



Complete Seat Subsystem Center of Gravity Determination

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 determines the center of gravity of any fully trimmed complete seat assembly or fully trimmed seat component, such as seat back, seat cushions, etc.

1.2 Applicability. This procedure applies to all GM passenger cars, light duty and medium duty trucks.

1.3 Remarks. Not applicable.

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.

- Appropriate drawing (seat assembly, seating arrangement, etc.)
- GM approved test report form.
- Subsystem Technical Specification (SSTS).

3 Resources

3.1 Facilities. An approved GM certified test lab with an adequate bed plate or equivalent work surface necessary for mounting the test sample and associated test fixtures appropriate for the procedure to be run.

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 Fixture. A suspension fixture with enough height to allow the trimmed seat or component to be suspended freely and away from all obstructions. The fixture should include a steel shaft longer in length than the seat or component, and be large enough in diameter to support the test item without shaft deflection. It must also have vertical marking templates for defining a plane through the center of gravity (see Appendix A, Figure A1).

3.2.2 Hooks. Miscellaneous suspension hooks.

3.2.3 Force Gage. A force gage of (0 to 500) N ((0 to 100) lb) capacity (two required).

3.2.4 Measuring Devices. Measuring devices such as rulers, measuring tape, protractor, etc.

Note: Calibrate all instrumentation as required.

3.3 Test Vehicle/Test Piece. Complete trimmed seat subsystem. 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).

3.4 Test Time.

Calendar time:	1 day
Test hours:	4 h
Coordination hours:	4 h

3.5 Test Required Information.

 Not applicable.

3.6 Personnel/Skills.

 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 Adjustment Setting.

 If so equipped, set all adjustments of the seat as follows:

- a. Fore-and-aft adjusters – midpoint.
- b. Height adjuster – full up.
- c. Recliners – design back angle.
- d. Head restraints – full up.

Note: Any additional adjustable features (lumbar, thigh, etc.) should be set so as to place the seat system center of gravity to its highest location. Confirm the location with the GM Validation Engineer.

4.1.2 Inspection. Examine the seat subsystem and select two points on the front that are symmetrical about the centerline of the seat. These will be used to conveniently suspend the sample. Repeat this procedure for selecting the rear suspending points.

Note: The center of gravity will be determined by the intersection of two planes. As a result, the most desirable suspension points will be resulting in an intersection angle as close to 90° as possible.

4.2 Conditions.

4.2.1 Environmental Conditions. Unless otherwise specified in the Subsystem Technical Specification (SSTS), 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 Point Projection Procedure.

4.3.1.1 The test item should be suspended from the steel shaft with equal length suspension hooks or cable. Use one point on one end and the symmetrical point on the opposite end. Make sure that test items swing freely of all obstructions.

Note: This test should not be performed in areas of unusual air velocity (close to doorways, ventilators, etc.) Air blowing on the surface of the assembly can result in erroneous center of gravity locations.

4.3.1.2 Move the suspension fixture vertical marking templates adjacent to the test item on both sides. Be sure the templates avoid contact with the test item.

4.3.1.3 Define a plumb line from the suspension point with respect to the seat or component by marking the test item using the vertical marking templates.

Note: If needed, apply masking tape across the side of the test item to avoid an interrupted line.

4.3.1.4 Repeat 4.3.1.1 through 4.3.1.3 with the seat subsystem attached to the steel shaft by the other two previously selected points.

Note: Additional sets of suspension points may be used to double-check results.

4.3.1.5 The intersection of the two planes (defined by the plumb lines and the suspension points) defines the center of gravity in two dimensions.

4.3.1.6 If the seat or component is symmetrical about a centerline perpendicular to the steel shaft (during suspension), the lateral center of gravity location will be on the seat centerline. This defines the center of gravity in three dimensions with respect to the suspension points.

4.3.1.7 If the seat or component is not symmetrical about a centerline, perform steps 4.3.1.8 and 4.3.1.9 of the Point Projection Procedure.

4.3.1.8 Using either the front or the rear set of attachment points selected in 4.1.1, determine the supporting loads at each point. To do this, support the test item from the horizontal steel shaft by force gages.

4.3.1.9 If the supporting loads at each attachment point are known, the lateral center of gravity location can be calculated by summing the moments about either attachment point (see Figure A2).

4.3.1.10 Record the center of gravity location on the datasheet in three dimensions using the vehicle coordinate system.

4.3.2 Angular Intersection Procedure.

4.3.2.1 Hang the test item from the steel shaft with equal length suspension hooks or cables. Use one point on one end and the symmetrical point on the other. The test item must swing freely, clear of all obstructions.

Note: This test should not be performed in areas of unusual air velocity (close to doorways, ventilators, etc.) Air blowing on the surface of the seat subsystem can result in erroneous center of gravity locations.

4.3.2.2 Attach angle finder protractor to an identifiable flat surface on the test item. The protractor must be positioned 90° to the horizontal suspension bar and as close to the suspension point as possible (see Figure A3).

4.3.2.3 Read and record the protractor angle.

4.3.2.4 Repeat steps 4.3.2.1 through 4.3.2.3 for the second set of suspension points.

4.3.2.5 On the appropriate drawing (seat assembly, seating arrangement, etc.), draw a straight line from each suspension point, which relates to the protractor angle determined experimentally. The center of gravity (in two dimensions) of the test item will be at the intersection of these lines (see Figure A4).

4.3.2.6 If the seat or component is symmetrical about a centerline perpendicular to the steel shaft (during suspension), the lateral center of gravity location will be on the seat centerline. This defines the center of gravity in three dimensions with respect to the suspension points.

4.3.2.7 If the seat or component is not symmetrical about a centerline, perform steps 4.3.1.8 and 4.3.1.9 of the Point Projection Procedure.

4.3.2.8 Record the center of gravity location on the datasheet in three dimensions using the vehicle coordinate system.

5 Data

5.1 Calculations. Not applicable.

5.2 Interpretation of Results. Not applicable.

5.3 Test Documentation. Complete a GM approved test report form, include the following:

5.3.1 Complete identification of the structural subsystem or the structural components (part number, lot number, etc.)

5.3.2 Conditioning of test sample, if any.

5.3.3 Test conditions (temperature, humidity, force applied, etc.)

5.3.4 Test results.

5.3.5 Observations and conclusions.

6 Safety

This Engineering Standard may involve safety requirements for hazardous materials, the method of operations and equipment. This standard does not propose to address all the safety issues associated with its use. It is the responsibility of the user of this standard to ensure compliance with all appropriate safety and health practices. This would include any specific training that may be required. The safety and health standards include site specific rules and procedures, company rules and procedures, and Government Standards. Contact shall be made with the appropriate site Safety and Health personnel for further direction and guidance in these matters.