



Body Lock Pillar - Simulated Door Slam Fatigue Durability

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 the vehicle body lock pillar and its surrounding area, when subjected to simulated door slam load inputs. This procedure describes the loads data acquisition, loads data editing, and the durability test execution.

1.2 Applicability. This procedure applies to all passenger cars, light-duty trucks, and medium-duty trucks having conventional swing-open doors, or any other door design having a conventional latch/striker system and vertically hinged orientation.

1.3 Remarks. This test procedure describes test techniques for a full body structure. The load input to the lock pillar is a real-time simulation of door forces on the striker during a door-closing event. The phase relationship of the lateral and vertical striker loads is retained in this test.

2 References

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

2.1 External Standards/Specifications.

None

2.2 GM Standards/Specifications.

GMW14269

GMW15094

GMW16176

2.3 Additional References.

- Body Test Lab Fixture Drawing Number TLA00441
- CG190 GM Evaluation Report
- CG2556 - Body Structure Subsystem Technical Specification (SSTS)

3 Resources

3.1 Facilities.

Major Facility: The major facility should provide all of the infrastructure and equipment called for in 3.1 and 3.2 as well as providing the environmental conditions required in 4.2.

Minor Facility:

- 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 and size and placement of the actuators.
- Overhead Crane:** An overhead crane or other lifting device of sufficient capacity to lift the body structure and allow installation onto bedplate.
- Hydraulic System:** Capable of supplying pressurized oil at a sufficient flow rate to meet the maximum simulator system demand. Typically, the system should be capable of delivering approximately 3.8 L/minute at 21 MPa.

3.1.1 Calibration. The test facilities and equipment shall be in good working order and shall have a valid calibration label.

GM Confidential

© Copyright 2017 General Motors Company All Rights Reserved

December 2017

Page 1 of 9

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.

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.

3.2.1 Door Striker Loads Data Acquisition. Follow the procedure in GMW16176 to acquire the required striker loads.

3.2.2 Durability.

3.2.2.1 A Servo-hydraulic actuator controller capable of reproducing the performance objectives referenced in 3.5.

3.2.2.2 Two (2) uniaxial load cells (one for lateral input and one for vertical input) capable of providing load feedback to the controller described in 3.2.2.1. Typically, two 5000 N uniaxial load cells are recommended.

3.2.3 Fixtures. See Figures A1, A2, and A3 in Appendix A.

3.2.3.1 Two (2) actuators, with sufficient travel and capacity/output to apply the desired loads to the body lock pillar. The operating range is ± 5000 N.

3.2.3.2 Two (2) angle stands: approximately 2 m (for the vertical actuator) and 1 m (for the lateral actuator).

3.2.3.3 Fixture to support the vertical actuator on the 2 m angle stand.

3.2.3.4 Two (2) crossbeams long enough to extend beyond the width of the body structure to be able to anchor to the bedplate (see Figure A1 in Appendix A).

3.2.3.5 Miscellaneous hardware for attaching and connecting the various angle stands, crossbeams, supports, etc.

3.2.3.6 Pillar-loading fixture, reference Drawing Number TLA00441 stored in the Teamcenter Engineering Automotive Edition (TcAE) database. This fixture includes a split spherically bearing that allows the striker to rotate. See Figure A3 in Appendix A.

3.2.3.7 Depending on the body structure geometry, various actuator extensions may be needed to connect to the pillar-loading fixture to allow for clearance of the actuator to the lock pillar.

3.2.3.8 Torque wrench for striker fasteners.

3.3 Test Vehicle/Test Piece.

3.3.1 Load Measurement Vehicle. One (1) complete vehicle (including air bind, a condition where all of the vehicle's closure panels, windows, and any other body openings are closed/sealed) to perform the door slam loads data acquisition.

Test Property should have seal margins set at nominal. Adjustment of seal margin may require setting the correct nominal margin at the lock pillar as a priority.

3.3.2 Durability. One (1) body structure is needed. Typically, a complete body-in-white is recommended for the durability test.

3.3.3 Load measurement and durability door strikers, anchor plates, and attaching hardware.

3.4 Test Time.

Calendar time:	20 d
Test time:	3 d – 1 Rear Pillar 3 d – 1 Front Pillar
Coordination time:	2 d

3.5 Test Required Information. The requesting engineer is responsible for providing specifications appropriate to the particular vehicle line being tested.

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,

GM Confidential

© Copyright 2017 General Motors Company All Rights Reserved

December 2017

Page 2 of 9

minimum/maximum fastener torque(s), lubrication, environmental extremes, location of customer representative load application, symmetry (left hand vs. right hand), color, mold or die source, etc.

The following specifications or information are required to run this test:

3.5.1 Durability Cycle Requirement. These specifications can be found in 3.2.1.3.10.3.2 (Body Lock Pillar Fatigue) of the CG2556 - Body Structure Subsystem Technical Specification (SSTS).

3.5.2 Real-Time Door Striker Loads Data. The durability cycle requirement (shown in the Body Structure SSTS) provides specifications to match the GMW15094 Door Slam Durability test. Channels that need to be recorded are lateral and vertical striker loads for the window positions and velocities shown in the Structures SSTS. These different window positions and velocities produce a corresponding load on the lock pillar.

3.5.3 Fastener Torque Specifications. Unless otherwise specified, use the nominal torque values for the striker fasteners during both the door striker loads data acquisition and durability.

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. This experience is also critical to achieving the estimated times shown in 3.4.

4 Procedure

4.1 Preparation.

4.1.1 Test Planning. Create a test plan that details the timeline of events that are to take place in executing this procedure.

4.1.2 Sample Inspection. The test and requesting engineer(s) should inspect the test items to ensure all material listed in 3.3 is of correct design level and assembled properly including number of welds, weld positions and placement of structural adhesive. Note and record areas of visible metal deformation, cracks, etc., at or near the striker attachment on the body lock pillar. The requesting engineer should be notified if these conditions exist, and determine if the body structure should be replaced before testing begins.

4.1.3 Sample Preparation. This test must be run on a test specimen with nominal seal margins and nominal striker torques. If it is requested to be run in a specifically adjusted condition, follow the applicable procedure(s).

4.1.3.1 If a change to the body structure includes adding hardware to the body structure or adjusting striker position 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.

4.1.3.2 Spray white stencil ink on areas around the striker. This will enable visual inspections of the pillar and surrounding area for cracks, etc.

4.1.3.3 Fasteners should be indexed with a paint pen, torque seal, or equivalent, in order to detect movement of the fasteners. Straight lines should be made from the center of the fastener head to the striker or component that the fastener connects to.

4.1.4 Facilities and/or Equipment Preparation. Record all site and instrument calibration information.

4.2 Conditions.

4.2.1 Environmental Conditions. Unless otherwise specified in this document's 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).

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 Setup Instructions for Door Striker Loads Data Acquisition.

4.3.1.1 Using the strain-gauged striker procedure in GMW14269, and the real-time data acquisition system, collect the door striker loads at the required slam velocities and different window positions.

Note: If the actual striker is modified and used for data acquisition, care should be taken to correctly identify where the striker pin is actually loaded during the door-closing event. Typically, the strain-gauged striker is calibrated in load at the mid-point of the striker pin. If the loading is offset from where it was calibrated, then the

GM Confidential

© Copyright 2017 General Motors Company All Rights Reserved

December 2017

Page 3 of 9