



Propshaft Boot High Temperature/Altitude Vent and Ballooning 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. The purpose of this standard is to evaluate propshaft boots which function to contain propshaft joint lubricant. The boot should not rupture, abrade/wear or otherwise leak lubricant through the boot venting mechanism under elevated thermal and altitude conditions.

1.2 Applicability. This standard applies to passenger cars and light trucks.

1.3 Remarks. This test procedure is intended to simulate high underbody temperatures and high altitude conditions in order to induce worst case thermal load and atmospheric pressure, subsequent lubricant fluid expansion, loss of boot structural integrity and increased possibility of an expulsion event.

2 References

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

2.1 External Standards/Specifications.

None

2.2 GM Standards/Specifications.

GMW14555 GMW15824

2.3 Additional References.

CG2543 - Prop Boot Venting Data Table

CG2544 - Instrumentation Calibration

CG2545 - Prop Boot Venting Video Recordings File Names

Subsystem Technical Specification (SSTS)

3 Resources

3.1 Facilities. A dynamometer or fixture capable of spinning propshaft at desired speed (rpm) and torque while under elevated thermal and atmospheric conditions. Thermal/atmospheric chamber to be constructed around entire prop section (if multi-piece shaft).

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 Thermocouples to monitor temperature of test chamber.

3.2.2 Pressure transducers to monitor atmospheric pressure of test chamber.

3.2.3 Non-contacting sensors to monitor boot temperature, shape (ballooning) and presence of grease due to lubricant expulsion.

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Documents

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3.2.4 Video equipment to record dynamic boot shape at beginning, middle and end of planned test duration (cycle count).

3.3 Test Vehicle/Test Piece.

3.3.1 Three (3) complete propshaft assemblies (required for validation tests).

3.3.1.1 Venting method, construction and location should be verified as design intent prior to start of test, if test is developmental in nature, then each iteration, if different, shall be documented. If venting is accomplished in conjunction with a boot retaining clamp, special attention needs to be given to clamp installation and resulting effects on vent.

3.4 Test Time.

Calendar time: 5 days

Test hours: 24 hours

Coordination hours: 16 hours

3.5 Test Required Information. Not applicable.

3.6 Personnel/Skills. Driveline technician with experience using environmental chambers. Video measurement must be conducted by qualified technician/engineer to ensure accuracy of measurements.

4 Procedure

4.1 Preparation. Install propshaft on test stand in design position with regard to joint angle and at nominal stroke for plunging joints. Install thermal and atmospheric chamber around propshaft in order to simulate test conditions. Record calibrations on form CG2544 - Instrumentation Calibration.

4.2 Conditions.

4.2.1 Environmental Conditions. Determine maximum thermal environment of joint either through thermal analysis or physical testing during on road or Climatic Wind Tunnel (CWT) thermal audit testing. Powertrain thermal audit GMW14555 (or similar test) can be used to determine thermal environment of propshaft. Maximum elevation in combination with minimum expected atmospheric pressure shall be determined for each vehicle market. Minimum total pressure shall be used in testing. Subsystem Technical Specification (SSTS) may also state maximum elevation and minimum atmospheric pressure for a particular system.

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.

4.3.1 Static presoak installed propshaft for 60 minutes at desired test temperature. Atmospheric pressure can also be adjusted during this soak cycle. Record data on form CG2543 - Prop Boot Venting Data Table.

4.3.2 Start dynamometer and run propshaft at agreed upon propshaft speed and torque. Maximum actual operating propshaft speed can be calculated based on maximum vehicle speed, tire revolutions per kilometer (rpk) and final drive ratio.

4.3.2.1 Record with video equipment to document the shape of the boot during the following events. Propshaft shall be at test temperature and pressure. Recordings to take place at beginning, middle and end of planned cycle count. Linear measurement scale should be in view of recording equipment and adjacent to boot in order to judge amount of boot ballooning, if any. Record file names on form CG2545 - Prop Boot Venting Video Recordings File Names.

4.3.2.1.1 Quick run up from 0 rpm to maximum test rpm.

4.3.2.1.2 Constant maximum rpm video recording lasting 5 minutes.

4.3.2.1.3 Repeat 4.3.2.1.1 and 4.3.2.1.2.

4.3.3 Run each sample until one of the suspension criteria (4.3.3.1 thru 4.3.3.4) is met.

4.3.3.1 Boot rupture indicated by presence of lubricant outside of boot.

4.3.3.2 Lubricant expulsion via vent indicated by presence of lubricant outside of boot.

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