



Automotive Type Trailer Hitch 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. The purpose of this specification is to statically test the installation of trailering equipment.

1.2 Applicability. This specification applies to conventional passenger cars; light duty commercial vehicles, light trucks and multi-purpose passenger vehicles equipped with trailering equipment.

1.3 Remarks. This specification encompasses the relevant procedures set forth in SAE J684, "Trailer Couplings, and Hitches and Safety Chains Automotive Type".

2 References

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

2.1 External Standards/Specifications.

SAE J684

2.2 GM Standards/Specifications.

GMW15474 (ID)

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

2.3 Additional References.

Appropriate Subsystem Technical Specification (SSTS).

3 Resources

3.1 Facilities. Any facility that has the necessary equipment can run this test.

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 Low frequency surface bedplate or equivalent surface.

3.2.2 Angle stands or equivalent fixtures capable of securing the body or frame to the test surface. See Figures B1, B2 and B3 in Appendix B for photographs of test setup examples.

3.2.3 Hitch platform input load fixture capable of applying loads as described in Table A1, steps a, b, c, d, and e, in Appendix A through the hitch ball centerline. The load fixture must account for proper position of the trailer hitch ball. Trailer hitch design best practice locates the receiver tube so that a trailer hitch ball centered 50 mm above the receiver tube pin hole centerline accommodates the trailer coupler height range associated with maximum trailer weight rating for the vehicle model line. The GM Design Responsible Engineer must determine if a different hitch ball position is required for test. In addition, the portion of the load fixture that inserts into the hitch receiver tube should be made to fit snugly and should not extend past the forward face (in vehicle position) of the receiver tube.

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Note: If a bumper is under test (weight carrying configuration only), prepare fixtures capable of applying loads as described in Table A1, steps a, b, c, d, and e, 45 mm above the top surface of the bumper through the hitch ball centerline.

3.2.4 Load cell and recorder.

3.2.5 Load/deflection measuring equipment.

3.2.6 Torque wrench and fittings.

3.2.7 Angle measuring device.

3.2.8 Hitch platform input moment fixture capable of applying leveling force couple loads as described in Table A1, steps a and f, through the hitch ball centerline. The hitch ball longitudinal centerline should be 215.9 mm rear of the vertical centerline of the receiver hitch pinhole, and the moment fixture should extend an additional 609.6 mm to aid in applying the appropriate force couple to the hitch assembly (see Figure A1 in Appendix A). In addition, the portion of the moment fixture that inserts into the hitch receiver tube should be made to fit snugly and should not extend past the forward face (in vehicle position) of the receiver tube.

3.3 Test Vehicle/Test Piece.

3.3.1 Vehicle structure to be evaluated.

3.3.2 Hitch or hitch platform to be evaluated.

3.4 Test Time.

Calendar time: 10 to 20 days

Test hours: 30 to 40 hours

Coordination hours: 40 to 56 hours

3.5 Test Required Information. Not applicable.

3.6 Personnel/Skills. The test can be performed by an experienced technician; no special training required.

4 Procedure

4.1 Preparation.

4.1.1 Calibrate instrumentation as required. Record instrument details and date calibrated on Data Sheet A1 in Appendix A.

4.1.2 Install the hitch or hitch platform on the vehicle with the appropriate fasteners. Fastener torques shall be to the minimum torque recommendations.

4.1.3 Position vehicle structure on test bedplate, securing it to the bedplate at the appropriate rear suspension locations. This should be done with the vehicle section positioned relative to the bedplate as if loaded to its Gross Vehicle Mass Rating (GVMR).

4.2 Conditions.

4.2.1 Environmental Conditions. Test is typically performed in laboratory ambient conditions 15 °C to 35 °C and 5% to 95% relative humidity.

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.

Note: The applicable Hitch Static Load Test steps (4.3.1) and the Chain Attachment Test (4.3.2) must be applied to each test sample but can be applied in any order due to differences in test load severity.

Note: Repeat 4.3.1 and 4.3.2 for the number of samples as specified by the appropriate SSTs.

4.3.1 Hitch Static Load Test.

Note: For a hitch or hitch platform designed to be used only in a weight carrying configuration, only the Weight Carrying Hitch loads in Table A1 Steps a through e need be applied.

Note: For a hitch or hitch platform designed to be used in both the weight carrying and weight distributing configurations, only the more severe load configuration per step (between the Weight Carrying Hitch and Weight Distributing Hitch loads) in Table A1 Steps a through f need be applied.

