



Body Shop Installed Sunroof Drain Hose Test Procedure

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 procedure describes the performance test requirements for body shop installed sunroof drain hoses.

1.2 Applicability. This procedure/standard applies to all passenger vehicles, multipurpose passenger vehicles, trucks, and buses produced by GM Globally. This test procedure is applicable to all body shop installed sunroof drain hoses.

1.3 Remarks. This document is the GM Worldwide Body Shop Installed Sunroof Drain Hose Testing Standard. Its purpose is to establish a common test methodology for Body Shop Installed Sunroof Drain Hose systems to ensure that a high quality, world class system is consistently developed and produced. This is a living document and any suggestions or revisions will be reviewed and/or updated annually by the Sunroof Global Subsystem Leadership Team (GSSLT). These tests must be used to determine the performance properties of body shop installed sunroof drain hoses.

2 References

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

2.1 External Standards/Specifications.

ASTM D380 ASTM D573 IEC 60068-2-27

2.2 GM Standards/Specifications.

GMW3059 GMW15530 GMW16602
GMW3600 GMW15760

2.3 Additional References.

- CG180 5-Phase Document (ID).
- GM Security Guidelines. <https://gmweb.gm.com/HR/Security/Pages/FutureGuide.aspx>.
- Program specific Component Technical Specification (CTS).
- Subsystem Technical Specifications (SSTS).
- Vehicle Technical Specifications (VTS).

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

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.

3.2.1 Personal Protection Equipment (PPE).

3.2.2 Digital Camera.

3.2.3 Force Gauge.

3.2.4 Magnifying Glass.

3.2.5 Scale (mm).

3.2.6 Test Fixture to hold hose set in vehicle position.

3.2.7 Thermal Chamber large enough to minimally contain one (1) test fixture (prefer to contain at least 3). The chamber should also meet the following:

- Temperature Range (-40 °C to +95 °C) and continuously adjustable.
- Controlled humidity.
- Recirculating air temperature cabinet.
- Test room, suitable for the execution of the test.
- Permissible temperature accuracy: ± 3 °C.
- Explosion proof.

3.2.8 Instron or similar.

3.2.9 Vacuum pump system - Capable of 60 kPa.

3.2.10 Stop watch.

3.2.11 Fluid container large enough to hold the entire volume of test fluid.

3.2.12 Accelerometer.

3.2.13 Vibration/shock machine.

3.2.14 Dynamic torque equipment.

3.2.15 Plug for drain hose outlets.

3.3 Test Vehicle/Test Piece.

3.3.1 Unless otherwise specified, three (3) samples of components, or systems, shall be tested. Test samples shall be of production intent design and material for design validation (DV); or, production intent design and materials manufactured with production processes (home line) for product validation (PV). Any changes to the components or material, e.g., design, fit, form, function, properties, manufacturing process, and/or location of manufacture require revalidation. GM shall approve validation methods for product/process changes before the supplier is committed to the change. Refer to GMW3600.

3.3.2 All components/systems used in testing shall be within drawing specifications and have supporting data prior to start of test.

3.3.3 **ALL** test samples **MUST** be conditioned per 4.1.1.

3.4 Test Time.

Calendar time: 7 d

Test time: 40 h

Coordination time: 20 h

3.5 Test Required Information.

3.5.1 GM Validation is to be notified of test failures within a 24 h period of occurrence.

3.5.1.1 Supplier to develop a 5-Phase Document (CG180) for all test failures.

3.5.2 **Product Security.** Security protocol for the test vehicle must be followed per GM Security Guidelines.

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

4 Procedure

4.1 Preparation.

4.1.1 Read the proper requirement from the SSTs.

4.1.2 Thoroughly Read this GMW and any other associated GMWs.

- 4.1.3** Ensure that proper Personal Protection Equipment (PPE) is used during set up and testing.
- 4.1.4** Ensure that the materials comply with GMW3059 and any regulatory requirements for country of sales.
- 4.1.5** Confirm Product Security Protocol for the vehicle tested by contacting the Vehicle Performance Manager (VPM). (Vehicles requiring camouflage, etc., must be carefully secured throughout the testing procedure so that no lapse in vehicle security occurs.)
- 4.1.6** Ensure that ALL components are at the proper release level and signed off by the DE and VE prior to testing.
- 4.1.7** Ensure that all torques have been confirmed before test.
- 4.1.8** Ensure that all critical bolts have been marked before test.
- 4.1.9** Ensure that the fixture is in proper working order – proper representation of the body, no damage from previous test.
- 4.1.10** Ensure that all equipment is in proper working order, equipment is calibrated, counters are working properly.
- 4.1.11** Ensure the system is set up on the fixture in design intent. Place the fixture in a thermal chamber and run the following temperature profile.
- 90 minutes at 204 °C (400 °F).
 - 240 minutes at 163 °C (325 °F).
- 4.1.12** All test samples are to be properly labeled using a permanent unique identifier. The numbering system shall be used in all phases of testing including DV, PV, Post Validation Audit (PVA), Development and any test incident retesting.
- 4.1.13** All test Samples shall have a Bill of Materials (BOM) that indicates release levels of the subsystem and components.

4.2 Conditions.

4.2.1 Environmental Conditions. The minimum time between manufacturing and testing shall be 72 h. The test pieces shall be maintained at a temperature of 23 °C ± 5 °C and 50% ± 5% relative humidity for at least 24 h prior to test and shall be free from strain during this period.

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.

Deviations must be approved by the GM Subsystem Validation Engineer (SVE) and Design Engineer (DE).

4.2.3 Materials. All materials used in the body cavity must be approved by Materials Engineering prior to testing and compatible to Electrophoretic Priming Operation (ELPO) and paint shop requirements.

