



Seat Back Folding Durability for Cargo Access

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 evaluates the effects of a repetitive folding of the seat back from its design back angle position to the full forward or fold flat position to access cargo and back to seating position.

1.2 Applicability. This test shall be applied to all General Motors vehicle seats with folding seat backs meant to allow access to cargo space.

1.3 Remarks. There are two primary types of features to allow for rear cargo access – Fold Flat (or Fold and Shuttle), and Flip and Fold. These features are utilized by front and rear seats in car and truck products to gain access to rear cargo areas or to provide additional cargo space, and then return to seating positions.

1.3.1 Fold Flat Maneuver. The fold flat maneuver includes folding the seat back forward to full flat and return. In some cases, this maneuver may include a shuttle feature, which shuttles the seat cushion forward while the seat back is folded.

1.3.2 Flip and Fold. The flip and fold maneuver includes flipping, or rotating, the seat cushion forward, folding the seat back down to full flat, and then returning the seat back and seat cushion to seating positions.

2 References

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

2.1 External Standards/Specifications.

FMVSS 202a SAE J826 UN R17

2.2 GM Standards/Specifications.

None

2.3 Additional References.

- Subsystem Technical Specification (STS).

3 Resources

3.1 Facilities. An approved GM certified test lab with an adequate bedplate or equivalent work surface necessary for mounting of the test sample and associated test fixtures.

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 Mounting Blocks. Appropriate model mounting blocks (stanchions, fixtures, or brackets) to secure the seat subsystem in body position.

3.2.2 Cycling Device. Consisting of air-opened actuators with the required stroke capacity, solenoid-controlled air valves, air regulators, flow valves, air hose, electronic programming unit, timer, limit switches and any other necessary pneumatic controls.

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3.2.3 Load Application Device. A round rigid plate of 127 mm diameter covered with 12.5 mm of medium foam, and covered Number 10 Oceanic Duck fabric cloth cover or equivalent.

3.2.4 Load Measuring Device. 1000 N (200 lb) capacity - (load cell, etc.,) with attachments to the seat back/load application device.

3.2.5 Angle Measuring Device. Adjustable protractor, or equivalent, to measure the seat back frame angle.

3.3 Test Vehicle/Test Piece. Complete trimmed seat subsystem. Use the heaviest fully trimmed seat back option. An appropriate seat subsystem consisting of all components necessary to qualify as complete for the model and trim level specified by the Design Release Engineer (DRE). If available, the seat should include all interfacing safety belts, including retractors, latchplates and buckles attached to the seat or interfacing with the seat while in the seated position, the folded position, or in the transition between seated and folded position. All external components influencing the folding kinematics such as package tray, side bolsters, or garnish, should be included or represented. Consult with the DRE or GM Validation Engineer.

3.4 Test Time.

Calendar time: 5 days

Test hours: 96 h

Coordination hours: 4 h

3.5 Test Required Information. Obtain from the seating arrangement drawing or from the Design Release Engineer the design position of the seat (seat back angle, cushion frame angle, H-Point location, and location of upper structure of seat back). In addition, obtain the maximum operating force for each adjustment.

3.6 Personnel/Skills.

3.6.1 The following individuals are necessary to complete this test procedure:

- General Motors Design Release Engineer.
- General Motors Validation Engineer.
- Testing organization's Test Engineer.
- Testing organization's Test Technician.

4 Procedure

4.1 Preparation.

4.1.1 Visual Inspection. The Design Release Engineer or GM Validation Engineer shall visually inspect the seat assembly for correct part numbers, quality of frame welds, proper fit and assembly and the presence of all required parts.

4.1.2 Mounting. Install the seat subsystem on the appropriate model mounting blocks. Include mounting spacers if specified for installation. If the seat back is restrained at one upper corner when in a vehicle, then fixturing must be installed to simulate this condition on the test fixture.

4.1.3 Positioning. Set the seat back frame to the design back angle (measure the back angle on the outboard portion of the seat back). Engage the seat adjuster in its design location. For adjustable head restraints, set the position according to the following order:

- a. Step 1: 25% of the required cycles in the most upright position.
- b. Step 2: 50% of the required cycles in the first locking position at the FMVSS 202a (section 4.2.1, Minimum Height) and UN R17 (section 5.6) regulated height.
- c. Step 3: 25% of the required cycles in the down most position.

If the most upright position is the same as the first locking position at the FMVSS 202a (section 4.2.1, Minimum Height) and UN R17 (section 5.6) regulated height, perform 75% of the cycles at that position. Additionally, if the head restraint interferes with the structure directly in front of it in the vehicle environment (e.g., seat, console, and instrument panel), move the head restraint to the first position that allows the seat to be folded without interference and complete the scheduled cycles.

4.1.4 Test Setup. Install the load application and measurement devices to the seat back so the following conditions are satisfied.

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4.1.4.1 Align the device used for pushing/pulling the seat to the upper outboard corner of the seat back. Prior to testing, the force application position should be agreed upon by the GM DRE and Validation Engineer. This location should be based on customer usage expectation and approved by the GM Human Vehicle Integration (HVI) Engineer.

4.1.4.2 Align the device to unlock the seat back lock (if the seat is equipped with such a feature).

4.1.4.3 Damage to the seat as a result of the pushing/pulling feature should be mitigated as much as possible, and reviewed with the GM DRE and GM Validation Engineer for approval.

4.1.4.4 Mark the heads of the recliner bolts in order to observe any rotational movement.

4.2 Conditions.

4.2.1 Environmental Conditions. The durability test may be performed at temperatures representative of vehicle profile (the Validation Engineer to use engineering judgment based on materials used). If not otherwise agreed, conduct test in a room temperature environment.

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 Fold Flat Seat Folding Operation Durability.

4.3.1.1 Initiate Folding Cycle. Release the seat back fold flat lock mechanism to rotate the seat back forward as shown in Figure 1: Step 1. Lift the seat handle and keep it in this position, if needed, by applying a force, not to exceed the specified seat back release force in the Subsystem Technical Specification (SSTS).

4.3.1.2 Rotate Seat Back Forward. Using the robot/actuator, rotate the seat back in the forward direction by applying a force to the agreed upon seat back load application location until the seat stops or locks at the fold flat position (see Figure 1: Step 2). If the design locks in the fold flat position, confirm that the seat back is locked before proceeding.

4.3.1.3 Load Application. With the seat in its fold flat position, apply a 225 N load to the upper outboard corner 125 mm from the top of the seat back and perpendicular to the seat back. Hold for 5 s and release (see Figure 1: Step 3 and Figure 2).

4.3.1.4 Rearward Motion. Release the fold flat lock, if applicable, and using the robot/actuator, return the seat back rearward by applying a force to the agreed upon seat back load application location until it begins to freely fall back against the return stop and re-latch (see Figure 1: Step 4). Ensure the seat back is latched or locked in the first lock position.

Note: For seat backs with inertia latches, during the first 200 cycles, a 40 N rearward load must be maintained normal to the emergency release lever.

4.3.1.5 Repeat steps 4.3.1.1 thru 4.3.1.4 until all cycles as specified in the SSTS are complete at a rate of (5 ± 2) cycles per minute. Locking or latching speed is not to exceed 2 m/s.

4.3.1.6 Prior to cycling, measure and record all applicable release lock forces and seat operation forces. During testing, inspect the lock assembly for loss of initial design function, wear on moving parts and for noise. At the end of cycling, measure and record operational efforts of release mechanisms and forward and rearward movement.



Figure 1: Fold Flat Operation Durability Cycle

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