



Swing or "Pop Out" Glass 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 document defines the procedures for Swing glass or "Pop out" glass systems used for effort and durability tests. This procedure describes durability testing via actuation of a typical swing-open-window manual latch. This procedure also includes the evaluation of opening and closing efforts.

1.2 Applicability. This procedure/standard applies to all passenger vehicles, multipurpose passenger vehicles, trucks, and buses with a manually operated, swing open window systems. This procedure might also apply to manual, swing-open sunroof designs.

1.3 Remarks. Its purpose is to establish a common test methodology for Swing or "Pop Out" glass 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 periodically by the Fixed Glass Global Subsystem Leadership Team (GSSLT).

- ALL glass must meet regulatory requirements and Quad Certification unless otherwise agreed to by the Fixed Glass Global Subsystem Leadership Team (GSSLT).
- All Swing Glass and Pop Out Windows must meet the requirements of GMW3136 unless otherwise agreed to by the Fixed Glass Global Subsystem Leadership Team (GSSLT).

2 References

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

2.1 External Standards/Specifications.

None

2.2 GM Standards/Specifications.

GMW3059 GMW3136 GMW3600

2.3 Additional References.

- CG180 5-Phase Document (ID).
- Component Technical Specification (CTS).
- GM Security Guidelines (ID). (<https://gmweb.gm.com/HR/Security/Pages/FutureGuide.aspx>).
- Milford Proving Ground Weather Report (<http://usmpgbd0413307.nam.corp.gm.com/eWeather/Stations/>)
- Subsystem Technical Specification (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.

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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.

Note: The following list(s) include fixturing and instrumentation typically used by the Test Lab to perform this test. Other equipment may be substituted at the discretion of the testing facility as long as it provides the same data and/or data record, with equivalent accuracy as specified herein or by the requestor.

3.2.1 Personal Protection Equipment (PPE).

3.2.2 Voltmeter/Multimeter.

3.2.3 Power supply capable of producing the minimum and maximum voltage and current required in the program specific SSTS/CTS.

3.2.4 Thermal chamber large enough to contain fully assembled sunroof system and capable of -40 °C to 105 °C with controlled humidity. Thermal Chamber large enough to minimally contain one (1) test buck 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.
- Rate of thermal change to be 1 °C/minute.

3.2.5 Digital camera or video recorder.

3.2.6 Torque wrench with a range of approximately 1.5 times the required torque specifications.

3.2.7 Fixturing.

3.2.7.1 Structural metal framing, such as Unistrut brand, to mount air cylinders and, if needed, closure panels or body panels.

3.2.7.2 Two air cylinders (with airline fittings and clevis head attachments) per latch. See Figure 2.

3.2.7.3 A handle adapter which attaches to the latch and to the interface block. Design of the interface block may vary per swing out window design. See Figure 3.

3.2.7.4 One interface block per latch to connect the cylinders to the handle adapter. Design of the interface block may vary per swing out window design. See Figure 3.

3.2.8 Instrumentation.

3.2.8.1 Programmable controller.

3.2.8.2 Air flow control valves.

3.3 Test Vehicle/Test Piece. 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.

The test material should include a fully assembled, production-representative body panel (fixed panel or closure panel) with the hinged window and any interfacing parts installed. If necessary, the subject panel should go through the production paint and bake process to assure all adhesives, sound deadeners, etc. have been properly cured. It is recommended that the test parts/assembly be dimensionally certified before testing is started.

3.4 Test Time.

Calendar time: 12 d

Coordination time: 20 h

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3.5 Test Required Information.

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

3.5.2 Five (5) Phase. Supplier to develop five phase document for all test failures using CG180.

3.5.3 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 program specific SSTS/CTS.

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 are in compliance to 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 ALL test setups are to be photographed and approved by GM validation engineer. Pictures of the test setup to be included in the test report or for Subsystem Validation Engineer (SVE) review.

4.1.7 Ensure all materials used in testing conform to GMW3059.

4.1.8 Ensure that ALL components are at the proper release level and signed off by the Design Engineer (DE) and Subsystem Validation Engineer (SVE) prior to testing.

4.1.9 Ensure that all torques have been confirmed before test.

4.1.10 Ensure that all critical bolts have been marked before test.

4.2 Conditions. All test conditions must be agreed to and approved the GM Subsystem Validation Engineer (SVE) and Design Engineer (DE) and documented.

