GM WORLDWIDE ENGINEERING STANDARDS	Test Procedure	GMW15819

Body Structures Development Jacking Location Maximum Load

1 Scope

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 the test is to serve as a Body Structure Pre–Validation Development Test to evaluate early properties to see if one (1) or more lifting points on the vehicle have strength enough to withstand the lift forces when jacking. Also, any deformation or damage which may be a result of jacking can be evaluated. Refer to 4.3.5. This procedure is not intended to validate the jacking tool.

1.2 Foreword. Occasionally during the vehicle development process, it is desirable to evaluate early prototype vehicle bodies for the ability of a vehicle structure to withstand service jacking loads. Computer Aided Engineering (CAE) analysis is the preferred validation method.

1.3 Applicability. This procedure applies to all passenger cars, Sport Utility Vehicles (SUV), light duty trucks, and medium duty trucks, when jacking will be applied to the vehicle's body structure.

2 References

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

2.1 External Standards/Specifications.

None

2.2 GM Standards/Specifications.

GMW14337

2.3 Additional References.

- CG190 - GM Evaluation Report Template
- CG583 - Development/Validation Test and Vehicle Review Form
- Subsystem Technical Specifications - (SSTS)

3 Resources

3.1 Facilities. Not applicable.

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. Standard Service Industry Floor Jack. A typical floor jack is pictured in Appendix A, Figure A1. The lift equipment can consist of the vehicle's own jack as well as a service station jack or a hoist, however, the specific equipment shall be agreed to prior to commencement of the test, and be described and/or photographed in the final report.

3.2.1 Bedplate and Surrounding Area. Approximately 4 m (length) × 4 m (width) of bedplate space is needed, depending on the length and width of the body structure.

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3.2.2 Calibration. When using equipment where calibration applies, note the calibration date on the form shown in Appendix A, Figure A2.

3.2.2.2 Overhead Crane. An overhead crane or other lifting device of sufficient capacity to lift the body structure and allow installation onto bedplate.

Note: The following list(s) include fixtures and instrumentation typically used to perform this test. Other equipment may be substituted at the discretion of the testing facility as long as it provides the same data and/or data record, with equivalent accuracy as specified herein or by the requestor.

3.3 Test Vehicle/Test Piece. One (1) Body in White or vehicle. The stage of completion should be noted in the final report.

3.4 Test Time. Not applicable.

3.5 Test Required Information. The following specifications or information are required to run this test.

3.5.1 The requesting engineer is responsible for providing specifications appropriate to the particular vehicle line being tested.

3.5.2 Testing worst-case scenarios may uncover some potential problems. Discuss with the requesting engineer if testing should include some worst-case scenarios. Depending on which level of parts or systems is being tested, consider if any of the following may apply:

- Tolerance stack-ups
- Build variations
- Misalignment
- Minimum/maximum fastener torque(s)
- Lubrication
- Environmental extremes
- Location of customer representative load application
- Symmetry (left hand versus right hand)
- Color, mold or die source, etc.

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 preferred for a successful evaluation.

4 Procedure

4.1 Preparation.

4.1.1 Sample Inspection. The test and requesting engineer(s) should inspect the test items to ensure that the body is of the correct design level and assembled properly. Note and record areas of visible metal deformation, cracks, etc., at or near the area being studied. The requesting engineer should be notified if these conditions exist and determine if the body structure should be replaced before testing begins.

4.1.2 Sample Preparation. This test is normally run on the test specimen in an as-received condition. If it is requested to be run in a specifically adjusted condition, follow the applicable procedure(s).

4.1.2.1 If a change to the body structure includes adding hardware to the body structure or making adjustments, and specific directions are not given, then the change should be done following appropriate product assembly specifications, orientation, fit, assembly specifications, etc., for the system being evaluated.

4.1.2.2 Weigh Body. The mass of the body or vehicle shall be determined prior to testing. Ballast per 4.3.2 if required, and shall be agreed to by the requesting engineer, and noted in the Development/Validation Test and Vehicle Review Form (CG583), and the final report.

4.2 Conditions.

4.2.1 Environmental Conditions. Unless otherwise specified in this documents text or by the requesting engineer, the typical environmental conditions for developing this test are the temperature, humidity and pressure at the major test facility, see 3.1.1. Unless otherwise noted, these conditions are typically 22 °C ± 3 °C, relative humidity of 40% ± 20%, and atmospheric pressure equivalent to the local barometric pressure which is variable during any given day and from day to day.

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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. If a physical test is required for Final vehicle validation, the test procedure outlined in GMW14337 shall be used. This test is not intended to validate the Subsystem Technical Specifications (SSTS) requirements such as, and not limited to flange stiffness, or damageability. The method outlined here can be used during the development phase, or help problem solve, and can help assist in CAE correlation studies. Special consideration should be taken if the test vehicle does not represent Gross Vehicle Weight (GVW).

4.3.1 Determine Jack Locations. The requesting engineer and test engineer shall discuss, determine, and agree on the jacking locations to be tested, a typical jacking location is shown in Appendix A, Figure A3 and Figure A4.

4.3.2 Test Setup. Set up the body on the floor with support of the beam system such that there is place enough under the body for use of a service station jack. The distance between the body attachment point and the lifting point should not exceed 0.5 m (19.7 in). It is also suitable to use the rear attachments for the shock absorbers and the front subframe attachments as fixing points (Appendix A, Figure A5 through Figure A8). The body should be sufficiently restrained so as to not influence the final test results.

4.3.3 Alternative Test Setup. An alternative body retention method is to use stands and turnbuckles (Appendix A, Figure A4). The body should be sufficiently restrained so as to not influence the final test results.

