



Fuel/Diesel Exhaust Fluid (DEF) Inlet Load 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 simulate a customer refilling a vehicle, and placing a vertical or axial load on the fill nozzle over the service life of the fuel system.

1.2 Applicability. Gasoline, alcohol, and diesel fuel systems, as well as Diesel Exhaust Fluid (DEF) fill systems.

1.3 Remarks. This procedure tests for deformation, wear, or fatigue of the fuel and DEF fill pipe assemblies and attached components, due to a repeated vertical and/or axial load.

2 References

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

2.1 External Standards/Specifications.

ISO 22241-5

2.2 GM Standards/Specifications.

GMW14859 (ID) GMW16194

(ID) = This standard is limited to internal distribution within General Motors and shall not be distributed outside this company. Contact the GM Lead Engineer for further instructions.

3 Resources

3.1 Facilities. Test laboratory capable of housing a vehicle or representative vehicle body fixture and equipment to apply a vertical and/or axial load on the fill pipe.

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 Air cylinder, hydraulic cylinder or equivalent device capable of applying downward or axial loads of $222\text{ N} \pm 2\%$ (50 lb $\pm 2\%$) and $445\text{ N} \pm 2\%$ (100 lb $\pm 2\%$). The equipment must also have sufficient travel, typically 76 mm (3 in) or greater, to apply the required load and then be able to completely remove it.

3.2.2 Related controls, cycle counter.

3.2.3 A dispensing nozzle appropriate for the type of system being tested and the market in which the vehicle will be sold, complete with retainer coil on spout (if applicable).

Tests of gasoline or alcohol fuel systems should use one of the following nozzles:

- North America and China: Nozzle OPW 11AP or OPW 11BP with 2-piece spout.
- Europe: Elaflex ZVA 2 GR.
- Korea: Tatsuno FN-1001-Z01.

Tests of diesel fuel systems should use one of the following nozzles:

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- North America and China: Nozzle OPW 11A or OPW 11B.
- Europe: Elaflex ZVA Slimline 2.
- Korea: Tatsuno FN-1002-U.

Tests of DEF systems should use one of the following nozzles:

- Vertical: OPW 21Gu.
- Axial: Elaflex ZVA Slimline.

Fuel fill pipe designs that are sold in multiple markets should be tested with the nozzle having the longest moment arm from the fill pipe to the center of the grip area where the vertical load is to be applied.

As an alternative to using an actual nozzle for this test, a cylinder or pipe to simulate the nozzle spout may be used. The simulated nozzle spout must have:

- The same outside diameter and curvature as the actual nozzle spout.
- A length that will allow a load to be applied at a location representing the center of the grip area (to achieve the correct moment arm).
- A retainer coil installed in the same location as found on the actual nozzle to ensure correct nozzle insertion depth.
- A simulated nozzle body to allow evaluation of contact to the body.

3.2.4 A weight equal to $111\text{ N} \pm 2\%$ ($25\text{ lb} \pm 2\%$) and attachment string/wire to suspend from fill cup.

3.2.5 A digital inclinometer with a 4×90 degree capability to allow it to measure within the fill cup pocket.

3.3 Test Vehicle/Test Piece.

3.3.1 A representative vehicle body fixture or full vehicle. A representative vehicle body fixture must include the body panel and fill pipe attachment points.

3.3.2 Fuel or DEF fill pipe assembly, three (3) or more parts for vertical load, an additional three (3) or more parts if running axial load. Each part should be labeled with a unique part identifier.

3.3.3 Fuel or DEF tank assembly.

3.3.4 Three (3) or more fill pocket inserts, attachment hardware (if applicable) for each fill pipe. Each part should be labeled with a unique part identifier. If diesel fill pipe and DEF fill pipe share a fill pocket, the same one should be used for testing both the diesel and DEF pipes. You may also use the same pocket insert for axial and vertical testing.

3.4 Test Time. The following is an estimate on the amount of time (work hours) needed to perform this procedure. Preparation and other downtime, actual test, and analysis of data are considered in capturing a total calendar time.

