



Fuel System Overturn Test

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 evaluate the ability of liquid fuel systems to hold a liquid without leaking during an overturn test. This test procedure may be used:

- As a development subsystem test based on Federal Motor Vehicle Safety Standard 301 (FMVSS 301) vehicle testing requirements and the European Economic Community 70/221 (EEC 70/221) requirements.
- To evaluate performance to the current EEC 70/221.

1.2 Applicability. Tanks and reserve tanks for non-pressurized liquid fuel (i.e., gasoline, diesel) of any vehicle subject to requirements of FMVSS 301, EEC 70/221 or Economic Commission for Europe R34 (ECE R34).

1.3 Remarks.

1.3.1 There are no requirements for this type of fixture subsystem test in FMVSS 301. (FMVSS 301 requirements are related to performance after a barrier test.) However, this test procedure can be used as a development tool to evaluate fuel system performance under conditions similar to the required vehicle test.

1.3.2 The General Development Method (4.3.1) is designed to evaluate to current EEC 70/221 requirements, as well as, satisfy the need for a development test to evaluate FMVSS 301 performance. Thus, some aspects of the General Development Method are more restrictive than what might be needed to satisfy the current EEC 70/221 or FMVSS 301 separately. See 4.3.1 for details.

1.3.3 If this procedure is used for a third party witness approval (vehicle type approval) for certain regional statutes, the following applies:

- When a United States based laboratory is permitted to perform approval testing, a European witnessing official of the approving agent may be required to be present during some or all of the testing.
- The use of special forms may also be required, in addition to Data Sheets A1 and A2, Appendix A.
- Deviations from this procedure may be requested by the witnessing official.

2 References

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

2.1 External Standards/Specifications.

ECE R34 EEC 70/221 FMVSS 301

2.2 GM Standards/Specifications.

None

3 Resources

3.1 Facilities. A qualified facility with required equipment.

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.

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3.2 Equipment.

3.2.1 A fixture which can hold a fuel tank and the complete venting system in simulated vehicle position. The fixture must be able to rotate the system 360 degrees in either direction about the vehicle's longitudinal axis, with the axis kept horizontal.

3.2.2 Equipment suitable for collecting and weighing spilled liquid to an accuracy of 3 g (0.1 oz). Cotton gauze has been used successfully for measuring fuel spillage at openings to the atmosphere.

3.2.3 Stopwatch or timing device to measure time intervals during which fluid spillage is to be measured.

3.2.4 Inclinator to measure the angular attitude of the tank, if required.

3.2.5 Equipment to extract fluid from the fuel tank.

3.3 Test Vehicle/Test Piece.

3.3.1 Test Materials/Components.

3.3.1.1 Fuel subsystem, including the complete integrated fuel tank assembly, fuel filler pipe assembly, fuel cap (if applicable), attaching parts (straps and bolts), and the complete venting system (i.e., recirculation line, vapor canister, Canister Vent Solenoid (CVS), fresh air line, and purge line) if applicable.

Unless specified by the Design Release Engineer (DRE), the fuel feed/return lines (other than Part Of Assembly (POA) fuel tank) are not required. Fuel feed/return lines POA of the tank are to remain unplugged.

The fuel cap (or capless unit) should be verified to its design intent sealing specifications.

3.3.1.2 Test Liquid. Stoddard solvent, water or a non-flammable liquid having the density and viscosity close to that of the liquid fuel.

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

Consider preparation and other downtime, actual test, and analysis of data in capturing a total calendar time.

Calendar time: 5 days

Test hours: 8 hours

Coordination hours: 16 hours

3.5 Test Required Information. Not applicable.

3.6 Personnel/Skills. Prior experience/training in setting up and running this test or similar tests is required. Additionally, experience/training in the use of the referenced test equipment are required for a successful evaluation. This experience is also critical to achieving the estimated times shown in 3.4, Test Time.

4 Procedure

4.1 Preparation.

4.1.1 The engineer shall:

4.1.1.1 Record the customer fuel fill capacity of the tank per the DRE. Calculate and record 90% and 30% of this capacity for use during test. (Reference Data Sheet A1, Appendix A.)

4.1.1.2 Determine and record which method to use based on test objective.

4.1.1.3 The General Development Method (4.3.1) would be used during general development of a fuel system to evaluate system design performance against United States and Canada vehicle requirements (e.g., after a barrier test) and Europe EEC 70/221 requirements. The advantage of the General Development Method is that one procedure covers both domestic evaluation and European requirements.

4.1.1.4 The EEC 70/221 method would be used only for a third party witness approval (vehicle type approval) for certain regional statutes with a witnessing official present. The advantage of this method is that it is a shorter and simpler test.

4.1.2 Securely attach the fuel tank and venting system to the test fixture in simulated vehicle attitude.

4.1.3 Ensure that all vents are operational. This may involve purging the vent line by pressurizing the fuel tank at the filler neck (approximately 13.8 kPa (2 psi)) to force out all liquid in the vapor canister vent line.

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