GM WORLDWIDE ENGINEERING STANDARDS	Test Procedure	GMW15919

Thermal Shock Test for Paint Adhesion

1 Introduction

Note: Nothing in this standard supercedes applicable laws and regulations.

Note: In the event of conflict between the English and domestic language, the English language shall take precedence.

1.1 Purpose. Coated exterior parts are exposed to a variety of environmental conditions. This procedure simulates the thermal shock that an exterior part would experience when a vehicle is cleaned on a cold winter day. Temperature extremes are used to ensure durability of the materials through "worst case" conditions and accelerate the onset of failure in a single test cycle. The purpose of this standard is to determine the resistance to coating adhesion loss of coated surfaces of aluminum, plastic, steel, and other substrates when subjected to a wet steam blast similar to that produced by vehicle wash equipment.

1.2 Applicability. Painted exterior components of vehicle.

1.3 Remarks. None.

2 References

Note: Only the latest approved standards are applicable unless otherwise specified.

2.1 External Standards/Specifications.

ASTM D1193 ISO 2808

2.2 GM Standards/Specifications.

None

2.3 Additional References.

- Testing Innovations, 25170 John R Rd, Madison Heights, MI 48071; U.S.A., phone (248) 515-5855; http://www.testing-innovations.com

3 Resources

3.1 Facilities.

3.1.1 Calibration. The test facilities and equipment shall be in good working order and shall have a valid calibration label.

3.1.2 Alternatives. Alternative test facilities and equipment may also be used. However, all measuring variables as specified in this standard shall be determined correctly with respect to their physical definition.

3.2 Equipment.

3.2.1 Test Equipment and Material.

3.2.1.1 Scribe Tool. A straight shank tungsten carbide tip, lathe cutting tool or carbide-tipped pencil type tool with tip angle of 60 degrees ± 15 degrees or equivalent. (For rigid materials-metals).

3.2.1.2 Razor blade. For flexible materials-plastics.

3.2.1.3 Water Bath. Water bath at 38 °C ± 2 °C temperature with 5 ppm maximum dissolved solids as measured utilizing a suitable dissolved solids meter.

3.2.1.4 Freezer capable of maintaining -29 °C ± 3 °C temperature.

3.2.1.5 Steam Source. A steam generator per the following description, or equivalent, may be used: Model 100 Steam Generator from Testing Innovations. However, earlier generations of the Model 100, in house steam (no

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longer an alternative due to inability to control flow) and other equivalent steam generators must be calibrated upon each use with an approved dynamic head fixture. Retro-fit kits are not available. It has been shown that older generations cannot reliably produce the required test conditions. Contact Testing Innovations for information.

3.2.1.5.1 Input Flow of Water. Input flow of water to be 2.7 L/minute with a deviation < 5% (3.2.1.5.1.1).

3.2.1.5.1.1 Model 100 Steam Generator. The pumping pressure is directly related to the input flow rate. The pressure needed for the required flow can be determined by measuring the pump pressure and discharge flow rate with the burner off. When the burner is turned on, the required flow rate is obtained by readjusting to the required pump pressure.

3.2.1.5.2 Nozzle Diameter. Diameter of 12.5 mm inner diameter (ID) within 2% and at least 100 mm long.

3.2.1.5.3 Discharge Dynamic Head. Discharge dynamic head pressure must be 37.9 kPa (5.5 psi) within ± 5% measured 25 mm from the nozzle using a 4.7 mm ID tube. A non-diverging discharge is required for this test (3.2.1.5.3.1, 3.2.1.5.3.2 and Figure 1).

3.2.1.5.3.1 This is done by placing the tube midstream 25 mm from the nozzle. The tube size must not be varied because the densities and velocities are not uniform throughout the cross section of the discharge stream.

3.2.1.5.3.2 Adjusting the discharge dynamic head may be required. This must be done in such a way that the input flow rate, as specified in 3.2.1.5.1, is maintained. This is done by adjusting the amount of heat transferred to the water. Increasing the heat will cause the input flow rate to change. It must be readjusted. This operation will result in an increased dynamic pressure. To decrease it, decrease the heat and then adjust the flow (pressure).

3.2.1.6 K Type Thermocouple. For measuring temperature at sample test location.

3.2.1.7 Face Mask. Full face cover safety mask is required when performing this test.

3.2.1.8 Gloves. Gauntlet-type gloves for protection of hands are required.

3.2.1.9 Fixtures. A fixture or rack is needed to hold test sample in place during test, and to hold nozzle in place at specified distance and angle. Fixtures are available through Testing Innovations for this purpose but can also be self-created as long as test parameters are met.

