



Multi Axis Seat Subsystem Durability 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. This procedure evaluates the structural durability of a front or rear seat subsystem by subjecting it to real time load and displacement profiles. These profiles are designed and developed to represent a lifetime usage. This procedure describes the durability test execution.

1.2 Applicability. This procedure applies to all free-standing seats or partially free-standing seats for GM passenger cars, Sport Utility Vehicles (SUV) and light and medium duty trucks.

1.3 Remarks.

1.3.1 This procedure is primarily intended for laboratory Test Engineers and technicians. It does not cover every possible aspect of durability testing and is not to be used as a stand-alone procedure. Successful durability testing inherently requires engineering judgment and the ability to recognize and solve problems which are unexpected and/or complex.

1.3.2 This procedure utilizes a generic profile developed from Road Load Data Acquisition or Virtual Road Load Data Acquisition (RLDA or vRLDA), drive file development and correlation evaluation. The time required has been reduced by utilizing the damage cycles of a typical seat system and is provided in the appropriate Subsystem Technical Specification (SSTS) or Component Technical Specification (CTS). However, if a new architecture is developed, a new profile can be developed.

2 References

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

2.1 External Standards/Specifications.

None

2.2 GM Standards/Specifications.

GMW15219 GMW15245

2.3 Additional References.

- CG1804 SSTS for Seat Systems (ID)
- Component Technical Specification
- Seating arrangement drawing
- Subsystem Technical Specification

(ID) = This document is limited to internal use within General Motors and shall not be accessed outside this company. Contact the GM Design Responsible Engineer for further instructions.

3 Resources

3.1 Facilities. A bedplate large enough for securing the test rig and capable of withstanding dynamic loading of the test rig/specimen required. Also required is a hydraulic system capable of supplying oil at a rate consumed by a Multi-Axial Simulation Table (MAST). The test facilities and equipment shall be in good working order and all instrumentation shall have a valid calibration label.

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. The following list(s) include test rig, fixtures and transducers typically used by the GM Structural Development Laboratory to perform this test. Other equipment may be substituted at the discretion of the local 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 Test Rig. A simulation table capable of controlling three (3) degrees of freedom, (vertical, lateral, and fore-aft). Also, a multi-axis table with six (6) degrees of freedom can be used. A typical MAST table in current usage at GM with three (3) degrees of freedom is shown in Figure 1. Alternative test equipment is also shown in Figure 2.

3.2.1.1 Table Surface Area. The simulation table surface area should be adequate to mount the test specimen, appropriate seat fixture, and appropriate fixturing to mount the D-ring to ensure correct belt routing. The hydraulic actuators should be sized appropriately to reproduce the acceleration as provided in the CG1804 SSTs. The supplier shall work with the GM Design Responsible Engineer to comprehend this requirement.

