



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 test procedure is applicable to all body shop installed sunroof drain hoses.

1.3 Remarks. These tests must be used to determine the performance properties 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.

GMW15530

GMW16602

2.3 Additional References.

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

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 Digital Camera.

3.2.2 Force Gauge.

3.2.3 Magnifying Glass.

3.2.4 Scale (mm).

3.2.5 Test Fixture to hold hose set in vehicle position.

3.2.6 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: $\pm 3\text{ }^{\circ}\text{C}$.
- Explosion proof.

3.3 Test Vehicle/Test Piece.

3.3.1 Unless otherwise specified, three (3) samples of components, or systems, shall be tested.

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 days
Test hours: 40 hours
Coordination hours: 20 hours

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 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. Not applicable.

4 Procedure

4.1 Preparation.

4.1.1 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 $204\text{ }^{\circ}\text{C}$ ($400\text{ }^{\circ}\text{F}$).
- 240 minutes at $163\text{ }^{\circ}\text{C}$ ($325\text{ }^{\circ}\text{F}$).

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 $23\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$ and $50\% \pm 5\%$ 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.

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

4.3.1.2 Subject assemblies to oven aging at $125\text{ }^{\circ}\text{C}$ ($257\text{ }^{\circ}\text{F}$) for 70 h. See ASTM D573 for oven requirements.

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

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

4.3.3 High Temperature. 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 $204\text{ }^{\circ}\text{C}$ ($400\text{ }^{\circ}\text{F}$), 240 minutes at $163\text{ }^{\circ}\text{C}$ ($325\text{ }^{\circ}\text{F}$) in the chamber for expansion and deformation if possible. 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.

4.3.4 Ambient Temperature Pressure Test. Ensure the system is set up on the fixture in design intent position. 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.

4.3.5 Low Temperature Freeze Test.

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4.3.5.1 Ensure the system is set up on the fixture in design intent. For the initial testing, both ends are to be plugged and filled with water and frozen to ensure the main hose and grommet ends will not crack or burst under low temperature conditions.

4.3.5.2 Partial Freeze Test. Ensure the system is set up on the fixture in design intent position. For the initial testing, both of the tube (hose) ends shall be plugged. Partially fill the tube (hose) with water and freeze the tube to ensure the main hose and grommet ends will not crack or burst under low temperature conditions.

4.3.6 Retention Test.

4.3.6.1 Perform GMW15530 on all grommets, connectors and retaining features, i.e., clips, fir trees, push pins etc.

4.3.6.2 Record data and plot.

4.3.6.3 Test setup shall be photographed or video recorded.

4.3.6.4 Test shall be performed by sunroof drain hose supplier and Body panel supplier.

4.3.7 Insertion Test.

4.3.7.1 Perform GMW15530 on all grommets, connectors and retaining features i.e., clips, fir trees, push pins, etc.

4.3.7.2 Record data and plot.

4.3.7.3 Test setup shall be photographed.

4.3.8 Leak Test.

4.3.8.1 A 2 m water column shall not fall within 24 h.

Following ventilating, the test piece shall be connected to a vertical hose of 10 mm internal diameter, which is filled with water and is open at the upper end.

Attach the vertical hose to the top end (in vehicle position) of the drain hose.

Keep test setup in place for a minimum of 24 h or check program specific Subsystem Technical Specification (SSTS) or Component Technical Specification (CTS) for other requirements.

4.3.8.2 Requirement.

- The permissible quantity of water escaping between the moving parts is 0.1 cm³ maximum.
- See program specific SSTS or CTS for requirements.

4.3.9 Burst Test. Conduct Hydrostatic Burst Test per ASTM D380.

4.3.10 Vacuum Leak and Flow Test.

4.3.10.1 Assemble the drain hose system with suitable end fittings such that one end may be completely sealed against air leakage and the other end connected to a vacuum pump.

4.3.10.2 Set up test sample and measure the leak and flow using air at 55 kPa (8 psig). Leak failure is calibrated to a 0.25 mm (0.010 in) diameter orifice. The flow test is calibrated to a 13.2 mm (0.52 in) diameter orifice.

4.3.10.3 All sunroof drain tubing assemblies shall be 100% tested at time of production by the manufacturer to verify both leak and flow performance.

- a. Testing shall be performed using a positive air pressure of 50 kPa (7.25 psig).
- b. Rate of pressure decay should be used to determine both leak and flow performance.
 1. No leak shall be permitted exceeding that of a 0.25 mm (0.010 in) diameter orifice.
 2. No obstruction shall be permitted exceeding that of an in-line 13.2 mm (0.052 in) diameter orifice.
 3. Pass/fail calibration of the test system shall be performed using the required orifices.

Known "bad" parts with orifices of these sizes shall be used to verify tester is functioning properly. Verify multiple times per shift during production the tester is providing accurate data.

4.3.11 Random Vibration.

4.3.11.1 Purpose. This test is to confirm that a sunroof drain hose assembly is capable of functioning properly after a lifetime of vehicle vibration.

4.3.11.2 Test Equipment. Test fixture that orientates sunroof drain hose assembly in proper vehicle position and represents vehicle attachment points and surface areas. Fixture must not have resonance below 250 Hz.

4.3.11.2.1 Accelerometer.