



Air Induction Duct Vacuum Collapse

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. The purpose of this test is to determine how the design of clean air ducts (low pressure side for turbocharger) will react to changes in vacuum caused by slow/steady engine vacuum increase, and sudden/short term vehicle acceleration with a dirty air filter. The test determines a change in the cross section profile of the duct at the Excursion Temperature based on Location (ETL), degrees Celsius. See Subsystem Technical Specification (SSTS) Normal Operating Temperature Section.

1.2 Applicability. This test is for the clean air duct assembly of the air induction system. This test is also applicable to the dirty side air duct if required.

2 References

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

2.1 External Standards/Specifications.

ASTM D2000 IRM903 ISO 1817 SAE J200

2.2 GM Standards/Specifications.

GMW16955

2.3 Additional References.

- GMPT-6-023-B (E85 Fuel)
- Subsystem Technical Specification (SSTS)

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. The regulated vacuum test equipment must be electronically controlled and must have a valid calibration label.

3.3 Test Vehicle/Test Piece. Test specimens shall be clean, dry, and previously unused.

3.4 Test Time.

Calendar time: 5 days
Test hours: 75 hours
Coordination hours: 5 hours

3.5 Test Required Information.

3.5.1 Minimum torque specification for any clamps used in the assembly.

3.5.2 A picture of the testing setup must be included with the test report.

3.6 Personnel/Skills. Prior experience in setting up and running similar tests and experience in the use of the referenced test equipment.

4 Procedure

4.1 Preparation.

4.1.1 The test samples shall be preconditioned with oil/fuel exposure. If there is no Positive Crankcase Ventilation (PCV) port on the duct, go to 4.1.5.

4.1.2 For All Regions Except General Motors South America (GMSA). Prepare a mixture (> 50 mL) of oil combined with E85 fuel. Fifteen percent (15%) of the mixture volume should be E85 fuel (GMPT-6-023-B) and 85% of mixture volume should be IRM903 or GMW16955 (Code F) oil.

Note: If the vehicle is not designed to run E85 fuel, then ISO 1817, Liquid 2, can be substituted for E85 fuel.

4.1.3 For GMSA Region. Two test samples are required. Prepare two mixtures (> 50 mL for each) of oil and fuel. One with E25 fuel and the other with E100 fuel. Fifteen percent (15%) of mixture volume should be fuel and the remaining 85% of mixture volume should be IRM903 or GMW16955 (Code F) oil. For the first test sample use the E25 fuel mixture and for the second test sample use the E100 fuel mixture.

4.1.4 Pour 50 mL oil/fuel mixture into the duct PCV port. Install PCV plug. Shake the duct assembly to distribute the mixture. Remove PCV plug.

4.1.5 Place duct assemblies into a temperature chamber. Mount the duct on a rigid fixture that represents the in-vehicle position.

Heat chamber up to ETL (degrees Celsius) using a temperature gradient of 70 °C/h to 80 °C/h.

Hold temperature at ETL (degrees Celsius) for 6 h.

Cool chamber down to -30 °C using a temperature gradient of 70 °C/h to 80 °C/h.

Hold temperature at -30 °C for 6 h.

Repeat this cycle five (5) times.

4.1.6 Install equipment to measure and record vacuum level per unit of time. Seal any open ports. See Figure 1.



Figure 1: Vacuum Collapse Test Setup

4.2 Conditions.

4.2.1 Environmental Conditions.

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.

4.2.2.1 Soak duct at ETL (degrees Celsius) specified in the vehicle program air induction system SSTs for a minimum of 3 h. Record the temperature of the test chamber.

4.3 Instructions. Maintain excursion temperature and apply vacuum at the rates in 4.3.1 and 4.3.2.