Midsize SUV and Pickup Truck Established Road Regions Structural Durability 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. This standard provides a common GM global structural durability evaluation of a midsize Sport Utility Vehicle (SUV) or pickup. This test standard provides severe chassis structural inputs representing vehicle usage in markets with established road systems (i.e., Australia, New Zealand, Canada, United States, Japan, Western Europe and Middle East).

1.2 Applicability. Midsize Body on Frame (BOF) SUVs and Pickup Trucks marketed for Established Road Regions.

1.3 Remarks. This standard is intended as the basis for structural laboratory tests and analytical modeling. The core test provides the basis for laboratory and/or road evaluation (when appropriate) of structural subsystems and components. This test standard has been developed to reflect customer usage of markets with established road systems. These regions have more stable road systems and lesser amounts of unpaved and rough roads.

1.3.1 The events repeated to the specified number of times provide high and medium amplitude structural inputs for severe customer usage. Structural inputs are defined as vertical, lateral, fore-aft, and chassis torsion, and full stop steering. Inputs other than these are present at a much lower severity and are incidental to obtaining the representative structural inputs.

1.3.2 Due to the abbreviated nature of this test procedure, the less damaging and often time-consuming inputs are greatly reduced or eliminated.

1.3.3 While GMW16618 is intended to cover global established road systems, the test does not encompass all known customer usage treatments or road types. Some of the limitations are due to the accelerated nature of the test and some are due to the constraints of the test site environment and test facilities. Additionally, the database for defining the world-wide vehicle operating environment is evolving and periodic content changes to the GMW16618 are expected.

1.3.4 If more rigorous exposure to unique customer usage treatments is desired, other specialized testing should be considered as part of the overall vehicle dependability test plan. Some considerations should be given to the following:

- GMW15016 Cold Weather Exposure Test
- GMW15730 Hot Weather Exposure Test
- GMW18048 Desert Off-Road Structural Test (for vehicles with off-road capability)

1.3.5 Results of this test should be regarded as highly probable to also occur in the hands of some customers inasmuch as the test contains vehicle treatments based on measured customer vehicle operation. This procedure specifies vehicle operation designed to match data collected on groups of randomly selected customers' vehicles. The intent of the test is to subject the vehicle to the treatment of a greater-than-average severity customer for each of the measured structural inputs.

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2 References

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

2.1 External Standards/Specifications.

None

2.2 GM Standards/Specifications.

GMW3238	GMW15193	GMW15553	GMW15709
GMW3241	GMW15444	GMW15554	GMW15730
GMW3423	GMW15445	GMW15556	GMW16933
GMW14264	GMW15550	GMW15557	GMW18048
GMW15016	GMW15552	GMW15706	

2.3 Additional References.

- Steering Subsystem Technical Specifications (SSTS) – Steering Gear/Tie Rod/Linkage High Load Fatigue.

2.3.1 Cruz Alta.

DR.CA.1060	DR.CA.1174	DR.CA.1302	DR.CA.1316
DR.CA.1061	DR.CA.1258	DR.CA.1307	DR.CA.1319
DR.CA.1062	DR.CA.1296	DR.CA.1308	DR.CA.1321
DR.CA.1064	DR.CA.1300	DR.CA.1309	DR.CA.1326
DR.CA.1075	DR.CA.1301	DR.CA.1313	

2.3.2 Milford.

DL.MF.4B	DL.MF.BP	DL.MF.EX	DL.MF.S7
DL.MF.4E	DL.MF.CB	DL.MF.HA	DL.MF.SA
DL.MF.4F	DL.MF.CP	DL.MF.HB	DL.MF.SF
DL.MF.4G	DL.MF.CR	DL.MF.JS	DL.MF.SH
DL.MF.4H	DL.MF.CS	DL.MF.MC	DL.MF.TZ
DL.MF.4M	DL.MF.DP	DL.MF.PX	DL.MF.VM
DL.MF.4R	DL.MF.DS	DL.MF.PY	DL.MF.WE
DL.MF.4S	DL.MF.DT	DL.MF.PZ	DL.MF.WF
DL.MF.4W	DL.MF.EB	DL.MF.Q5	DL.MF.WH
DL.MF.4X	DL.MF.EG	DL.MF.RB	DL.MF.XF
DL.MF.AZ	DL.MF.ES	DL.MF.RP	

3 Resources

3.1 Facilities. General Motors Proving Grounds:

- Cruz Alta Proving Ground (Brazil)
- Milford Proving Ground (USA)

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 Some method of accurate speed indication should be provided to the driver for accurate execution of the driving schedules.

3.2.2 Some type of acceleration/deceleration rate indicator should also be provided to the driver.

3.3 Test Vehicle/Test Piece. Test vehicle equipped as specified.

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3.4 Test Time. Repair, inspection, routine maintenance, refueling, and downtime will increase the total test time.

Calendar time:	0 d
Test time:	462 h to 492 h (proving ground dependent)
Coordination time:	0 h

3.5 Test Required Information. Not applicable.

3.6 Personnel/Skills. If data measurements are required the driving instructions that comprise this test are intended to be performed by personnel specifically trained in the proper execution of the driving instructions. Refer to the appropriate proving ground driving instruction documents and related risk assessments.

Different driver license requirements, knowledge of test content, and mandatory health checks for involved personnel have to be considered.

4 Procedure

4.1 Preparation. Current maximum allowable vehicle speed to be supplied by test responsible personnel to ensure the vehicle is operated safely. If the vehicle is equipped with a manual transmission, the shift point speeds should also be determined and provided.