3.3 Test Vehicle/Test Piece. Not applicable.

3.4 Test Time.

Calendar time:	1 d
Test time:	1 h
Coordination time:	8 h

3.5 Test Required Information. Not applicable.

3.6 Personnel/Skills. Personnel trained in accordance with laboratory accreditation requirements

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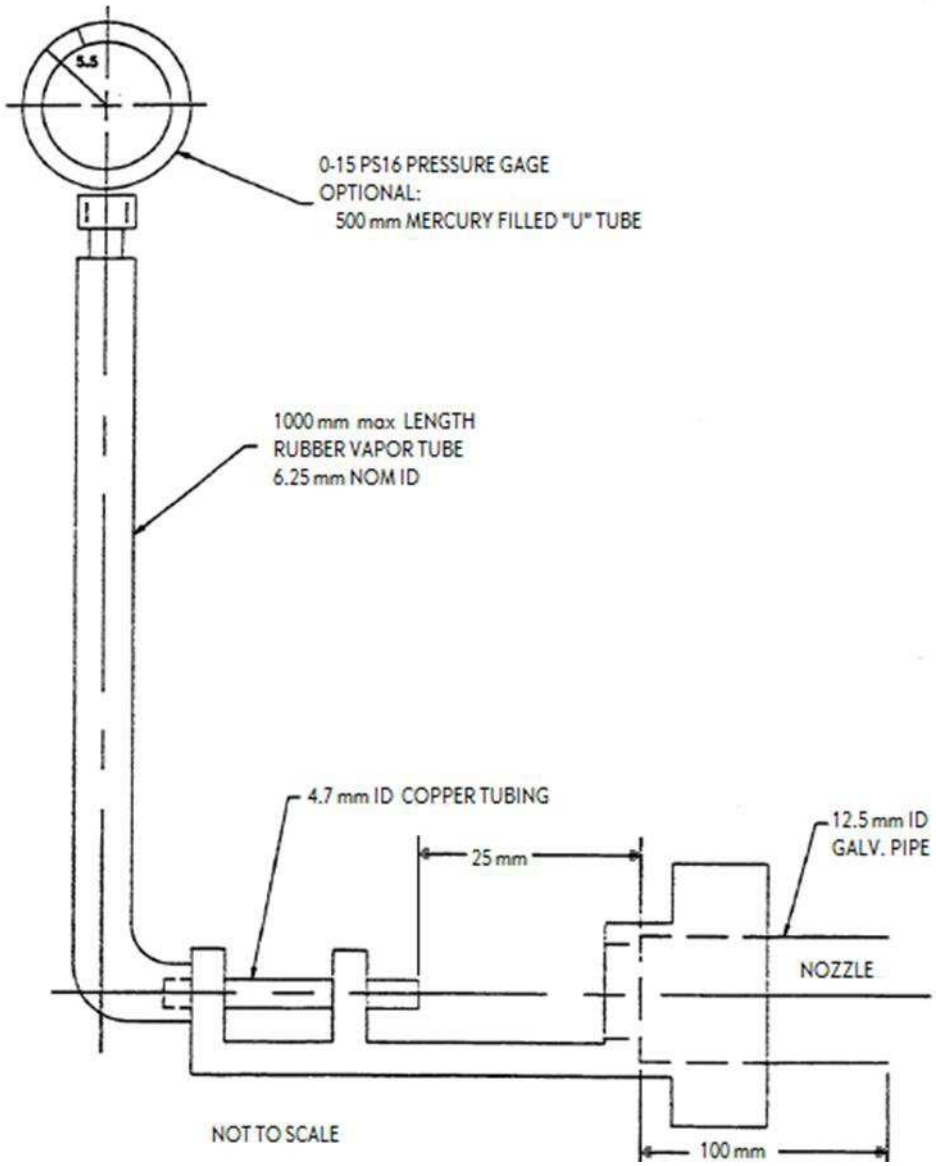
Figure 1: Measuring the Discharge Dynamic Head Pressure



Note: GALV. = Galvanized, max = maximum, NOM = Nominal.

4 Procedure

4.1 Preparation. Not applicable.

4.2 Conditions.

4.2.1 Environmental Conditions. Not applicable.

4.2.2 Test Conditions. Deviations from the requirements of this standard shall have been agreed upon. Such requirements shall be specified on component drawings, test certificates, reports, etc.

4.3 Instructions.

4.3.1 Standardize the steam generator (pre-2013) as described in the following.

4.3.1.1 Measure and maintain the input flow at 2.7 L/minute.

4.3.1.1.1 Install a 1.27 cm globe valve in the steam line between coil weld assembly and hose nipple, 0.4 cm.

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