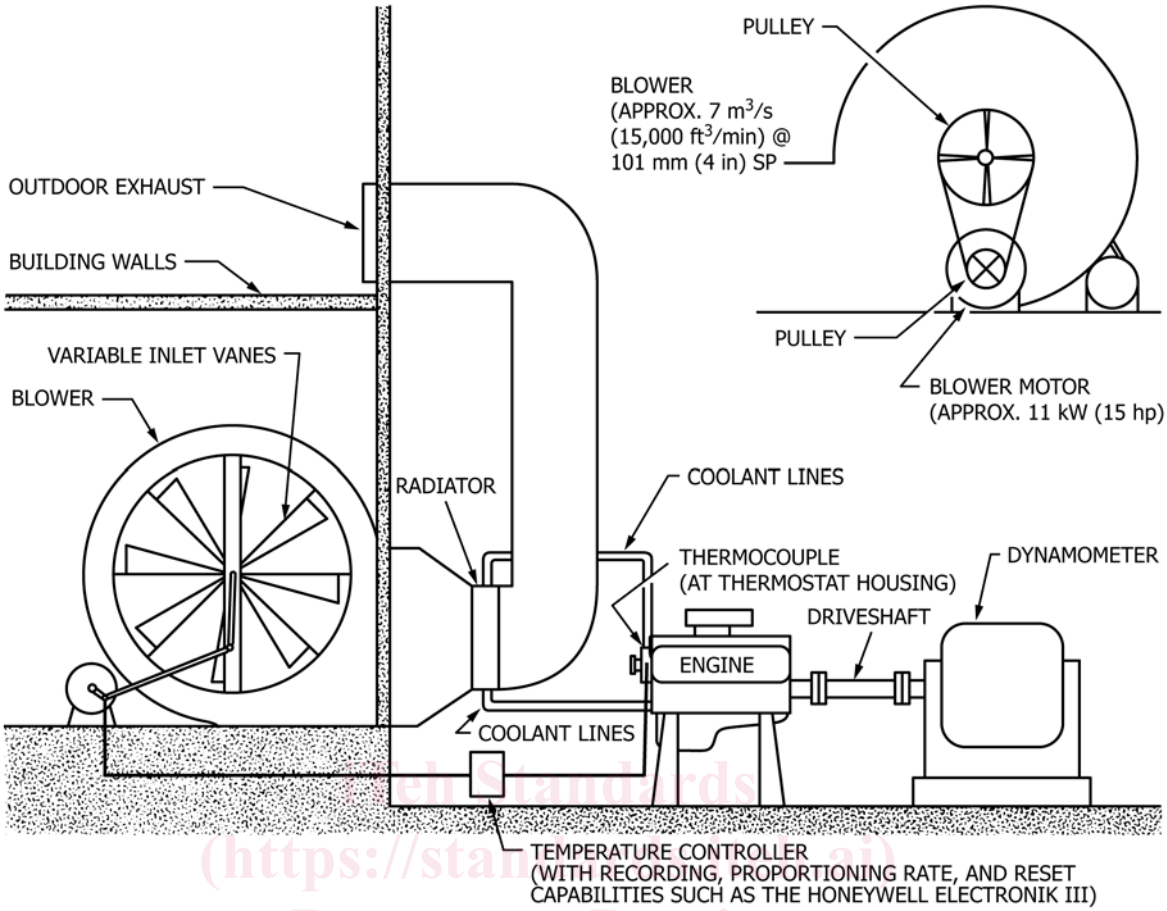

FIG. 1 Air Cooling Setup

Preparation, cleaning, and weighing of the metal specimens are described in Test Method D1384 and Practice G1. Each specimen bundle shall be held in a canvas-reinforced phenolic tube (see Fig. 3) which, in turn, is contained in a capsule. Use two types of specimen capsules: full-flow and bypass. Install the full-flow capsule in the upper radiator hose, and connect the bypass capsule across the heater taps of the engine. Details of the capsules are shown in Fig. 4 and Fig. 5. The full-flow capsule shall contain three sets of specimens; weigh and replace one set with a fresh set at 100-h increments, and weigh two sets at the conclusion of the test. The bypass capsule shall contain three sets of specimens; clean, weigh, and replace the first set at 100-h increments. Clean and weigh the second set at 400 h. Replace, clean, and weigh this set at the end of the test. Clean and weigh the third set at the end of the test.

5.3.2 Position the full-flow capsule in the upper radiator hose at a point below the radiator coolant level.

5.3.3 The bypass capsule should be located in close proximity to the engine in order to avoid excessive coolant temperature drop.

5.3.4 Equip the bypass capsule with a temperature-measuring device to assure that normal flow is being maintained. (A temperature drop from normal operating temperature indicates an obstruction in the bypass circuit.) A mounting bracket attached to the radiator stand is recommended. Mount the capsule below the radiator coolant level in a vertical position. Connect the bottom fitting of the capsule with a rubber hose to the standard heater supply nipple, and connect the top fitting to the return nipple on the coolant pump.

5.4 *Fuel and Crankcase Oil*—Because of the extended duration of this test, it is suggested that high-quality fuels and motor oils be selected to control combustion problems and achieve maximum valve life.

6. Precautions

6.1 *Safety Precautions:*

6.1.1 *Coolant*—All coolant concentrates and their solutions should be considered harmful or fatal if swallowed.

6.1.2 *Specimen Cleaning*—When cleaning aluminum specimens with chromic acid/orthophosphoric acid solution, use fume hood.

6.1.3 *Personal Protection*—Appropriate personal protection equipment (safety glasses, gloves, etc.) should be worn at all times when working with hot, pressurized engine systems. In general, engine speed should be lowered to 1000 rpm at no load, and the temperature and pressure on the cooling system should be lowered to a level below the boiling point of the coolant before approaching the engine. To avoid possible burns, care should be exercised in venting and opening the radiator pressure cap.