4.3.4 Test Setup Agreement. Prior to commencement of testing, the responsible test engineer, and product engineer or engineers if applicable shall agree and document the agreement on the Development/Validation Test and Vehicle Review Form (CG583). A sample is shown in Appendix A, Figure A9. Specific lift equipment, vehicle's own jack, service station jack, or a hoist, shall be agreed to prior to commencement of the test.

4.3.5 Ballast. The body or full vehicle if available, may be ballasted to simulate a more representative vehicle mass. The requesting engineer and test engineer shall agree and document the agreement prior to beginning the test. Ballasting is not required on a body that is rigidly fixtured.

4.3.6 Load Indication. Mount the load indicator to the head cap of the jack, see Appendix A, Figure A10.

4.3.7 Mount the level indicator as close as possible to the lifting point, in such manner that it is measuring the remaining deformation if any.

4.3.8 Connect the load and level indicator to the measurement rack and calibrate.

4.3.9 Place the head cap of the jack against the lifting point (Appendix A, Figures A11, A12 and A13). Then load in steps of 2 kN at a time with unloading between each step, in that way, it is possible to detect remaining deformation on the load/deflection curve, until the pre-agreed to load is reached. If no remaining deformation is visible when the requirement is reached, continue to increase the load in the same manner until a visible remaining deformation has occurred in the lifting point or in the adjacent area. When lifting in jacking points made for the vehicle's own jack, it is important that the head cap used has the same shape as the head cap of the vehicle's jack. An adapter which fits in the jacking point shall be used. For other lifting points, a head cap shall be used such as prescribed in SSTS for actual vehicle.

4.3.9.1 Optional Load Case. In order to evaluate the effects of a lateral load on a flange or jack location, refer to Appendix A, Figure A14 and Figure A17.

4.3.10 All lifting points as agreed on with the requesting engineer for the vehicle shall be tested as above. One (1) typical location is shown in Appendix A, Figure A1.

4.3.11 Measure Deflection. As close to the jacking point as possible, measure the deflection while the load is applied. The same surface can be measured after the load is removed, in order to determine the permanent set. Record deflection data and observations on Appendix A, Figure A15.

4.3.12 Save the measured data.

4.3.13 Graph. The resultant load/deflection curve shall be plotted, and included in the final test report. See Appendix A, Figure A16, Simple Force Deflection Graph.

4.3.14 Inspect and photograph after the test.

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4.3.15 Analyze results and prepare report.

Note: Every posttest operation/measurement/inspection must typically have a pretest equivalent to have any meaning or significance. A crack detected at the end of the test means nothing unless there is pretest documentation verifying no crack existed prior to start of test. Inspect the area for cracks, part separation, damaged welds, fastener movement, etc., and note in the final test report.

5 Data

5.1 Calculations. Not applicable.

5.2 Interpretation of Results. Not applicable.

5.3 Test Documentation.

5.3.1 The final test report shall be presented in a format consistent with the GM Evaluation Report Template (CG190), found in the Standard Forms and Templates library in the GDM (Global Document Management) Database.

5.3.2 The results of this test procedure shall be represented in a GM approved test report. It shall contain a complete identification of the structural subsystem or the structural components (part number, lot number, etc.) Detailed pictures of the seat setup and the adjustments necessary to obtain the test load shall be included. If any cracks, breakage or weld damaging in the structure is found, pictures shall be taken. Observations and comments shall be recorded on an Observation Log similar to the sample shown in Appendix A, Figure A17.

5.3.3 Test Documentation. The results of the measurements from this test procedure shall be presented in a test report consistent with the GM Evaluation Report Template (CG190).

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.

Body Structure: The primary structure of the vehicle which includes the body, any significant structural members that may affect the stiffness of the body structure when the structural component or component interface is being evaluated.

X-Direction: Along the cars driving direction parallel to a horizontal plane positive direction rearward, see Figure 1.

Y-Direction: Across the cars driving direction parallel to a horizontal plane. Positive direction to the right (reference seating position), see Figure 1.

Z-Direction: Perpendicular to X and Y directions. Positive direction upwards, see Figure 1.

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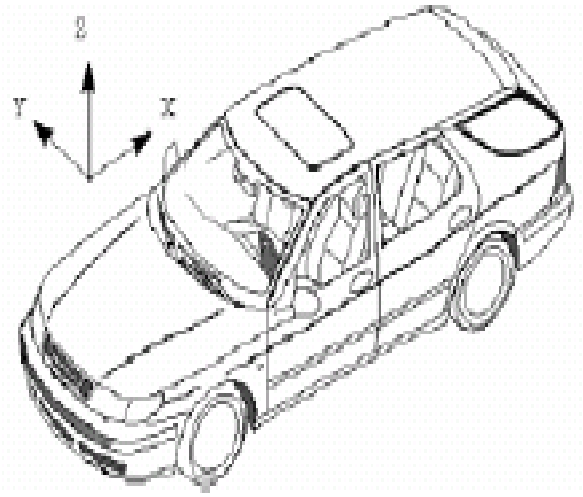


Figure 1: Coordinates Reference

7.2 Acronyms, Abbreviations, and Symbols.

CAE Computer Aided Engineering
GDM Global Document Management
GVW Gross Vehicle Weight
SSTS Subsystem Technical Specification
SUV Sport Utility Vehicle

8 Coding System

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

Test to GMW15819

9 Release and Revisions

This standard was originated in March 2008. It was first approved by Body Structure in June 2008. It was first published in June 2008.

Issue	Publication Date	Description (Organization)
1	JUN 2008	Initial publication.
2	NOV 2013	Updated to current template. (Underbody Structures Global Subsystem Leadership Team)

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Appendix A



Figure A1: Typical Service Station Floor Jack

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