



Desert Off-Road 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. To subject an off-road vehicle to events similar to those found while off-roading in the desert.

1.2 Applicability. Off-road vehicles with a Motivity Capability of Level 2B or higher.

1.3 Remarks. This standard is intended as the basis for structural laboratory tests and analytical modeling. The structural test content shall include the cycle repeats of the structural durability lab test (for example, GMW16618 or GMW15980) as well as from this desert off-road test. These combined tests provide the basis for the laboratory testing of structural subsystems and components.

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 This test focuses on desert off-road truck usage and does not encompass all known customer usage treatments or road types.

2 References

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

2.1 External Standards/Specifications.

None

2.2 GM Standards/Specifications.

GMW14264	GMW15445	GMW16618
GMW15444	GMW15980	

2.3 Additional References. VTS 3.2.1.1.5.26 Off-Road Performance Section.

2.3.1 Desert Proving Ground – Yuma (DPG-Y).

DL.YU.XA	DL.YU.XG	DL.YU.XP	DL.YU.XW
DL.YU.XB	DL.YU.XJ	DL.YU.XR	DL.YU.XX
DL.YU.XC	DL.YU.XL	DL.YU.XT	

3 Resources

3.1 Facilities. Desert Proving Ground Yuma (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.

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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.

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

Calendar time: 0 d

Test time: 2 h to 25 h (depending on off-road capability)

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, it 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.

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.

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

4.2.3 Ballast. The test truck is to be ballasted with the driver, 70 kg in the right front passenger position, and 91 kg in the cargo area. Ballast definitions are explained in GMW15445 Vehicle Ballast.

4.2.4 Description of Off-Road Capability Levels. The VTS Off-Road Capability Paragraph (3.2.1.1.5.26) specifies the vehicle-level Mobility and Motivity Capability Ratings. A brief description of each is provided in the following.

4.2.4.1 Mobility Off-Road Capability. Mobility Off-Road Capability is focused on low speed off-road events like rock crawling and traversing ledges, shelves and ditches found in places like the Rubicon Trail in CA and Moab, UT. Mobility Capability, regardless of severity, does not drive any additional vehicle-level structural lab testing.

4.2.4.2 Motivity Off-Road Capability. Motivity Off-Road Capability or "desert running" capability involves faster speeds over terrain with whoops, swells, sand washes, jumps, etc. This Desert Off-Road Structural Test is intended for vehicles with a Motivity Capability of Level 2B or greater.

The following Off-Road Motivity Capabilities are defined in VTS 3.2.1.1.5.26 Off-Road Performance Section:

- Level 1 - Basic

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- Level 2 - Elevated
- Level 3 - Desert Race Course Capable

Further divisions exist within some of the levels. Refer to the Off-Road Capability VTS Paragraph for a detailed description.

4.2.4.2.1 Level 2B Off-Road Capability. Trucks with Level 2B Elevated Off-Road Capability run some aspects of the DPG-Y Saguaro Trail. Basic lap content excludes the man-made events such as whoops, table top, and swells. Refer to Appendix A Table A1 for the cycle repeats of specified events.

4.2.4.2.2 Level 3A Off-Road Capability. Level 3A Desert Off-Road Course Capable trucks run all of the DPG-Y Saguaro Trail events but the cycle repeats of the man-made events such as whoops, table top, and swells are reduced. Refer to Appendix B Table B1 for the cycle repeats of specified events.

4.2.4.2.3 Level 3B Off-Road Capability. Level 3B Desert Off-Road Course Capable trucks run all of the DPG-Y Saguaro Trail events. The cycle repeats of all events are the same. Refer to Appendix C Table C1 for the specified events and cycle repeats.

4.3 Instructions. Perform the driving instructions listed in Appendices A, B and C.

4.3.1 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. 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. The general (road) durability test does not address desert off-road usage.

5.3 Test Documentation. With reference to this test standard, the test results shall be presented in a test report. Written and photographic documentation is to be generated and maintained on all factors involved in the test.

All involved parties should agree upon and follow established standards regarding the appropriate documentation for the test (e.g., RLDA workbooks and checklists, data recorder setup files, test incident reporting).

5.4 Subjective Rating Scale. The subjective rating scale should be used to document subjective evaluations of fluid leaks, squeaks and rattles, disturbances, performance items and seat comfort. Refer to GMW14264 Subjective Rating Scales for more information.

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.

In general, a risk assessment needs to be performed for every driving instruction prior to executing this standard. (**Note:** National law needs to be considered while performing a risk assessment.) The required rating of risk by exposure probability and possible violation will be done in a separate document. Every identified risk must be named inside the risk assessment for the relevant driving instruction in order to announce that risk to employees. Within the risk assessment, the vehicle equipment and different vehicle build stages have to be considered. After performing a risk assessment, non-acceptable risk needs to be mitigated by appropriate countermeasures. Here technical measures are preferred because these are independent from attendant circumstances. In case technical measures are not appropriate, organizational and/or personal measures will apply. This includes training, wearing of Personal Protection Equipment, or arrangement of idle time.

6.1 Safety Precautions.

6.1.1 Instrumentation and other test equipment must be securely mounted in accordance with proving grounds traffic safety guidelines for mounting and usage of in-vehicle instrumentation.

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