



Tire Material Cold Temperature Evaluation

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 test procedure is to describe a method to determine the cold cracking endurance of passenger and light truck tires under specified conditions.

This procedure describes the test equipment, test conditions, and test preparation requirements.

1.2 Applicability. Passenger and light truck tires.

1.3 Remarks.

1.3.1 European hard metric tire size designations are judged to be equivalent to Passenger (P)-metric size designations and vice versa for the purpose of this test.

1.3.2 Tire speed rating and tire type can be ignored for the purpose of this test.

1.3.3 Test methodology and laboratory equipment shall adhere to International Organization for Standardization (ISO) standards.

2 References

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

2.1 External Standards/Specifications.

ASTM D2137 ISO 812 ISO 23529

2.2 GM Standards/Specifications.

None

3 Resources

3.1 Facilities. Laboratory environment. Reference ASTM D2137 and/or ISO 812.

3.2 Equipment. Equipment includes but, not limited to:

3.2.1 Temperature indicator capable of covering the range of temperatures and accurate to ± 0.5 °C, bath or

3.2.1.1 Test chamber capable of holding heat-transfer medium to within ± 0.5 °C.

3.2.1.2 Heat-transfer medium liquid or gaseous, which remains fluid at the test temperature and which does not appreciably affect the material being tested.

Reference ASTM D2137 and/or ISO 812.

3.3 Test Vehicle/Test Piece. Reference ISO 23529 Rubber – General Procedures for preparing and conditioning test pieces for physical test methods.

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3.4 Test Time.

Calendar time:	0.5 days
Test hours:	1 hours
Coordination hours:	1 hours
Set Up hours	3 hours

3.5 Test Required Information. All test required information shall be provided by the test requestor.

3.6 Personnel/Skills. Personnel must comply with test laboratory regulations and certifications.

4 Procedure

4.1 Preparation. Internal developed procedure for determining glass transition temperature and brittleness of rubber is acceptable. Reference ISO 23529 Rubber - General Procedures for preparing and conditioning test pieces for physical test methods.

Reference ASTM D2137 and/or ISO 812 Rubber, vulcanized or thermoplastic – Determination of low-temperature brittleness.

4.1.1 Key Compounds.

- Shall include tread compound.
- May include inner liner, sidewall/white sidewall, or other compounds as appropriate.

4.1.2 Documentation shall be included for validation in the Engineering Source Approval (ESA) package in the form of an A to B comparison and include:

- Glass transition temperature (T_g) versus a reference compound(s).
- Brittleness versus a reference compound(s).

4.1.3 Reference compound must be:

- Used in a large volume Original Equipment (OE) or replacement tire.
- In production at least 3 years.
- Demonstrate acceptable field performance (e.g., less than or equal to 10 ppm cold weather returns).

4.2 Conditions.

4.2.1 Environmental Conditions. Laboratory ambient conditions.

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.

4.2.2.1 Bath or test chamber capable of holding heat-transfer medium temperatures to within ± 0.5 °C.

4.3 Instructions.

4.3.1 Tire designer must identify key compounds and shall include the tread rubber. Other compounds are left to the discretion of the designer.

4.3.2 A reference compound must be identified. See 4.1.3.

4.3.3 Samples are cut using ISO 23529 Rubber – General procedures for preparing and conditioning test pieces for physical test methods, and ISO 812 Rubber, vulcanized or thermoplastic – Determination of low-temperature brittleness or a similar internal developed method.

4.3.4 Glass transition temperature (T_g) and brittleness are measured on both the candidate sample as well as the reference sample.

4.3.5 A comparison is made either in the form of a difference, percentage or both difference and percentage.

4.3.6 Documentation shall be included for validation in the ESA package.

5 Data

5.1 Calculations. Percentage and/or difference.

5.1.1 Follow ISO 812 or equivalent.

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