



Bushing Stick-Slip Noise 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 determine stabilizer bar and suspension bushing stick-slip noise performance.

1.2 Applicability. This procedure will apply to all passenger cars and light trucks having suspension designs using stabilizer bar systems or a bushing designed to allow relative motion between two surfaces.

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

2.3 Additional References.

Design For Six Sigma (DFSS) Project Number 471

3 Resources

3.1 Facilities. The facility must be adequate to house the equipment to perform the procedure(s).

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 Hot/Cold test chamber with the capability of providing temperatures from -20 °C to 60 °C.

3.2.2 Fixture that simulates the vehicle installation of the stabilizer bar, bushing, and clamp, or the suspension interfaces. A sample test setup is shown in Figure C1, Appendix C.

3.2.3 Actuator to apply radial load.

3.2.4 Load cell to measure applied radial load.

3.2.5 Torque motor to apply angular rotation.

3.2.6 Rotary Variable Differential Transducer (RVDT) to measure angular rotation.

3.3 Test Vehicle/Test Piece. Test must be completed using design intent parts.

3.4 Test Time.

Calendar time: 1 day

Test hours: 14 hours

Coordination hours: 1 hours

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3.5 Test Required Information.

3.5.1 Radial preloads supplied by GM responsible engineer.

3.5.2 Required bushing torsion angles supplied by GM responsible engineer.

3.6 Personnel/Skills. The test technician should be familiar with the test machine and the instrumentation required to obtain test data.

3.7 Development/Validation Items. A minimum of six (6) samples should be tested for each test phase. To the extent possible, bushing samples should come from a population of mold cavities over time in order to comprehend as many manufacturing variables as possible.

4 Procedure

4.1 Preparation.

4.1.1 All samples must be checked to ensure conformance to all print dimensional requirements.

4.1.2 Before testing, the samples should be installed in vehicle design condition including fastener torque and installation angle. Mating parts must have design intent material, dimensions, surface treatments, and coatings.

4.1.3 For stabilizer bar bushings, the stabilizer bar section used for testing shall be from an actual stabilizer bar, and be sectioned from the bushing interface location.

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. These instructions are in reference to Design For Six Sigma (DFSS) Project Number 471 for bushing stick-slip identification.

4.3.1 Phase One (1) New Bushing Noise Test.

4.3.1.1 Install bushing in vehicle position using design intent clamps, torques, and stabilizer bar sample. For suspension bushings, this must include all mating parts, such as control arms and brackets.

4.3.1.2 Soak assembly for a minimum of 2 h at test temperature per the desired run. This will be repeated at -20 °C, 0 °C, 23 °C and 60 °C.

4.3.1.3 Apply desired radial preload to the bushing. This is determined by the test matrix in Table A1, Appendix A, with low, medium and high loads supplied by the responsible GM engineer.

4.3.1.4 Apply the displacement input as shown in the example in Figure B1, Appendix B, scaled according to Tables A1 and A2, Appendix A. This will be repeated at 1.0 Hz, 0.5 Hz and 2.0 Hz. Input magnitude to be determined to represent ± 12 degrees of stabilizer bar rotation, ± 15 degrees control arm articulation, or suspension angular travels as supplied by the GM responsible engineer.

4.3.1.5 Repeat procedure at temperature, frequency, and contact pressure evaluation points for dry bushing.

4.3.1.6 Wet bushing interfaces with tap water and repeat 4.3.1.1 through 4.3.1.5 for 23 °C and 60 °C. Reference Table A2, Appendix A.

4.3.2 Phase Two (2) Worn Bushing Noise Test.

4.3.2.1 Wear bushings according to applicable bushing wear procedure. Samples should be prepared to 50% wear.

4.3.2.2 Install bushing in vehicle position using design intent clamps, torques, and stabilizer bar sample. For suspension bushings, this must include all mating parts, such as control arms and brackets.

4.3.2.3 Soak assembly for a minimum of 2 h at test temperature per the desired run. This will be repeated at -20 °C, 0 °C, 23 °C and 60 °C.

4.3.2.4 Apply desired radial preload to the bushing. This is determined by the test matrix in Appendix A, Table A1.

4.3.2.5 Apply the displacement input as shown in the example in Figure B1, Appendix B, scaled according to the Tables A1 and A2, Appendix A. This will be repeated at 1.0 Hz, 0.5 Hz and 2.0 Hz. Input magnitude to be determined to represent ± 12 degrees of stabilizer bar rotation, ± 15 degrees control arm articulation, or suspension angular travels as supplied by the GM responsible engineer.

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4.3.2.6 Repeat procedure at temperature, frequency and contact pressure evaluation points for dry bushing.

4.3.2.7 Wet bushing interfaces with tap water and repeat 4.3.2.2 through 4.3.2.6 at 23 °C and 60 °C for wet bushing at desired test frequencies and preloads. Reference Table A2, Appendix A.

4.3.3 Analysis. Review force output curves to determine if stick-slip occurred. Examples of good and bad curves can be seen in Appendix B (Figures B2, B3 and B4).

4.3.4 Requirements.

4.3.4.1 No stick-slip is to be present in new or 50% worn bushings at any test condition. GM responsible engineer has final buy in for presence of stick-slip.

4.3.4.2 No noise above TRACE (Level 8) level, as defined by GMW14264, shall be present during any of the test conditions. GM responsible engineer must determine acceptable noise levels in test.

4.3.4.3 Test results for stick-slip and subjective noise evaluation per GMW14264 are to be documented in the Tables A1 and A2 in Appendix A.

5 Data

5.1 Calculations. Not applicable.

5.2 Interpretation of Results. Not applicable.

5.3 Test Documentation. Report the test and inspection results on a data sheet contained within evaluation report.

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. Not applicable.

7.2 Acronyms, Abbreviations, and Symbols.

DFSS Design For Six Sigma

GSSLT Global Subsystem Leadership Team

RVDT Rotary Variable Differential Transducer

8 Coding System

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

Test to GMW16256

9 Release and Revisions

This standard was originated in July 2009. It was first approved by Global Chassis Team in January 2010. It was first published in January 2010.

Issue	Publication Date	Description (Organization)
1	JAN 2010	Initial publication.
2	JAN 2016	Revised to current template. (Chassis Suspension Global Subsystem Leadership Team (GSSLT))

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