



Door Window System Glass Stability and Static Blowout Strength 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 determine the dropping window system's glass stability and static blowout strength characteristics.

1.2 Applicability. This test procedure applies to all passenger cars, light duty trucks, and medium duty trucks having dropping window systems in swing open doors, sliding side doors, endgates, and quarter panels.

1.3 Remarks. This test examines the dropping window system's deflection when loads are applied in the outboard direction, normal to the glass surface.

2 References

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

2.1 External Standards/Specifications.

None

2.2 GM Standards/Specifications.

GMW15081

2.3 Additional References.

- Side Closures Vehicle Technical Specifications/Subsystem Technical Specifications (VTS/SSTS)

3 Resources

3.1 Facilities.

- Major Facility: GMNA Body Test Lab or similarly equipped test facility.

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. Note: The following list(s) include fixturing and instrumentation typically used by the GMNA Body 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 Fixturing.

3.2.1.1 Load cell and/or force gage accessories, as required, to push and/or pull the dropping window glass.

3.2.1.2 Glass stability fixture with suction cups for mounting the Linear Variable Differential Transducer (LVDT) or Linear Digital Encoder (see Figure A1) or an equivalent linear displacement measuring device.

3.2.1.3 Manual window crank handle, if testing manual window systems.

3.2.2 Instrumentation.

3.2.2.1 Load cell or force gage with a capacity approximately 1.5 times the specified load required (refer to 3.5) and with a "T" handle for applying load.

3.2.2.2 Linear Variable Differential Transducer (LVDT) or Linear Digital Encoder.

3.2.2.3 X-Y plotter, Hewlett Packard model 7090A or equivalent.

3.2.2.4 Signal Conditioner, Vishay 3210.

3.2.2.5 Power Supply. 12 V DC regulated, for power window systems.

3.2.2.6 One hundred fifty (150) mm measuring scale.

3.2.2.7 Variable resistance box.

3.3 Test Vehicle/Test Piece. One (1) fully assembled door with the entire window system; including, but not limited to, the glass and glass guidance components (i.e., beltline weather seals, glass run channels, body mounted window seal, etc.), window regulator and attaching hardware, trim, lock, striker, hinges and all required fasteners. Testing is performed on a body. It is recommended that the test parts/assembly be dimensionally certified before testing is started.

3.4 Test Time. The following is an estimate on the amount of time (work hours) needed to perform this procedure.

Calendar time: 1 d

Test hours: 4 h

Coordination hours: 4 h

Note: These time estimates are approximate averages. Actual times vary considerably depending on early component failures (and subsequent availability of replacement parts), testing to varying multiples of cycle lives, varying requirements for frequency of environmental test conditions, scheduling problems for test facilities, test equipment malfunctions, scheduling of overtime and/or multiple shifts, scheduling of "witnesses" for tests, actual readiness of test samples upon receipt, unique or additional requests for test detailed test information, running multiple samples (times shown are for one system), etc.

These times consider preparation and other downtime, actual test, and analysis of data in capturing a total calendar time. Report writing, approval, processing, etc., are not part of these times.

3.5 Test Required Information. (Reference Appendix B for supporting documentation.) The requesting engineer is responsible for providing specifications appropriate to the particular vehicle line being tested (reference Side Closures Vehicle Technical Specifications/Subsystem Technical Specifications (VTS/SSTS) paragraph numbers if applicable).

Testing worst case scenarios may uncover some potential problems. Discuss with the requesting engineer if testing should include some worst case scenarios. Depending on which test is being performed and which level of parts or systems is being tested, consider if any of the following may apply: tolerance stack-ups, build variations, misalignment, minimum/maximum fastener torque(s), lubrication, environmental extremes, location of customer representative load application, symmetry (Left Hand vs. Right Hand), color, mold or die source, etc. The following specifications or information are required to run this test:

3.5.1 Glass Stability.

3.5.1.1 Magnitude(s).

3.5.1.2 Window position(s) (up/down).

3.5.1.3 Load location(s) (on glass).

3.5.1.4 Allowable glass deflection.

3.5.1.5 Door window system fastener torque values (minimum/maximum).

3.5.2 Static Blowout Strength.

3.5.2.1 Load location(s).

3.5.2.2 Minimum allowable static blowout load.

3.5.2.3 The window position (up/down or aligned with some other part or surface).

3.6 Personnel/Skills. Prior experience in setting up and running similar tests, and experience in the use of the referenced test equipment, are critical to achieving the estimated times shown in "3.4 Test Time".

