GM WORLDWIDE ENGINEERING STANDARDS	Test Procedure	GMW16654

Fuel Filler Pipe Pressure and Vacuum Cycling Durability

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. To determine the fatigue life of a Fuel Filler Pipe (FFP) Assembly, including attachment points, by alternately applying an internal pressure and vacuum to the FFP at a given rate.

1.2 Applicability. All passenger cars and light-duty trucks which have a primary or secondary diesel or gasoline fuel tank of metallic or non-metallic material.

1.3 Remarks. This procedure simulates pressure and vacuum variations which develop within vehicle fuel tank systems during vehicle operation. Pressure and vacuum variations occur due to:

- Fuel motion
- Tank wall motion
- Engine vacuum via purge
- Vapor pressure changes due to change in ambient temperatures and vehicle hot fuel handling

This test may also show a tendency of FFP components (e.g., filler hose or vapor bundle) to “oil can” due to the pressure and vacuum extremes of the test.

2 References

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

2.1 External Standards/Specifications.

None

2.2 GM Standards/Specifications.

GMW15667

2.3 Additional References.

- Fuel Filler Pipe Assembly Component Technical Specification (CTS)
- Master Process Document (MPD)

3 Resources

3.1 Facilities. A laboratory test facility capable of controlling temperature, housing the test fixture and cycling the FFP between pressure and vacuum.

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.

Note: All instrumentation is to be calibrated as required; record instrumentation details and date of calibration on Data Sheet A1 in Appendix A, unless the information is otherwise preserved in the testing facility records.

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3.2.1 A fixture system capable of holding the FFP assembly in design-intent position. The FFP attachment points shall be of intended design and location. Actual underbodies may not last for multiple tests because they would have to be replaced as required. In practice, most facilities use special fabricated fixtures or reinforced production designs.

3.2.2 A controlled heat source is required for non-metallic FFP to maintain a temperature of 82 °C ± 3 °C (180 °F ± 5 °F). The heat source may be either a thermal chamber (preferred) or water heating device.

3.2.3 Liquid leak detector (e.g., soapy water) to check for leaks.

3.2.4 Equipment with capabilities as listed in 3.2.4.1 through 3.2.4.5.

3.2.4.1 Cycling between pressure and vacuum limits of 14.9 kPa ± 5% (2.2 psi ± 5%) pressure and 7.0 kPa ± 5% (1.0 psi ± 5%) vacuum or to a level determined by design or test engineer and approved by the Global Subsystem Leadership Team (GSSLT). Use of a calibrated transducer (with an accuracy 10 times the allowable variation) to check the pressure and vacuum levels at start of test is recommended. The cycle time is 4 cycles per minute ± 2 cycles per minute. It is important to maintain consistent cycle times from sample to sample of this same design to reduce test variation.

3.2.4.2 Producing a smooth waveform when changing between peak loads of pressure and vacuum.

3.2.4.3 Producing time at peak pressure and vacuum ≥ 1 s (to assure proper load application). Maximum load hold time is not specified.

3.2.4.4 Conducting a pressure leak test during inspections. This is important to determine if there might be an unobservable leak (one that would not produce a visible leak, or a leak too slow to observe). Alternately, a measurement of the time necessary to obtain pressure or vacuum readings may be used. For example, a leak might have occurred if the time to obtain test Pressure/Vacuum (P/V) is longer than at the beginning of test.

Note: This is not a substitute for leak checking FFPs during preparation since this method may only identify large leaks.

3.2.4.5 Measuring torque.

3.2.5 Instrumentation. Instrumentation is needed to do the following:

- Measure pressure and vacuum internal to the FFP
- Count P/V cycles

3.3 Test Vehicle/Test Piece.

3.3.1 Assemblies. Three (3) complete FFPs, from as many cavities as possible (with attachment components) are required for test. The fuel fill pipe is required to be utilized with an aluminum or non-venting style fuel cap.

3.3.1.1 FFPs are to be visually inspected to assure they represent test intent for:

- Proper metal or material flow
- Metal creases
- Proper seam weld technique

3.3.1.2 Non-metallic FFPs must have proper coatings and treatments.

3.3.1.3 Internal baffle or reservoir system.

3.4 Test Time. The following is an estimate on the amount of time (work hours) needed to perform this procedure.

Calendar time:	4 days
Test hours:	8 hours
Coordination hours:	20 hours

Note: Preparation and other downtime, actual test, and analysis of data are considered in capturing a total calendar time.

3.5 Test Required Information. Not applicable.

3.6 Personnel/Skills. Engineering technician trained in Section 4 procedure.

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