



Brake Evaluation with Temporary-Use Spare Tire/Wheel Unit

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 the performance of the brake system when a temporary-use spare tire/wheel unit is installed on one corner of the vehicle.

1.2 Applicability. This procedure is applicable to those passenger cars, multipurpose vehicles, and light trucks equipped at manufacture with a temporary-use spare tire/wheel unit sized differently than the vehicle's standard road tire/wheel units.

1.3 Remarks. The test methods in this standard provide data sufficient to judge conformance to the following regulatory standards:

- United Nations UN R 64.01 Amendment 4 Annex 3
- United Nations UN R 13H
- Government of India AIS-110:2009, Amend 1
- Gulf Cooperation Council GSO 1052

This standard may require that a witness official be present at time of testing. Requesting engineer or test engineer is responsible for arrangements. This standard does not validate all requirements in the listed regulations. The listed regulations include requirements for tire design and production that must be validated by GM Tire and Wheel Engineering.

2 References

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

2.1 External Standards/Specifications.

AIS-110:2009	ASTM E1337 - 90	UN R 64.01	UN R 13H
ASTM E1136	GSO 1052		

2.2 GM Standards/Specifications.

GMW15102	GMW15112
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2.3 Additional References.

- Global Document Management (GDM) System (<https://documents.gm.com/gdm3/component/main>) (ID)
(ID)=This website is limited to internal access within General Motors and shall not be accessed outside this company. Contact the GM Lead Engineer for further information.

3 Resources

3.1 Facilities.

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.

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3.1.3 Vehicle Weighing Station. Scales should provide measurements of at least the weight at each axle. Ballast materials must be available.

3.1.4 Road Test Surface.

3.1.4.1 Pavement Friction. The specified road test surface shall produce a Peak Friction Coefficient (PFC) of at least 0.9 when measured using an ASTM E1136 standard reference test tire, in accordance with ASTM E1337 - 90, at a speed of 64.4 km/h, without water delivery. The actual test road should have the PFC measured at time of test. A PFC correction algorithm for stopping distance should be used when appropriate.

3.1.4.2 Gradient. The test surface shall have no more than a 1% gradient in the direction of testing and no more than a 2% gradient perpendicular to the direction of testing.

3.1.4.3 Lane Width. Road tests are conducted on a test lane 3.7 m wide.

3.2 Equipment.

3.2.1 The measurement of the following at time of test is required:

3.2.1.1 Vehicle odometer mileage.

3.2.1.2 Vehicle tire pressures.

3.2.1.3 Test site wind velocity.

3.2.2 Equipment to measure the PFC of the test road surface is required.

3.2.3 Data acquisition and recording equipment is required. The recommended sample rates are 10 Hz for all temperature channels and 100 Hz for all other channels.

3.2.4 The following information must be automatically recorded in phase continuously throughout each test run such that values of the variables can be cross-referenced in real time.

3.2.4.1 Service brake pedal force.

3.2.4.2 Booster vacuum or boost pressure.

3.2.4.3 Vehicle deceleration.

3.2.4.4 Vehicle speed, including means to "capture" speed at time of brake application.

3.2.4.5 Vehicle stopping distance.

3.2.4.6 Brake pad/lining temperatures.

3.2.4.7 Ambient air temperature.

3.2.4.8 (Optional) Brake line pressures.

3.2.4.9 (Optional) Service brake pedal travel.

3.2.4.10 (Optional) Wheel speeds.

3.2.5 All instrumentation shall be calibrated as required. List instrumentation details and calibration dates in the test record unless otherwise preserved by the test laboratory.

3.3 Test Vehicle/Test Piece.

3.3.1 In selection of the test vehicle consideration is to be given to the combination of axle ratio, type, and size of tires, type of wheels and wheel covers, engine, body type and front to rear weight distribution which is representative of the extreme characteristics of the vehicle family. The standard tire and wheel unit with the static loaded radius that provides the largest differential for the spare unit should be used if possible. Pretest analysis should be completed to select the appropriate vehicle for test.