4.2.1 Environmental Conditions. The following conditions apply to all tests unless otherwise specified in the program specific SSTS/CTS:

- Ambient temperature: $+23\text{ }^{\circ}\text{C} \pm 3\text{ }^{\circ}\text{C}$.
- Voltage: $V_{\text{nom}} \pm 0.3\text{ V}$ at motor terminals.
- Humidity shall be 50% to 75% for all tests unless otherwise specified.
- T_{min} is $-40\text{ }^{\circ}\text{C}$ unless otherwise specified.
- T_{max} is $+85\text{ }^{\circ}\text{C}$ unless otherwise specified.
- Atmospheric pressure equivalent to the local barometric pressure (which is variable during any given day and from day to day).

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 shall have been agreed upon by the GM SVE and DE.

4.3 Instructions.

4.3.1 Durability Testing. Unless this test is being performed on a competitive vehicle, analysis data should be available for the test being performed. For correlation purposes, communication between test and analysis personnel must take place to ensure that the loading conditions, restraints, and measurement locations are consistent between the test and analysis procedures.

4.3.1.1 Purpose. To ensure that the latching system meets program requirements for Reliability and Confidence.

4.3.1.2 Test Equipment.

4.3.1.2.1 Fixture to allow the cycling of the latch.

4.3.1.2.2 Digital camera.

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4.3.1.3 Test Samples. 6 samples unless otherwise specified in the program specific SSTS/CTS or more samples are required to meet program timing.

4.3.1.4 Test Time. Dependent on the number of samples, beta slope and the Reliability and Confidence levels for the specific program.

4.3.1.5 Test Preparation. See 4.1.

4.3.1.5.1 Setup Instructions.

4.3.1.5.1.1 Build a fixture to support the air cylinders. Anchor the fixture relative to the body or closure panels to prevent movement. See Figure 2.

4.3.1.5.1.2 Fasten the air cylinders to the fixture.

4.3.1.5.1.3 Attach the latch adapter to the latch, the interface block to the latch adapter and the air cylinders to the interface block. See Figure 3.

4.3.1.5.1.4 Position the cylinders to allow the interface block and latch adapter to move without binding. Support the weight of each cylinder by a simple support to prevent the weight of each cylinder from applying a load on the latch. If may be necessary to add a spacer (sleeve) for each air cylinder to limit the cylinder travel (for smooth latch operation and without unrealistic load applications).

4.3.1.5.1.5 Connect the airlines between the cylinders and the controller. Connect the main air supply to the controller.

4.3.1.5.1.6 Program the controller.

4.3.1.5.1.7 Begin with the air pressure turned down and run the controller while slowly increasing the air pressure until the latch is able to cycle from latched closed to latched open and back to latched closed.

4.3.1.5.1.8 Photograph the test setup to be attached to the test report.

4.3.1.5.1.9 Video the test setup and cycling of the window.

4.3.1.5.1.10 Perform any functional/operational tests/evaluations as requested or as may be referenced in Section 2 - References.

4.3.1.5.1.11 Specifically, cycle the window system through at least five full cycles to ensure proper operation and seating of all components.

4.3.1.5.1.12 As applicable, note any irregular sounds or erratic operation indicating a potential problem with design, manufacture, or assembly and verify observations with the requesting engineer. Measure and record operating efforts.

4.3.1.6 Test Conditions. See 4.2.

4.3.1.7 Procedure.

Note: The following steps (4.3.1.7.1 through 4.3.1.7.4) are typically a trial and error process to orient the actuating cylinders to provide proper open and close motion to the latch and window system.

4.3.1.7.1 Activate the controller to run the number of cycles as specified in the program specific SSTS/CTS until the next inspection.

4.3.1.7.2 Disconnect the handle adapter and inspect for cracks, looseness, visible wear, etc., check efforts (see 4.3.2), etc., as requested. Document the findings for the test report.

4.3.1.7.3 Reconnect handle adapter.

4.3.1.7.4 Repeat 4.3.1.7.1 through 4.3.1.7.3 until the test schedule has been completed. Check the program specific SSTS/CTS for temperature profile and total number of cycles.

Note: The default test profile with environmental conditions is given in Figure 1.

