



Pickup Box/Rear Cargo Area Localized Strength 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 test is to determine vehicle Pickup Box (PUBX) or rear cargo area assembly strength when being statically loaded.

1.2 Applicability. This procedure applies to all trucks and multipurpose vehicles with a rear cargo area or a PUBX (steel or composite).

1.2.1 The localized load may be applied to the following areas of the PUBX/rear cargo area:

1.2.1.1 Front panel.

1.2.1.2 Wheelhouse.

1.2.1.3 Side panels.

1.2.1.4 Cargo bed surface.

1.2.2 For Endgate Strength Test see GMW15486.

1.3 Remarks. This test is intended to determine the strength of specified sections of a PUBX or rear cargo area of a vehicle by applying a static, localized load.

2 References

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

2.1 External Standards/Specifications.

None

2.2 GM Standards/Specifications.

GMW15486

2.3 Additional References.

- CG190 GM Evaluation Report
- Subsystem Technical Specifications (SSTS)

3 Resources

3.1 Facilities. An approved GM certified test laboratory with an adequate bedplate or equivalent work surface necessary for mounting test samples and associated 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. The following list(s) include fixturing and instrumentation typically used by the GMNA Body Test Lab 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.

3.2.1 Fixturing.

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3.2.1.1 Hydraulic, electric, or pneumatic actuator(s) to apply the specified load to the PUBX rear inner side panels and/or endgate.

3.2.1.2 Structural framing to mount actuators inside and above the area to be tested as required. If the displacement measuring device is integral to the load actuator, the rigidity of all structural framing must be demonstrated to have more than 700 N/mm stiffness and less than 0.1 mm permanent set when loaded to required test load. If this cannot be demonstrated, then a displacement measuring device, e.g., string pot, dial indicator, Linear Variable Differential Transformer (LVDT) that is mounted to structural framing that is independent of the loading framing should be utilized.

3.2.1.3 Applicable structural framing, e.g., angle stands to rigidly mount the test buck to a suitable bedplate.

3.2.1.4 One piece of 125 mm x 125 mm steel plate for localized loading. The dimensions of the loading plate can be modified dependent on the requirements stated in the Subsystem Technical Specification (SSTS). Modifications to the loading plate dimensions may also be made in cases where the loading surface cannot support the entire 125 mm x 125 mm loading surface, e.g., wheelhouse surface. Unless otherwise specified, default to the dimensions stated above.

Note: See Figure A1 for representative fixturing.

3.2.2 Instrumentation.

Note: All instrumentation is to be calibrated as required; record instrumentation details and date of calibration on Data Sheet A2 unless the information is otherwise preserved in the testing laboratory records.

3.2.2.1 A programmable controller that is used to operate an actuator.

3.2.2.2 A load cell with suitable capacity to record the loads applied during test.

3.2.2.3 Dial indicators, dividers, displacement transducers, or other equipment to measure deflection.

3.2.2.4 An X-Y recorder.

3.3 Test Vehicle/Test Piece. Complete PUBX or Body-in-White (BIW) with all hardware, including an operational tailgate.

3.4 Test Time.

Calendar time: 1 d

Test hours: 4 h

Coordination hours: 4 h

3.5 Test Required Information.

3.5.1 The requesting engineer should provide specifications appropriate for the PUBX or rear cargo area being evaluated.

3.5.1.1 If possible, analysis techniques should be used to identify areas with the weakest structure, in order to reduce the number of required evaluations.

3.5.2 The following specifications may be needed.

3.5.2.1 Locations of the PUBX or rear cargo area to be loaded.

3.5.2.1.1 Maximum applied load.

3.5.2.1.2 Load apply direction.

3.5.2.1.3 Loading plate dimensions.

3.5.2.1.4 Maximum displacement and permanent set. See Figures A2 and A3 for examples of PUBX platform and wheelhouse loading.

3.6 Personnel/Skills. Prior experience in setting up and running similar tests, and experience in the use of the referenced test equipment is critical to achieving the estimated times shown in 3.4.

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4 Procedure

4.1 Preparation.

4.1.1 The Release and Test engineer should inspect the PUBX assembly or rear cargo area to ensure that all material listed in 3.3 is present and assembled properly. Observe and note all areas of damage or scratches in areas to be loaded.

4.1.2 Isolate the PUBX or vehicle body from the suspension so that the vehicle or box will not move when the loads are applied.

