



Convertible External and Luggage Obstruction 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 is to validate the convertible roof assembly to the GM SSTS Convertible Top Damage Resistance - External Obstruction and Luggage Obstruction.

1.2 Applicability. This test procedure is applicable to all convertible roof assemblies.

1.3 Remarks. This document is intended to test performance requirements of a convertible roof assembly that has been externally obstructed.

2 References

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

2.1 External Standards/Specifications.

None

2.2 GM Standards/Specifications.

GMW3600

2.3 Additional References.

- CG180 5-Phase Document
- GM Security Guidelines. <https://gmweb.gm.com/HR/Security/Pages/FutureGuide.aspx>
- Convertible Top Damage Resistance Subsystem Technical Specification (SSTS)
- GM1829 Analysis Development and Validation Plan and Report

3 Resources

3.1 Facilities. Facility requirements are listed in each individual requirement and test procedure section. Alternative test facilities and equipment may also be used. However, all measuring variables as specified in this specification shall be determined correctly with respect to their physical definition. The test facilities shall be accredited to ISO/IEC standards or by the International Laboratory Accreditation Cooperation. Room large enough to accommodate a vehicle or body in white is required. Overhead clearance is required to allow the top to cycle completely without interference.

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 Force gage.

3.2.2 Obstruction Fixture (see 3.2.3).

3.2.3 Obstruction Objects.

3.2.3.1 For external obstruction, use a block 100 mm x 100 mm.

3.2.3.2 To simulate a briefcase or luggage bag, use a block 100 mm x 300 mm x 400 mm.

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 (homeline) 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.

3.3.1 Material. The required material quality of the bonded lips, extruded profiles, extrusions and encapsulations are also designated by the relevant material specifications in the drawing.

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

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

3.3.4 ALL test samples MUST be conditioned per 4.1.1.

3.4 Test Time.

Calendar time: 1 d

Test hours: 8 h

Coordination hours: 1 h to 2 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. The test facility shall have sufficient personnel having the necessary education, training, technical knowledge and experience for performing the required tests.

4 Procedure

4.1 Preparation. The vehicle to be situated to allow for proper measurements without disturbing the test setup. Obstruction fixture to be installed into the test positions.

4.1.1 Test Samples. All test samples shall be design intent and meet all functional and dimensional requirements. Samples must have all design-intent components that might affect operating torque and travel times. These include mechanics, motor, etc. Preliminary tests may need to be made to evaluate whether a particular component may be worst case. The GM Validation Engineer and GM Designing Engineer shall approve any exceptions prior to the start of testing.

4.1.2 Dimension. Measure all assembly checkpoints on one (1) convertible assembly and attach results to test data sheets. All measured assemblies shall be dimensionally within twice the drawing tolerance for development and Design Validation (DV) testing. All measured assemblies shall be dimensionally within drawing tolerance for Product Validation (PV) testing. The GM Validation Engineer and GM Designing Engineer must review the dimensional data prior to start of test.

4.1.3 Torque. All fasteners shall be installed to the convertible assembly using the production torque specification. Fasteners shall then be marked with a visual indicator to enable visual detection of any fastener movement during test.

4.1.4 Fixtures. Unless otherwise specified, mount the test sample on a fixture of welded construction designed to place the test sample in its vehicle orientation. Mount with the production attachment strategy or, equivalent. Locating features and body interfaces must be represented in the fixture design. Position the fixture retention points to the test base such that the fixture can be removed without removing the convertible top. Vibration test fixtures shall have a first resonant frequency above the maximum specified test frequency and have no responses greater than two (2) times the input signal below this frequency. The GM Validation Engineer and GM Designing Engineer shall approve the design.

4.2 Conditions.

4.2.1 Environmental Conditions. No environmental conditions testing required. Perform test at ambient conditions. Ambient is defined at 23 °C ± 3 °C and a relative humidity of 5% to 40%.

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.

All conditions specified shall be targeted toward the specified value with any given tolerance ($\pm$) used to compensate for variation. During testing, conditions specified shall not be adjusted within the tolerance unless it is to maintain the particular test condition within the specified tolerance. Unless otherwise specified, perform the tests in the as-received condition without any special pre-conditioning. Such deviations shall be approved by the GM Validation Engineer and specified on the GM1829 Analysis Development and Validation Plan and Report and test reports.

4.3 Instructions.

4.3.1 Before any testing, Supplier Engineering or GM Engineering (depending which is responsible for Engineering and Design of the system), must determine the proper order of the testing. Since testing could result in a destructive test and the availability of properties may be extremely limited, identification of the worst potential failure points should be tested last. A block 100 mm x 100 mm (with no sharp radii – minimum of 5 mm radius) is to be placed at each of the test points. Test points at minimum are as follows:

- Three (3) points along header - right hand (RH) side and left hand (LH) side at A-pillar to header and at centerline (CL).
- Five (5) points across down stack - centerline, 45 degrees across the down stack and across the leading edge of the down stack at rails.
- At center console between the front occupants.

The top shall be cycled until the obstruction is contacted and power is applied for 5 s after contact. Object shall then be removed and top cycled three (3) complete cycles to check for proper function.

Each location is to be tested individually, (i.e., 9 test points total = 9 individual obstruction tests).

4.3.2 Maximum Height Obstruction. Determine the maximum travel height of the top mechanism. Place a rigid obstruction at least 100 mm wide at the vehicle centerline. Cycle the top from closed until the obstruction is contacted and power is applied for 5 s after contact. Repeat two (2) additional times. Note any breakage or loss of function to the convertible top or convertible top weather seal system in the data sheet. The amount of interference is to be determined through math. Obstruction shall have an interference of 25 mm minimum. This may necessitate a modification to the stated block size.

4.3.3 Luggage Obstruction. This test is to be performed even if vehicle warns through labels or owner's manual of damage due to luggage stowage. Place a 100 mm x 300 mm x 400 mm block (to simulate a briefcase or luggage bag) in the top stowage area (centered left to right) that prevents the top mechanism from reaching the fully stowed position. Cycle the top from the closed position to the stowed position or until the obstruction is contacted and power is applied for 5 s after contact. Repeat three (3) times. Note any breakage or loss of function to the convertible top system. Verify that the backlight defogger functions properly as designed during post-test review. Disregard abrasive damage to the top from the obstruction. The amount of interference is to be determined through math. Obstruction shall have an interference of 25 mm minimum. This may necessitate a modification to the stated block size.

4.3.4 Final Bow Obstruction.

4.3.4.1 Final Bow Obstruction - Compression. For Compression Bow Systems, the mid-position of the final bow, and the full up position of the final bow should also be obstructed. See Figure 1.

Note any damage, distortion or loss of function on the test report. All blockades should be positioned normal to the direction of travel.