Tire Rim Slip 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 determine the propensity of a tire/wheel assembly to have rim slip during normal and severe driving maneuvers.

This document describes the test equipment and methodology involved in testing a vehicle for rim slip.

1.2 Applicability. This standard is applicable for all vehicles and their respective tire-wheel assemblies.

1.3 Remarks. Rim slip is a phenomenon that occurs with certain tire/wheel combinations and is difficult to predict. Rim slip contributes to assembly imbalance and ultimately customer satisfaction level.

2 References

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

2.1 External Standards/Specifications.

None

2.2 GM Standards/Specifications.

GMW16590

2.3 Additional References.

Rubber Manufacturers Association (RMA), Washington, DC, (www.rma.org)

3 Resources

3.1 Facilities. Asphalt or concrete test surface greater than 46 m (150 ft) in length, where vehicle stops and accelerations are allowed.

3.2 Equipment.

3.2.1 Paint marker.

3.2.2 Rubber bands.

3.2.3 Duct tape.

3.2.4 Metric tape measure.

3.3 Test Vehicle/Test Piece.

3.3.1 A representative vehicle ballasted appropriately. In most cases, driver only ballast is acceptable.

3.3.2 Clean wheels representative of production intent components with respect to dimensions and surface finish.

3.3.3 Tires must be new with clean bead seat areas representative of production intent components with respect to dimensions, bead compression, and compounds in the bead seat area. Used wheels are acceptable as long as they are cleaned prior to testing.

3.3.3.1 Previous tire mountings can add uncertainty to test results since the tire history is uncertain.

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3.4 Test Time. Total test time can vary depending on the source of the test pieces and vehicle. The following estimates assume a test environment where the test pieces must be assembled from individual components.

Calendar time:	1 day
Test time:	6 hours
Coordination time:	2 hours

3.5 Test Required Information. Not applicable.

3.6 Personnel/Skills.

3.6.1 Personnel must possess any driver training required by the test facility.

3.6.2 Personnel mounting the tires must be trained in proper mounting procedures and recommended practices such as those from the Rubber Manufacturers Association (RMA).

4 Procedure

4.1 Preparation. If test is done on vehicle directly off assembly line, proceed to 4.1.10.

4.1.1 Pre-existing lubricant may affect the test results. Thoroughly clean any part of the rim that may come in contact with the tire with soap and water.

4.1.2 Insure all parts are dry prior to assembly.

4.1.3 Mount tires using acceptable mounting procedures.

4.1.3.1 Use only a thin film of lubricant. Excess lubricant will influence test results.

4.1.3.2 Use consistent amounts of lubricant.

4.1.3.3 Record notes about the amount of lubricant applied, type of lubricant, and method of application. Be specific and note all observations.

4.1.4 Record the bead seating pressure for each assembly.

4.1.5 Record any difficulties encountered in the mounting process.

4.1.6 Set inflation pressures as indicated on the vehicle placard.

4.1.7 Record the time at which the assemblies were mounted.

4.1.8 Install assemblies on vehicle.

4.1.9 Check inflation pressures with vehicle on the ground. Reset if necessary.

4.1.10 Final Preparations.

4.1.10.1 Mark the tire and wheel near the valve stem using the paint pen to establish a zero (0) reference position. It may be necessary to mark both the inboard and outboard sidewalls.

4.1.10.2 Be very precise when aligning the marks on the tire and wheel as the distance between these two (2) marks will be measured later.

4.1.10.3 A rubber band may also be necessary to check for revolutions of the tire on the wheel. Tape a rubber band on the tire at one (1) end, and then to the wheel with the other without any twists. Counting the number of twists later will enable measurement of the number of revolutions the tire has made on the wheel. This is only required in the case where more than one (1) revolution is possible.

4.1.10.4 Let tire/wheel assemblies dry for a minimum of 2 h and a maximum of 3 h prior to testing.

4.2 Conditions.

4.2.1 Environmental Conditions. Test roads must be dry.

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 Driving to the Test Area.