Measurement of adjustments and settings may be made as deemed necessary to document the condition of the vehicle. These measurements must be made without significantly affecting the adjustment or setting being considered. The intent of these measurements is to document the condition of the vehicle without changing the state of the original assembly.

Vehicles being operated on this test for any other purposes (e.g., design evaluation) should be prepared in a manner appropriate to that particular test intent.

4.2 Conditions.

4.2.1 Environmental Conditions. For data acquisition, in situations where severe weather makes certain driving events unsafe they should be postponed until road conditions improve.

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.

Limited environmental shielding of transducers and other instrumentation may require that loads acquisition be postponed during wet road conditions.

Road Load Data Acquisition (RLDA) measurements of some events should only be run during dry road conditions (e.g., aggressive brake events, standing start wide open throttles (WOT)), otherwise peak loads may be reduced due to tire slip.

In general, vehicles classified as Sport Utility Vehicles (SUV) are intended to transport passengers or be converted to a cargo hauling configuration in place of some or most passenger seating.

4.2.3 Ballast. Ballast definitions are explained in GMW15445 Vehicle Ballast.

The ballast calculation data sheets in GMW15445 should be used to determine proper ballast mass. Midsize Sport Utility Vehicles (SUV) should use Datasheet C1 or C2 in Appendix C. Midsize pickup trucks with ballast designations ≤ 700 kg payload should use Data Sheet D1 or D2 in Appendix D. Midsize pickup trucks with ballast designations > 700 kg payload should use Data Sheet E1 or E2 in Appendix E.

Vehicles with configurable cargo areas should use the cargo carrying configuration for Gross Vehicle Mass (GVM) ballast during test phases 3 and 4 of this test. Throughout test phases 1, 2, and 5, the passenger carrying configuration should be used for GVM ballast.

4.3 Instructions. Perform the appropriate driving instructions listed in Table A1 and Table A2 in Appendix A and Table B1 and Table B2 in Appendix B.

4.3.1 Antilock Brake System. If the vehicle is not equipped with an Antilock Brake System (ABS) or if the system is inoperative, this content should be deleted for the test.

4.3.2 Traction Control System. If the vehicle is not equipped with a Traction Control System (TCS) or if the system is inoperative, this content should be deleted for the test.

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4.3.3 Additional Test Content. Additional test content can be run in conjunction with the base test content to meet specific needs.

4.3.3.1 Four Wheel Drive Addition. For four wheel drive (4WD) trucks, the 4WD addition should be added to the base test. The specified events listed in the test are to be run in addition to the base two wheel drive (2WD) test events.

4.3.3.2 Steering Subsystem/Component Addition. For steering subsystem testing, additional steering events are listed.

Each test table includes additional content that should be included in any steering subsystem or component testing. These additional cycles should not be included in other tests such as full vehicle tests.

The Steering Ride and Handling (R&H) events are recorded at three different speeds [80 km/h, 89 km/h and 89/97 km/h (50 mph, 55 mph, and 55/60 mph)], as described in DL.MF.CR. At each speed, three separate events of the procedure are performed for a total of nine Steering R&H events per ballast condition. Both Light Vehicle Mass (LVM) and GVM ballast conditions should be measured. One third of the total Steering R&H cycles are to be reproduced in the test at each speed. The test performer should choose the recorded Steering R&H event at each speed [six total to choose from – three at LVM and three at GVM] that provides the most fatigue damage and use that event for all cycles at that speed.

The Steering Panic Brake events are recorded at 80 km/h, 89 km/h and 89/97 km/h (50 mph, 55 mph, and 55/60 mph) and once again at a driver determined speed for a total of four Steering Panic Brake events per ballast condition as described in DL.MF.CP. Both LVM and GVM ballast conditions should be measured. Of the recorded Steering Panic Brake events [eight total to choose from – four at LVM and four at GVM], the test performer should choose the event that provides the most fatigue damage and use that event for all Steering Panic Brake cycles.

One cycle of a Curb Rim Pull event DL.MF.RP should include four measured conditions per load level; right tire against the curb right turn, right tire against the curb left turn, left tire against the curb right turn, left tire against the curb left turn.

4.3.3.3 Additional Powertrain Mount Laboratory Test Content. For laboratory tests that include powertrain mount loads, City content is performed in addition to the base test content.

4.3.4 Test Scheduling Guidelines. In order to subject the vehicle to a reasonable simulation of customer usage in a linear manner of operation, distribute the driving instructions as evenly as possible throughout the test.

5 Data

5.1 Calculations. Due to variability in measured high level load inputs, the following events should be recorded two times:

- 7.2% Extended Grade Chatters (DL.MF.EG)
- 7.2% Hill Lap (DL.MF.WH)
- High G 60 km/h (DR.CA.1064)
- Panic Brake Event (DL.MF.BP)
- Pothole #3 (DL.MF.PZ, DR.CA.1316)
- Seven Sisters Lap (DL.MF.S7)

Similarly, the following events should be recorded three times:

- Belgian Block Lap (DL.MF.EB)
- D2 (DR.CA.1061)

During test development, the event repetitions should be evenly spread throughout the multiple runs for the base fatigue damage calculations. The test engineer may then choose to use a single run which is most advantageous to simulate the event and to produce similar fatigue damage as the base calculation using multiple run repetitions.

5.2 Interpretation of Results. In general, the structural durability test contains a more complete distribution of loads and, therefore, represents customer usage better than the structural content in the general durability test.

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