



Exhaust System Road Load Measurements

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 describes the stress measurements on the exhaust system. The measured values recorded serve:

- Component dimensioning
- Generating the test signal on the test benches
- Determining quality requirements of the individual components

1.2 Applicability. For all exhaust systems.

1.3 Remarks. The stress measurements on the exhaust system and its components are undertaken while driving at the GM proving ground.

2 References

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

2.1 External Standards/Specifications.

None

2.2 GM Standards/Specifications.

GMW14381 GMW14390

2.3 Additional References.

AICON 3D Systems GmbH, Braunschweig, Germany (www.aicon3d.com)

3 Resources

3.1 Facilities. The test facility road systems must be the same as those used to validate the vehicle level durability.

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 Measurement equipment to store the exhaust acceleration.

3.2.2 For flexpipe movement, a system, such as EngineWatch (AICON 3D Systems GmbH) engine tracker, to determine the input movement.

3.3 Test Vehicle/Test Piece. Test vehicle should have latest calibration level, recommended 65% calibration. Chassis parts and powertrain mountings should be according to design intent. Anti-lock Brake System (ABS) must be installed and in working condition.

3.4 Test Time.

Calendar time:	5 weeks
Test hours:	40 hours
Test engineer hours:	120 hours
Test technician hours:	120 hours
Coordination hours:	2 hours

3.5 Test Required Information.

 Not applicable.

3.6 Personnel/Skills. Experience and training in the use of the referenced test equipment is required. Prior experience and training in setting up and running this procedure or similar tests, would be beneficial in achieving a successful test.

4 Procedure

4.1 Preparation.

4.1.1 The vehicle measurements shall be performed on the same road systems and schedules used to validate vehicle level durability. Furthermore, additional special maneuvers may be stipulated. This takes place within the framework of the multi axial thermodynamic exhaust systems test.

4.1.2 The vehicle measurement shall be performed with the engine running, warm operation, with exhaust gases diverted to enable the use of cold gauges. Cold gauges are required for all measurements with the exception of thermocouples.

4.1.3 Exhaust skin temperatures shall be measured without exhaust gas diverted from the exhaust system. Measurements will be performed on the same road systems and schedules used to measure exhaust accelerations, strains, etc.

4.2 Conditions.

4.2.1 Environmental Conditions. Not applicable.

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. The component measuring points shall be selected in accordance with the measuring points listed in Appendix A, Table A1, in so far as type and direction are concerned.

5 Data

5.1 Calculations.

5.2 Interpretation of Results. With reference to this standard the results shall be compiled in a test report.

5.3 Test Documentation. All the measuring points shall be documented and described by photographs in the measurements report.

5.3.1 The reduction of the signal-time pattern takes place in the form of a rain flow matrix. Damaging inputs from the Belgium blocks and the maximum pothole are required to be maintained within the data reduction. Based on this, a damage calculation is performed using the Relative Miner's Rule (see 7.1). The stress is illustrated in the form of a Level Crossing Diagram. The GM Designing Engineer (DE)/Design Release Engineer (DRE) must approve the final data reduction prior to conducting hardware rig testing.

6 Safety

This Engineering Standard may involve safety requirements for hazardous materials, the method of operations and equipment. This standard does not propose to address all the safety issues associated with its use. It is the responsibility of the user of this standard to ensure compliance with all appropriate safety and health practices. This would include any specific training that may be required. The safety and health standards include site specific rules and procedures, company rules and procedures, and Government Standards. Contact shall be made with the appropriate site Safety and Health personnel for further direction and guidance in these matters.