4 Procedure

4.1 Preparation.

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4.1.1 Sample Inspection. The test and requesting engineers should inspect the test items to insure all material listed in 3.3 is of correct design level and assembled properly.

It is required to have the door heat cured according to the production paint process. This will insure proper cure of the structural adhesive in the door and/or body. Install and adjust the window system according to the production Master Process Documents (MPD) and torque all fasteners to the specified torque value.

4.1.2 Sample Preparation. This test is normally run on the test subject in an "as received" condition. If it is requested to be run in a specifically adjusted condition, follow the applicable procedure(s).

Note: Take proper safety precautions during testing because of the possibility of glass breakage (safety glasses and gloves). Do not tape the glass as it may affect the stiffness of the glass.

4.1.3 Facilities and/or Equipment Preparation. Record the instrumentation calibration information on Data Sheet A1.

4.2 Conditions.

4.2.1 Environmental Conditions. Unless otherwise specified in this document's text or by the requesting engineer, the typical environmental conditions for this test are the temperature, humidity and pressure at the major test facility (3.1.1). Unless otherwise noted, these conditions are typically 22 ± 3 °C, relative humidity of $40 \pm 20\%$, and 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.

4.3 Instructions.

4.3.1 Setup Instructions. Perform any functional/operational tests/evaluations as requested by responsible engineer and specifically perform GMW15081. Cycle the window system through at least 5 full cycles to ensure proper operation and seating of all system components. 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.

Note: Items 4.3.1.1 through 4.3.1.6 contain setup instructions for Glass Stability. Items 4.3.1.7 through 4.3.1.8 contain setup instructions for Static Blowout.

4.3.1.1 Glass Stability. Door should be on body and in closed position.

4.3.1.2 Operate the window system to the full up position with the door in the closed and latched position.

4.3.1.3 Locate the center of glass when measuring across the beltline. Mark or otherwise indicate this position on the glass. Then, translate this point vertically to the top edge of the glass and also mark this position.

4.3.1.4 Adjust the window system to the position(s) specified by the requesting engineer (4.1.1). Install the load cell with "T" handle and position it with the appropriate adapters to the top edge of glass as located per 4.3.1.3 (see Figure A1).

Note: The Load Cell should be mounted and loaded normal to the glass surface at the location indicated in 4.3.1.3. The load cell or window glass adapter must not contact the window frame or body during testing. Therefore, the window glass may be lowered only enough so that no contact occurs between the load cell and/or adapter and the body or door structure. Record on the data sheet any distance the glass had to be lowered.

4.3.1.5 Mount a LVDT or linear digital encoder, with its appropriate fixturing, to the window glass load cell adapter structure. Make sure that the measuring device's shaft/string is positioned normal to the glass surface at the point(s) located in 4.3.1.3.

4.3.1.6 Adjust the load cell and LVDT or Linear Digital Encoder to the desired plotter scale and for the intended load and deflection directions.

4.3.1.7 Static Blowout. Set up per 4.3.1.1 through 4.3.1.3 for the load application points specified in Section 4.1.1.

4.3.1.8 With the door closed and latched or otherwise secured, move the top edge of the window glass to a position specified in 4.1.1 (typically 3 mm below the blowout clip). Record the load application point (as specified in 4.1.1) on the window glass and the vertical distance from the top of the outer belt strip up to the load application point (refer to step 4.3.1.3). Include a sketch if needed.

4.3.2 Test Operation Instructions.