



Prop Shaft Bending Evaluation Procedure

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. Define the process of determining the first prop (propeller) shaft bending frequency on vehicle. The product of this procedure will be a frequency value in Hertz (Hz).

1.2 Applicability. This test procedure is appropriate for use with all passenger cars and light trucks utilizing single or multi-piece prop shaft systems. This applies to rear-wheel drive, rear-wheel drive based all-wheel drive, and front-wheel drive based all-wheel drive vehicle architectures.

1.3 Remarks. The prop shaft bending frequency placement is important for good noise and vibration performance in rear-wheel and all-wheel drive vehicles. The prop shaft first bending modal frequency target should be above the engine firing frequency for most operating conditions.

2 References

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

2.1 External Standards/Specifications.

None

2.2 GM Standards/Specifications.

GMW14172 GMW14181

2.3 Additional References.

Subsystem Technical Specification (SSTS)

3 Resources

3.1 Facilities. A test room and/or drive on hoist to allow vehicle wheels to be carrying the full weight of the vehicle by design.

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.

- Data acquisition system (DAS)
- Accelerometer (weight less than 0.004 kg)
- Small or medium impact hammer with tip capable of providing uniform force input out to 800 Hz or hand held shaker and force transducer
- Transducer cabling
- Signal conditioning

See of GMW14181, Appendix A, Table A2 for transducer key characteristics

3.3 Test Vehicle/Test Piece. Validation must be performed on a full vehicle.

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3.4 Test Time.

Calendar time: 0.5 days

Test time: 2 hours

Coordination time: 2 hours

3.5 Test Required Information. Exhaust heat shields/exhaust systems may need to be removed to access the prop shaft.

3.6 Personnel/Skills. See GMW14181.

4 Procedure

4.1 Preparation. Place test piece into test room. Boundary conditions are in situ (see GMW14181).

4.2 Conditions.

4.2.1 Environmental Conditions. Test piece must be at room ambient temperature (see GMW14181).

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.

See GMW14181 for more detail.

4.3 Instructions.

4.3.1 Perform accelerometer calibration verification (see GMW14172).

4.3.2 Mount accelerometer on the top or bottom of the prop shaft nearest to the lateral and fore-aft centerlines with hot glue, or other appropriate material. Orientation will be in the vertical direction. For multi-piece prop shaft systems, perform this test on each prop shaft section.

4.3.3 Set up the DAS to acquire data up to 800 Hz minimum with a frequency resolution of 0.5 Hz or smaller.

4.3.4 Acquire, verify and store a driving-point frequency response function (FRF) in the vertical direction (see GMW14181).

5 Data

5.1 Calculations. Examine the driving-point FRF data and visually determine the frequency at which the first high amplitude peak occurs in the imaginary portion of the FRF. This is generally in the 100 Hz to 300 Hz range. Disregard peaks in the low frequency range below 100 Hz, as these usually indicate rigid body modes of the prop shaft and/or powertrain.

5.2 Interpretation of Results. Reference Prop shaft SSTS document for program specific prop shaft first bending modal frequency requirements.

5.3 Test Documentation. See GMW14181.

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.

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