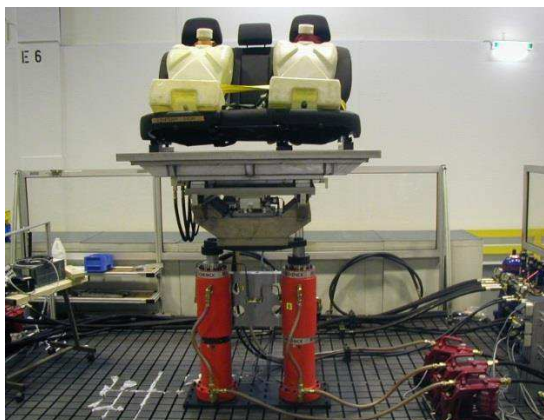


Figure 1: Example of Three (3) Degree of Freedom MAST Typically Used at GM

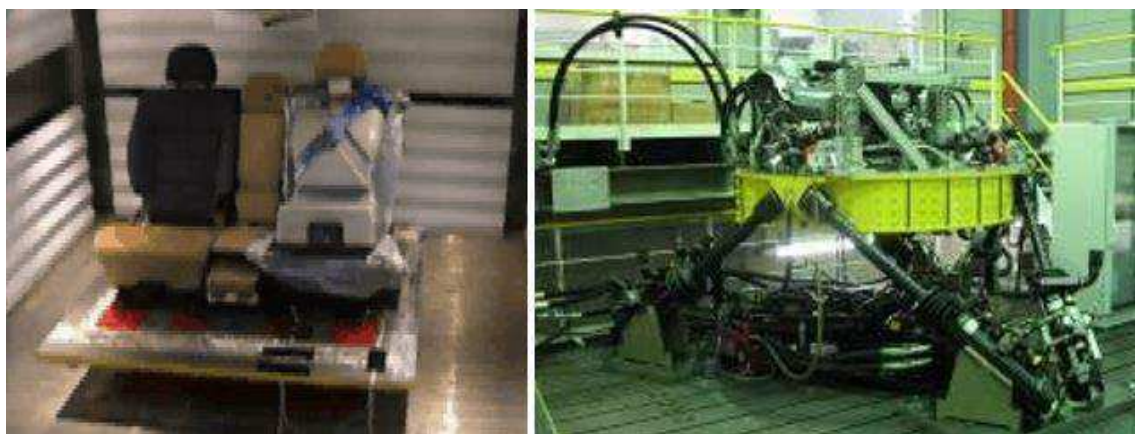


Figure 2: Example of Six (6) Degree of Freedom MAST Alternatives

3.2.1.2 Fixtures. Fixturing is required to support the test specimen in its test position. A means to support the front seat system including rigid mounting blocks, or equivalent, simulating the floor or body attachment points to mount the seat system in the test position on the MAST. D-ring fixtures may also be necessary to ensure the belt system is routed correctly.

3.2.2 Ballast Dummy. Ballast dummy simulating the occupant weight specified in the CG1804 SSTs. The supplier shall work with the GM Design Responsible Engineer to comprehend this requirement. The preferred shape of the dummy is as shown in Figure 1 and Figure 2 with the square edges, however, alternative ballast dummy shapes may be used with the approval of the GM Seat Subsystem Validation Engineer (SVE).

3.2.3 Transducers.

3.2.3.1 Accelerometer. Accelerometers are used to match the acceleration data that is provided in the CG1804 SSTs as specified. Remote parameter response coherent with the given direction for each actuator is required for each of the hydraulic actuators controlling the motion of the table. Acceleration responses must be collected on the rigid body and/or frame side as required. The supplier shall work with the GM Design Responsible Engineer to comprehend this requirement.

3.2.3.2 Loads/Strains. Loads and strains on the specimen can be used in a non-square matrix as additional control channels or for correlation.

3.2.4 Torque Wrench. A torque wrench is used to tighten all threaded fasteners to the specified torque.

3.3 Test Vehicle/Test Piece. Complete trimmed seat subsystem in the heaviest version. An appropriate seat subsystem consisting of all components necessary to qualify as complete for the model and trim level specified by the GM Design Release Engineer (DRE) or GM SVE. This test can be completed using only the seat structure by massing out the structure to represent the missing components and simulating the center of gravity of the fully trimmed and contented seat.

3.4 Test Time.

Calendar time: (9 to 15) d

Test time: (70 to 120) h

Coordination time: (1 to 8) h

3.5 Test Required Information. The part number of the seat or component as well as the level of the part should be provided with the seat. Obtain from the seating arrangement drawing or from the Design Release Engineer (DRE), the design position of the seat (seat back angle, cushion frame angle, H-point location, track position, and height adjust position), and the nominal torque of the seat anchorage fasteners. The GM SVE is responsible for identifying the durability schedule to be simulated and provide test specifications, CG1804 SSTs paragraph numbers, appropriate to the component/subsystem being tested. The supplier shall work with the GM Design Responsible Engineer to comprehend this requirement.

3.5.1 Time History Data. RLDA data for new profile development shall be provided to the test lab in Remote Parameter Control (RPC) III format. File names must adhere to the local standard naming convention (reference GMW15219 for the appropriate file naming convention). Modifications to the provided data should be documented in the RLDA report.

3.6 Personnel/Skills. Prior experience/training in setting up and running similar tests and experience/training in the use of the referenced test equipment are required for a successful evaluation. This experience is also critical to achieving the estimated times shown in 3.4 Test Time.

4 Procedure

4.1 Preparation.

4.1.1 MAST Test Preparation.

4.1.1.1 Table and Instrumentation. Prior to assembly, perform a function check of the transducers. Connect the transducers to the instrumentation and perform standard balance, calibration, and polarity checks.

4.1.1.1.1 Installation of Fixture onto MAST Surface. Install the fixture onto the MAST surface. The fixture should be placed as close as possible to the center of the table and secured rigidly to the table.

4.1.1.1.2 Installation of the Transducers.

4.1.1.1.2.1 Front Seat Transducer Location. Three transducers are required to use the profile provided in the CG1804 SSTs for front seats. The supplier shall work with the GM Design Responsible Engineer to comprehend this requirement. Place one transducer at the front outboard anchor mount, one transducer at the rear outboard anchor mount, and one transducer at the rear inboard anchor mount as close as possible to each anchor as shown in Figure 3.