4.1.3 If deflection readings are requested by the Design or Test Engineer, locate and mark the measuring points on the body/box.

4.1.4 Install the load actuator, load and displacement measurement devices and actuator support fixtures with minimal alterations to the test sample.

4.2 Conditions.

4.2.1 Environmental Conditions. Unless otherwise specified in this document's text by the requesting engineer, the typical environmental conditions for this test are the temperature, humidity, and pressure at the major test facility. Unless otherwise noted, these conditions are typically $22\text{ }^{\circ}\text{C} \pm 3\text{ }^{\circ}\text{C}$ ($72\text{ }^{\circ}\text{F} \pm 5\text{ }^{\circ}\text{F}$), relative humidity of $40\% \pm 20\%$, and atmospheric pressure equivalent to the local barometric pressure (which is variable during any given day and from day to day).

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 Strength of localized sections.

4.3.1.1 Locate the 125 mm x 125 mm loading plate (or other size, see 3.2.1.4) normal to the surface to be loaded (see Figures A2 through A6 for locations).

4.3.1.2 With the loading plate in close proximity to but NOT in contact with the surface to be loaded, zero the load cell. Gradually advance the actuator until contact between the loading plate and the surface to be loaded is achieved as indicated by a small positive reading on the load cell. Zero the displacement measuring device. Use Data Sheet A1 (page 1 of 2) to record load and displacement values. Refer to Data Sheet A1 (page 2 of 2) for an example for completion.

4.3.1.3 Apply a preload of 5% of the maximum required load. Record the displacement measuring device. Re-zero the displacement measuring device.

4.3.1.4 Gradually apply load through the center of the plate until 50% of the required load is reached. Hold load for 20 s. Record displacement. If utilizing a displacement measuring device not integral to the load actuator, e.g., string pot, mount the device to the load plate so that displacement is measured along the line of load application.

4.3.1.5 Gradually reduce the load to the preload value using caution to NOT reduce load to less than the preload value. Record displacement.

4.3.1.6 Repeat 4.3.1.4 and 4.3.1.5 in additional 10% increments until 100% of required load is reached. Continue loading above required load if requested by product engineer.

4.3.1.7 Note and photograph any permanent marks, mars, or denting of loaded surface.

4.3.1.8 Repeat 4.3.1.1 and 4.3.1.5 for each specified area.

5 Data

5.1 Calculations. Not applicable.

5.2 Interpretation of Results. Permanent set or yield is determined by a net positive difference between the displacement at the point of load application recorded at the preload value at the beginning of the test sequence and the displacement at the point of load application recorded at the preload value after application of 100% of the required load.

5.3 Test Documentation. Use Data Sheets A1 and A2 provided in this standard. If substitute data sheets are used they must, at a minimum, record all of the parameters called for in the data sheets provided in this standard.

5.4 Test Report Format. The final test report shall be presented in a format consistent with the CG190 form.

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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.

Actuator: Any device (pneumatic, hydraulic, electric, etc.,) capable of delivering a required motion to the system being tested.

Cargo Bed Surface: The floor of the PUBX or rear cargo area.

Flare Board: The portion of the side of the PUBX (typically horizontally oriented) that joins the inner, vertical panel of the PUBX to the outer fender/quarter panel of the PUBX.

Front Panel: The front vertical wall (usually oriented cross car) of a PUBX or of an enclosed rear cargo area of a vehicle.

Side Panels: The right hand and left hand side vertical walls of a pickup or an enclosed rear cargo area.

Wheelhouse: The exposed portion of the wheel well inside the PUBX walls or rear cargo area.

7.2 Acronyms, Abbreviations, and Symbols.

BIW	Body-in-White
LVDT	Linear Variable Differential Transformer
PUBX	Pickup Box
SSTS	Subsystem Technical Specification

8 Coding System

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

Test to GMW15661

9 Release and Revisions

This standard was originated in August 2007. It was first approved by the Global Body Structures Testing Sub-Team in February 2008. It was first published in May 2008.

Issue	Publication Date	Description (Organization)
1	MAY 2008	Initial publication.
2	JUN 2010	Added Figures A4, A5, A6 to Appendix A. (Global Body Structures GSSLT).
3	NOV 2015	Added reference to Figures A2 through A6 in 4.3.1.1. (Body Structures and Pickup Box GSSLT)

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