Calendar time: 4 days

Test time: 16 hours

Coordination time: 16 hours

3.5 Test Required Information. Not applicable.

3.6 Personnel/Skills. Lab test personnel with fuel system test experience.

4 Procedure

4.1 Preparation.

4.1.1 Record test component part numbers and any other pertinent descriptive data in Appendix A, Data Sheet A1 or A2.

4.1.2 Mount the test parts and pressure check the combined tank and fill pipe assembly (or only the fill pipe) at 10 kPa (1.45 psi) for 5 minutes. Apply pressure through a port or vent valve on the tank assembly that is not connected to the fill pipe assembly. It is acceptable to install an unvented cap with representative sealing quality in the event that the original cap will not hold 10 kPa (1.45 psi). Record the pretest leak check result on Appendix A, Data Sheet A1 or A2.

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Note: A plastic tank may take longer than 5 minutes to stabilize. A pressure decay of 1 kPa (0.2 psi) or more indicates a leak. Use soapy water to locate any leaks that occur.

4.1.3 Vertical Loading (Required for all fuel and DEF fill pipes). Insert the nozzle or simulated nozzle fully into the fill pipe. Adjust the load cycling equipment such that the downward load will be applied to the center of the nozzle grip area (or an equivalent distance). The downward load should be in addition to the weight of a nozzle and hose. The weight of the nozzle and hose is approximately 3 kg (6.6 lb). The nozzle/simulated nozzle and attachment to the load cycling equipment should therefore be approximately 3 kg (6.6 lb).

4.1.4 Axial Loading Attach the actuator to the fixture body so that it is at the center line of the fill pipe. Adjust the load cycling equipment, such that the axial load will be applied to the center line of the fill pipe face. The load should be applied evenly across the nozzle boot sealing surface.

Note: It is required for all vehicles sold in GMNA to represent California Air Resource Board (CARB) nozzle insertions, all DEF assemblies to represent low flow ISO 22241-5 nozzle insertions, and to be conducted on a separate set of fill pipes from vertical loading.

4.1.5 Adjust the load cycling equipment to alternate between applying the load and removing the load.

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 Install $222\text{ N} \pm 2\%$ (50 lb $\pm 2\%$) of weight on the test stand.

4.3.2 Measure the fill pipe face angle in the unloaded condition. See Figure 1. Record this measurement on Appendix A, Data Sheet A1.

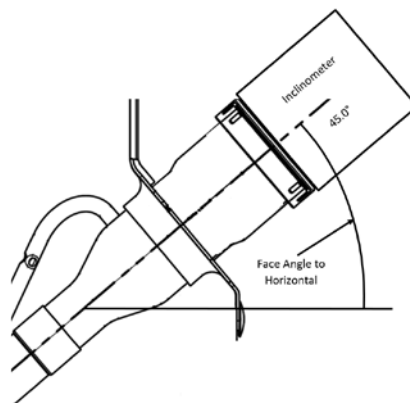


Figure 1: Fill Pipe Face Angle Measurement

4.3.3 Set the load cycling equipment for 1100 cycles for gasoline, ethanol, and diesel systems, or 180 cycles for DEF systems or as otherwise defined in the SSTs. Make sure to re-zero the cycle counter before beginning the test.

4.3.4 Begin the $222\text{ N} \pm 2\%$ (50 lb $\pm 2\%$) load test. Note any contact of the nozzle to the body and record on Appendix A, Data Sheet A1.

4.3.5 After completion of the test cycles, measure the fill pipe face angle in the unloaded condition. Record this measurement on Appendix A, Data Sheet A1.

4.3.6 Install $445\text{ N} \pm 2\%$ (100 lb $\pm 2\%$) of weight onto the test stand.

4.3.7 Measure the fill pipe face angle in the unloaded condition. Record this measurement on Appendix A, Data Sheet A1.

4.3.8 Set the load cycling equipment for three (3) cycles for gasoline, ethanol, and diesel systems (for DEF systems, go to 4.3.11). Make sure to re-zero the cycle counter before beginning the test.

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