4.3 Instructions.

4.3.1 Stress Aging.

4.3.1.1 Purpose. To ensure that the performance of the drain hose is not degraded due to the aging of materials.

4.3.1.2 Test Equipment.

4.3.1.2.1 PPE.

4.3.1.2.2 Digital camera.

4.3.1.2.3 Holding fixture.

4.3.1.2.4 Magnifying glass.

4.3.1.3 Test Samples. Unless otherwise specified 6 samples are to be used. GMW15760 is to be used to select test samples.

4.3.1.4 Test Time.

Calendar time: 3 d

Test time: 70 h

Coordination time: 3 h

4.3.1.5 Test Preparation. See 4.1.

4.3.1.6 Test Conditions. See 4.2.

4.3.1.7 Test Procedure.

4.3.1.7.1 Assemble samples of drain hose as shown in Appendix A, Figure A1.

4.3.1.7.2 Subject assemblies to oven aging at 125 °C (257 °F) for 70 h. See ASTM D573 for oven requirements.

4.3.1.7.3 After aging, visually examine tubing for cracks, breaks or other detrimental effects induced by the aging.

4.3.1.8 Test Requirements or Acceptance Criteria.

- Document all observations.
- Include photographs in the test report.

4.3.2 Environmental Shrinkage and Expansion. GMW16602 - Sunroof Drain Hose Environmental Testing.

4.3.2.1 Purpose. To ensure that the drain hose meets the performance requirements after exposure to environmental conditions.

4.3.2.2 Test Equipment.

4.3.2.2.1 PPE.

4.3.2.2.2 Digital camera.

4.3.2.2.3 Holding fixture.

4.3.2.2.4 Magnifying glass.

4.3.2.3 Test Samples. Unless otherwise specified 6 samples are to be used. GMW15760 is to be used to select test samples.

4.3.2.4 Test Time.

Test time: See specific GMW requirement for test time

Coordination time: See specific GMW requirement for test time

4.3.2.5 Test Preparation. See 4.1.

4.3.2.6 Test Conditions. See 4.2.

4.3.2.7 Test Procedure. Follow the environmental exposure in GMW16602.

4.3.2.8 Test Requirements or Acceptance Criteria.

- Document all observations.
- Include photographs in the test report.

4.3.3 High Temperature.

4.3.3.1 Purpose. To ensure that the drain hose meets the performance requirements after exposure to High Temperature conditions.

4.3.3.2 Test Equipment.

4.3.3.2.1 PPE.

4.3.3.2.2 Digital camera.

4.3.3.2.3 Holding fixture.

4.3.3.2.4 Magnifying glass.

4.3.3.2.5 Thermal chamber.

4.3.3.3 Test Samples. Unless otherwise specified 6 samples are to be used. GMW15760 is to be used to select test samples.

4.3.3.4 Test Time.

Test time: See specific GMW requirement for test time

Coordination time: See specific GMW requirement for test time

4.3.3.5 Test Preparation. See 4.1.

4.3.3.6 Test Conditions. See 4.2.

4.3.3.7 Test Procedure.

4.3.3.7.1 Ensure the system is set up on the fixture in design intent.

4.3.3.7.2 Set the thermal chamber to 204 °C (400 °F).

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4.3.3.7.3 Place the fixture in a thermal chamber and run the following temperature profile 90 minutes at 204 °C (400 °F).

4.3.3.7.4 Observe the components and identify any failures or potential failures.

4.3.3.7.5 Document the observations in the test report – include failures and test setup.

4.3.3.7.6 Set the thermal chamber to 163 °C.

4.3.3.7.7 Place the fixture in a thermal chamber and run the following temperature 240 minutes at 163 °C (325 °F) in the chamber for expansion and deformation if possible.

4.3.3.7.8 Observe the components and identify any failures or potential failures.

4.3.3.7.9 Document the observations in the test report – include failures and test setup.

Note: If testing cannot take place in the chamber, immediately take the fixture out of the chamber and run the test. Record the results in the data sheet.

4.3.3.8 Test Requirements or Acceptance Criteria.

- Document all observations.
- Include photographs in the test report.

4.3.4 Ambient Temperature Pressure Test.

4.3.4.1 Purpose. To ensure the drain hose system will not leak or burst under ambient temperature pressure.

4.3.4.2 Test Equipment.

4.3.4.2.1 PPE.

4.3.4.2.2 Digital camera.

4.3.4.2.3 Holding fixture.

4.3.4.2.4 Water.

4.3.4.3 Test Samples. Unless otherwise specified 6 samples are to be used. GMW15760 is to be used to select test samples.

4.3.4.4 Test Time.

Calendar time: 2 d

Test time: 24 h

Coordination time: 2 h

4.3.4.5 Test Preparation. See 4.1.

4.3.4.6 Test Conditions. See 4.2.

4.3.4.7 Procedure.

4.3.4.7.1 Place the system in the holding fixture. Ensure the system is set up on the fixture in design intent position.

4.3.4.7.2 For the initial testing, tube (hose) ends are to be plugged and air is to be used instead of fluid. A maximum of 690 kPa (100 psi) is to be applied without leakage or bursting of hose or grommets.

4.3.4.7.3 Document any observations and test data in the test report.

4.3.4.7.4 Fill the drain hose system with water and repeat the test.

4.3.4.7.5 Document any observations and test data in the test report.

4.3.8 Test Requirements or Acceptance Criteria.

- Test report with observations, data and photographs.
- Data set and graph.
- See program specific SSTS or CTS for requirements.

4.3.5 Low Temperature Freeze Test.

4.3.5.1 Purpose. To ensure the drain hose system will function properly after low temperature exposure and no damage to the system

4.3.5.2 Test Equipment.

4.3.5.2.1 PPE.