3.3.2 A new tire is required for installation on the temporary-use spare unit. Other vehicle tires should be in new condition or in the condition at the end of a GMW15102 or GMW15112 test.

3.3.3 At the start of test, the brakes of the vehicle shall be in the same condition as when the vehicle is manufactured; or in newly burnished condition; or in the condition at the end of a GMW15102 or GMW15112 test. New brake parts may be required for the test vehicle build. Follow instructions in the test request.

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3.4 Test Time.

Calendar time: 1 day to 2 days
Test hours: 4 hours to 6 hours
Coordination hours: 4 hours to 6 hours

3.5 Test Required Information. This spare tire test may be run at the end of a GMW15102 or GMW15112 test, if these tests are part of the test plan for the vehicle. This sequencing will reduce the cost for testing resources. If witness testing is required, consult with the platform export representative for instructions on scheduling the witness test and the required brake and tire conditioning.

3.6 Personnel/Skills. An experienced, trained brake tester is required for performing the instructions in 4.1 through 4.3.

4 Procedure

4.1 Preparation.

4.1.1 Vehicle and brake system information should be recorded in the test record.

4.1.2 The test weights and weight distributions should be determined by pretest analysis that comprehends the complete range of vehicles using the test brake system and temporary-use spare unit to determine compliance.

4.1.3 If sufficient data is available to analyze the worst case weight distribution condition for brake stopping performance with the temporary-use spare unit mounted on an axle, the test matrix may be limited to testing only the worst case distribution. Otherwise, run the entire test matrix.

4.2 Conditions.

4.2.1 Environmental Conditions.

4.2.1.1 Ambient Temperature. The ambient temperature is any temperature between 0 °C and 38 °C.

4.2.1.2 Wind Speed. For wind speeds not greater than 5 m/s run stops in any direction. For wind speeds of 6 m/s to 9 m/s parallel to the road, run stops only with the wind direction. For crosswinds at speeds of 6 m/s to 9 m/s, run stops in either direction. Do not run if wind speed exceeds 9 m/s.

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 Ballast. Instrumentation and driver are considered part of the ballast.

4.2.2.2 Brake Temperature Measurement. The brake temperature is measured by plug-type thermocouples installed in the approximate center of the facing length and width of the most heavily loaded shoe or disc pad, one (1) per brake. For brake drum shoe, recess the thermocouple 1.02 mm (0.040 in) under the surface. For disc brake pad recess the thermocouple 2.04 mm (0.080 in) under the surface. A second thermocouple may be installed at the beginning of the test sequence if the lining wear is expected to reach a point causing the first thermocouple to contact the metal rubbing surface of a drum or rotor. For center-grooved shoes or pads, thermocouples are installed within 3 mm (0.12 in) to 6 mm (0.24 in) of the groove and as close to the center as possible.

4.2.2.3 Initial Brake Temperature (IBT). The IBT is to be ≥ 65 °C and ≤ 100 °C. If the lower limit of the specified IBT for the first stop has not been reached, the brakes are heated to the IBT by making one (1) or more brake applications from a speed of 50 km/h, at a deceleration rate not ≥ 3 m/s².

4.2.2.4 Instruction for Stops in Neutral. For tests in neutral, a stop or snub is made in accordance with the following procedures:

4.2.2.4.1 Exceed the test speed by 6 km/h to 12 km/h;

4.2.2.4.2 Close the throttle and coast in gear to approximately 3 km/h above the test speed;

4.2.2.4.3 Shift to neutral; and;

4.2.2.4.4 When the test speed is reached, apply the brakes.

4.2.2.5 Stopping Distance. Braking performance is determined by measuring the stopping distance from a given initial vehicle speed. Where more than one (1) stop is required for a given set of test conditions, a vehicle

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