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4.3.1.1 Attach the appropriate hitch input fixture described in 3.2.3 or 3.2.8 to the bumper or hitch receiver tube using a representative hitch pin where applicable. Measure and record initial vertical and lateral position of the rear surface of the hitch receiver tube (or hitch ball vertical and lateral centerlines in the case of bumper hitches). Displacements and or angles can be utilized to make these measurements.

4.3.1.2 Apply as shown in Figure A1, the appropriate test loads given in Table A1 for the trailer hitch or hitch platform being evaluated. Loads to be applied with an onset rate of not more than 667 N/s and are to be maintained at the maximum specified force level for at least 5 s. At the completion of each test step, measure the vertical and lateral position of the hitch receiver tube (or hitch ball vertical and lateral centerlines in the case of bumper hitches). Record any change from the original position on Data Sheet A2 in Appendix A.

4.3.1.3 Inspect hitch or hitch platform and its attachments, energy absorbing system, bumper face board and brackets, if applicable, and vehicle for deformation or fracture and record if any abnormalities occurred.

4.3.2 Chain Attachment Test.

4.3.2.1 Attach the appropriate size chains (with hooks) to the rear of the vehicle at the designated locations.

4.3.2.2 As shown in Figure A2 in Appendix A, cross the chains at the ball vertical centerline. On some hitches coincidence of the ball centerline and the chain crossover is not possible. Secure the trailer ends of the chains to the test mechanism.

Note: The hitch or hitch platform input load/moment fixtures should be removed to assure clearance for the chains.

4.3.2.3 Apply a longitudinal tension load to the chain attachments (parallel to the ground) equal to twice the maximum hitch (trailer GVWR) rating, for the hitch or hitch platform being tested. Loads to be applied with an onset rate of not more than 667 N/s. Hold at maximum test load for 1 minute.

4.3.2.4 Inspect hitch or hitch platform and its attachments, energy absorbing system, bumper face bar and brackets if applicable and vehicle for deformation or fracture and record if any abnormalities occurred.

5 Data

5.1 Calculations. Refer to Table A1.

5.2 Interpretation of Results. Not applicable.

5.3 Test Documentation. Record all test data and observations on Data Sheet A2.

6 Safety

This standard may involve hazardous materials, operations, and equipment. This standard does not propose to address all the safety problems associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

7 Notes

7.1 Glossary. For additional definitions of weight terms see GMW15474, Definitions and Terminology - Vehicle and Component Mass. **Note:** This standard is limited to internal distribution within General Motors and shall not be distributed outside this company. Contact the GM Design Responsible Engineer for further instructions.

Coupling: That part of the connecting mechanism by which the connection to the hitch is actually made. This does not include any structural member, extension of the trailer frame, or brake actuator.

Hitch: That part of the connecting mechanism including the ball support platform and ball and those components that extend and are attached to the towing vehicle including bumpers intended to serve as hitches. **Note:** GM typically does not supply a hitch ball. The factory installed trailering package typically includes a trailer hitch platform.

Hitch Platform: Part of the connecting mechanism attached to the towing vehicle intended to accept a ball support device.

Trailering Bumper: Bumper designed to accept a ball assembly for trailering.

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Weight Carrying Hitch: A hitch that does not employ features designed to redistribute the load imposed at the hitch and coupling connection. Weight carrying hitches may be designed for attachment by bolting or other means to the towing vehicle frame, body, bumper structure, or to a combination of these or other points.

Weight Distributing (or Equalizing) Hitch: A hitch that, by means of leverage applied on both trailer and towing vehicle structures, when properly adjusted, distributes the imposed vertical load at the hitch and coupling connection between structures of towing vehicle and trailer.

7.2 Acronyms, Abbreviations, and Symbols.

Comp.	Compression
GVMR	Gross Vehicle Mass Rating
No.	Number
SSTS	Subsystem Technical Specification
VIN	Vehicle Identification Number

8 Coding System

This standard shall be referenced in other documents, drawings, etc., as follows:

Test to GMW15875

9 Release and Revisions

This standard was originated in April 2008, replacing GMN0689. It was first approved by Global Chassis Structure Team in June 2008. It was first published in June 2008.

Issue	Publication Date	Description (Organization)
1	JUN 2008	Initial publication.
2	NOV 2014	Revised to current template. Revised to change load input position determination. (Chassis Structure Global Subsystem Leadership Team)

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