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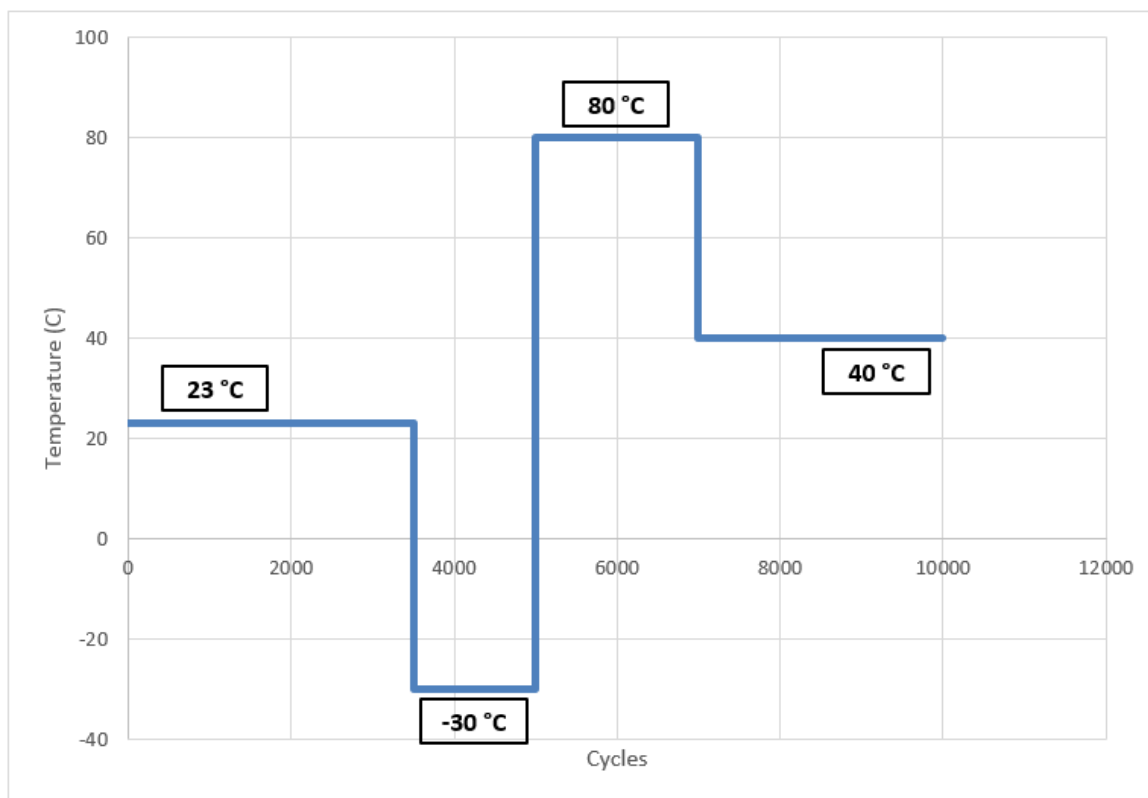


Figure 1: Swing or "Pop Out" Window Default Durability Profile

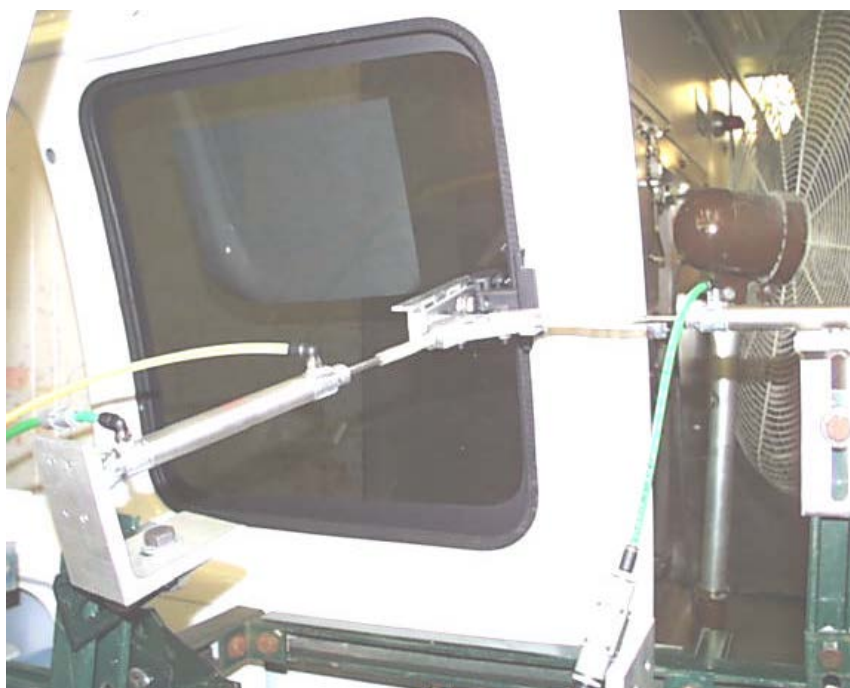


Figure 2: Durability Test Setup

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