



Dropping Window System Manual 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 evaluate the strength of a vertical motion manual window system by subjecting it to specified loads through the crank handle.

1.2 Applicability. This procedure applies to all passenger cars, light duty trucks, and medium duty trucks having crank handle actuated, manual window systems. This includes window systems mounted in side doors, rear doors, station wagon end-gates, mid-gates, and body quarter areas.

2 References

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

2.1 External Standards/Specifications.

None

2.2 GM Standards/Specifications.

None

2.3 Additional References.

- Component Technical Specifications (CTS)
- Side Closures Subsystem Technical Specifications (SSTS)
- Vehicle Technical Specifications (VTS)

3 Resources

3.1 Facilities.

- **Major Facility:** GMNA Body Test Lab or similarly equipped test facility.
- **Minor Facility:** Surface Plate/Bedplate.

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 Door cart or rigid stanchions with appropriate clamps and mounting hardware (see Appendix A Figure A1).

Note: As an alternative to the fixturing of 3.2.1.1, this test may be conducted with the door assembled on a body.

3.2.1.2 High strength cord for applying weights to the handle.

3.2.1.3 Tape measure or flexible ruler.

3.2.1.4 Window crank handle removal tool.

Note: If testing a frameless door window system, discuss with the requesting engineer the need to create special fixturing to simulate the roof header or the need to perform the test on a body.

3.2.1.5 Screw clamps.

3.2.2 Instrumentation - Torque Wrench.

3.2.2.1 Torque wrench(es) with a capacity of 1.5 times each fastener torque referenced in 3.5.1.

3.2.2.2 Calibrated weights and weight hanger.

3.3 Test Vehicle/Test Piece.

3.3.1 One (1) fully assembled door, including all sheet metal parts, reinforcements, welds, manual window regulator and components, manual window inside handle, and all window seals and stops. It is required that the test parts/assembly be dimensionally certified before testing is started. The window regulator shall be a new component that has not gone through other testing.

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:	2 h
Coordination hours:	2 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 detailed test information, running multiple samples (times shown are for one (1) 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. 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 Specified torque loading.

3.5.2 Window position during load application (up/down).

3.5.3 Overload/ultimate strength.

3.5.4 Environmental conditions.

3.6 Personnel/Skills. Prior experience in setting up and running similar tests, and experience in the use of the referenced test equipment, is **critical** to achieving the estimated times shown in "3.4 Test Time" and will minimize potential for accidents and injuries.

4 Procedure

4.1 Preparation.

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.

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).

4.1.2.1 Mark all window system fasteners and attachments to check for movement and rotation during test.

4.1.3 Facilities and/or Equipment Preparation. Record the instrumentation calibration information on Appendix A Calibration Data Sheet A1 or an equivalent document.

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). Unless otherwise noted in Subsystem Technical Specification (SSTS) or Component Technical Specification (CTS) documents, these conditions are typically $22^{\circ} \pm 3^{\circ} \text{C}$, 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.

4.3.1.1 Perform any functional/operational tests/evaluations as requested. These functional checks may include any manual window handle system test such as minimum handle torque required, handle turns from full up to full down, etc. These same functional checks will be performed again after the Dropping Window System (Manual) Strength Test is completed to verify any degradation that may have resulted. Specifically cycle the window system at least 5 times. As applicable, note any irregular sounds or erratic operation indicating a potential problem with design, manufacture, or assembly and verify these observations with the requesting engineer.

4.3.1.2 Clamp the door securely in body position. Roll the window to the full up position.

4.3.1.3 Set the window handle on its spindle to as near a horizontal position as possible, and in such a way that a downward force on the handle will push the window into the upper seal. This is done so that weights can be hung perpendicular to the handle and a measurable torque can be achieved.

4.3.1.4 Measure and record the distance between the centerline of the window handle spindle and the center of the handle knob where the weight is to be applied.

4.3.1.5 Once the load distance (from step 4.3.1.4) is measured, calculate the amount of weight required to achieve the specified torque.

4.3.2 Test Operation Instructions.

Note: The same door and regulator setup for each door can be used to perform the pre-load, the torque load and the torque overload testing. In the case, where both tests are performed, the torque load test shall be performed first, then the torque overload and then the pre-load test. See SSTS, etc., which tests have to be performed.

4.3.2.1 Pre Load Test. Add weights to the handle (as shown in Figure A2) in gradual increments until the specified torque is achieved (see 3.5).

Note: The weights must hang approximately perpendicularly from the handle. As more weight is added, it may be necessary to reset the handle on its spindle to maintain this perpendicular orientation.

4.3.2.2 Remove the weights and repeat all functional checks which were performed in step 4.3.1.1 and note any degradation and/or rivet or attachment loosening that may have occurred.

4.3.2.3 Repeat steps 4.3.1.3, 4.3.2.1 and 4.3.2.2, as necessary, to evaluate both full up and full down window positions.

4.3.2.4 As an optional test, additional torque may be applied to the handle (at either specified window position) in gradual increments until damage to the window system or loss of function occurs. This is to be only done after all other tests are completed on the window regulator.

4.3.2.5 For torque load and overload test, remove handle from regulator spindle and block the window in the full up position. Illustration included in Figure A1.

4.3.2.6 Torque Load Test. Apply a torque load (according to SSTS, etc.) to the regulator spindle for a 5 s duration for 5 times in both directions, with the first operation being in the downward direction. Remove the torque and repeat all functional checks which were performed in step 4.3.1.1, and note any degradation and/or rivet or attachment loosening that may have occurred.