



CNG/LPG Fill Nozzle 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. This test is to simulate two customer vehicle refueling cases:

1. placing a downward or lateral load on the fill nozzle and
2. driving a vehicle away from a filling station while still connected to the filling nozzle.

1.2 Applicability. CNG and LPG fuel systems.

1.3 Remarks. This procedure tests for deformation, wear, leakage, or fatigue of the fuel fill pipe assembly and attached components due to a repeated vertical or a lateral load.

2 References

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

2.1 External Standards/Specifications.

None

2.2 GM Standards/Specifications.

GMW15573

3 Resources

3.1 Facilities. Test laboratory capable of housing a vehicle or representative vehicle body fixture and equipment to apply a vertical or lateral 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 with a linear displacement rate of (20 to 30) mm/s ((0.8 to 1.2) in/s) while applying downward or axial loads of 222 N (50 lb) and 445 N (100 lb). The equipment must also have sufficient travel, typically ≥ 76 mm (≥ 3 in), to apply the required load and then be able to completely remove it.

3.2.2 Related controls, cycle counter.

3.2.3 The following fuel dispensing nozzles shall be used for this test:

- CNG: Use WEH TK17 fuel dispensing nozzle for Europe and other regions governed by UN R110
Use OPW 1000 for North America.
- LPG fuel systems shall use one of the following nozzles (or equivalent):
 - o ACME Adaptor; Gasguard GG20 or Elaflex ZVG
 - o BAJONETT Adaptor; OPW BN320
 - o DISH Adaptor; Gasguard GG50
 - o Coupler Adaptor; Youngdo YLF-3200

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Equivalent nozzles may be used for the test as approved by the subsystem BFO.

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 may be used. The simulated nozzle must have:

- The same outside diameter and curvature as the actual nozzle.
- 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).

3.3 Test Vehicle/Test Piece.

3.3.1 The test shall use 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 The test shall use three (3) fuel fill pipe assemblies with receptacles. Each part shall be labeled with a unique part identifier.

3.3.3 The test shall use three (3) fill pocket inserts and attachment hardware (if applicable) for each fill pipe. Each part should be labeled with a unique part identifier. If the CNG/LPG fill pipe and gasoline fill pipe share a fill pocket, the same fill pocket shall be used for testing both fuels (for gasoline testing see GMW15573).

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 h

Coordination time: 16 h

3.5 Test Required Information. Not applicable.

3.6 Personnel/Skills. Test technician familiar with test facilities and equipment.

4 Procedure

4.1 Preparation.

4.1.1 Record test component part numbers and any other pertinent descriptive data in the data sheet, Appendix A, A1.

4.1.1.1 Leak Test before and after each load test with region specific test pressure. Use Helium or Nitrogen with 10% Helium or dry air. Using a standard leak detection solution (e.g. "Snoop" by Sigma-Aldrich or equivalent) apply copious amounts of solution on component interfaces.

4.1.2 Load tests shall be performed without pressure.

4.1.3 Vertical Loading. Insert and lock the nozzle or simulated nozzle fully on to the fill receptacle. 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).

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 Nozzle Load Test (to be completed on the same part).

4.3.1.1 This entire test sequence shall be applied to each of the three (3) parts tested.

4.3.1.2 Leak test per 4.1.1.1 and record in Appendix A, A1.

4.3.1.3 Install the fuel filler nozzle.

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4.3.1.4 Install 222 N (50 lb) of weight on the test stand.

4.3.1.5 Set the load cycling equipment for 1100 cycles. Make sure to re-zero the cycle counter before beginning the test.

For Korean LPG Taxi testing only, set the load cycling equipment for 6000 cycles.

4.3.1.6 Apply a load of 222 N (50 lb) downwards on the nozzle and release the load. Repeat for the total number of cycles.

4.3.1.7 Leak test per 4.1.1.1 and record in Appendix A.

4.3.1.8 Install 445 N (100 lb) of weight onto the test stand.

4.3.1.9 Set the load cycling equipment for 3 cycles. Make sure to re-zero the cycle counter before beginning the test.

For Korean LPG Taxi testing only, set the load cycling equipment for 9 cycles.

4.3.1.10 Apply a load of 445 N (100 lb) downwards on the nozzle and release the load. Repeat for the total number of cycles.

4.3.1.11 Leak test per 4.1.1.1 and record in Appendix A, A1.

4.3.1.12 Inspect the fuel fill pipe and surrounding components for changes in fit, form, and function. Note any deformation, wear, cracking, or other damage on the data sheet, Appendix A, A1.

4.3.1.13 Install the next fuel fill pipe, fill pocket and hardware (if applicable) to be tested and repeat 4.3.1.1 through 4.3.1.12 as applicable to the system.

4.3.1.14 Nozzle Load Test. Test Setup see Appendix B, Figure B1.

4.3.2 Breakaway Force Test. This test shall be performed after the Nozzle Load Test according to 4.3.1 (i.e. use the same 3 test pieces). It is intended to simulate the drive off with connected filling nozzle.

4.3.2.1 The safety clutch at the pump disengages at 600 N. Test with 670 N in the direction of travel. Direction of force: Backwards horizontally to 20° maximum upwards.

4.3.2.2 The tests shall be performed without pressure.

4.3.2.3 Leak test per 4.1.1.1 and record in Appendix A, A2.

4.3.2.4 Breakaway Force Test. Test Setup see Appendix B, Figure B2.

4.3.3 Static Force Test. (Only for regions governed by VENEZUELAN STANDARD COVENIN 3228:1999).

4.3.3.1 The test shall be performed without pressure.

4.3.3.2 Leak test per 4.1.1.1 and record in Appendix A, A3.

4.3.3.3 The test shall use a representative vehicle body fixture or full vehicle. A representative vehicle body fixture must include the body panel and fill pipe attachment points.

4.3.3.4 Apply a downwards load of 690 N (155 lb_f) for 2 minutes and release the load. Repeat this sequence for the following additional directions on the same test sample: Upwards, to the left, and to the right (as seen by a customer filling the vehicle).

4.3.3.5 Leak test per 4.1.1.1 and record in Appendix A, A3.

5 Data

5.1 Calculations. Not applicable.

5.2 Interpretation of Results. The test results shall be compared with the targets specified by Program Specific Documents.

5.3 Test Documentation. The test results shall be represented in a test report with reference to this Test Procedure.

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