4.3.1.1 Record the time when departing the preparation site.

4.3.1.2 Drive vehicle very cautiously to the test area using very slight braking and acceleration to avoid any potential rim slippage prior to test.

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4.3.1.3 Upon arrival at the test area, stop the vehicle in a safe area, again using very slight braking.

4.3.1.4 Measure and record any rim slip. Measure the rim slip distance in millimeters following the curvature of the rim flange from the original position. The sign convention for the measurement is disregarded as test involves only braking.

4.3.1.4.1 The allowed maximum value for rim slip upon arrival to test area is 4 mm.

4.3.1.4.2 If more than 4 mm of rim slip has occurred, abort the test and start over with cleaning the tires and wheels as noted in 4.1.1.

4.3.1.4.3 If rim slip has occurred and it is less than 4 mm, remark the tire/wheel assembly as done previously in 4.1.10.1 so the rim slip is zero (0) to begin the test.

4.3.1.5 Record any irregularities in the travel from the garage/plant to the test area (e.g., abrupt stop occurred).

4.3.2 Perform Panic Brake Stops.

4.3.2.1 Record the time when the first run of five (5) is started.

4.3.2.2 Accelerate with light throttle input to 32 km/h (20 mph) in more than 5 s. If the acceleration time is less than 5 s, check the markings on the tire/wheel assemblies, marking again if necessary.

4.3.2.3 When 32 km/h (20 mph) is attained, with your foot approximately 75 mm (3 in) above the brake pedal, step down abruptly on the brake pedal to initiate a panic stop and come to a complete stop. Anti-lock Braking System (ABS) activation is acceptable and expected if the vehicle is so equipped**.**

4.3.2.4 Repeat the light acceleration followed by a panic stop four (4) additional times for a total of five (5) stops.

4.3.2.5 Measure the rim slip distance in millimeters, following the curvature of the rim flange from the original position.

4.3.2.6 Record rim slip results, and include pictures of the rim-slip assembly of each corners as shown in Figure 1.

Figure 1. Rim Slip Measurement

4.3.2.7 Repeat the above panic stop sequence one (1) additional time for a total of ten (10) stops and two (2) measurements. The two (2) recorded measurements are after the fifth stop and tenth stop.

5 Data

5.1 Calculations. Not applicable.

5.2 Interpretation of Results. Using the data sheet, compare total rim slip after the ten (10) panic brake stops to the maximum allowable value of 8 mm. If value exceeds 8 mm, then the tire/wheel assembly may not achieve the desired balance performance in production.

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5.3 Test Documentation. The test results documentation should include the following:

- Test results report
- Test result data files (Extensible Markup Language (XML) format)
- Completed datasheet(s)

A sample in Appendix A, Data Sheet A1 is given as well as a sample in Appendix B, Data Sheet B1.

Note: For data being loaded into the Global Tire-Wheel Test System (GTWTS), submit electronically the test results data files (XML format) and other supporting files listed. GMW16590 defines the electronic file details (e.g., file types, file naming convention, and detailed file formats) for the GTWTS.

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.

In general, a risk assessment needs to be performed for every driving instruction prior to executing this standard. (**Note:** National law needs to be considered while performing a risk assessment.) The required rating of risk by exposure probability and possible violation will be done in a separate document. Every identified risk must be named inside the risk assessment for the relevant driving instruction in order to announce that risk to employees. Within the risk assessment, the vehicle equipment and different vehicle build stages have to be considered. After performing a risk assessment, non-acceptable risk needs to be mitigated by appropriate countermeasures. Here technical measures are preferred because these are independent from attendant circumstances. In case technical measures are not appropriate, organizational and/or personal measures will apply. This includes training, wearing of Personal Protection Equipment, or arrangement of idle time.

6.1 Safety Precautions.

6.1.1 Instrumentation and other test equipment must be securely mounted in accordance with proving grounds traffic safety guidelines for mounting and usage of in-vehicle instrumentation.

6.1.2 All running lights and vehicle safety features must be operational according to proving grounds rules for running lights and power windows. Exterior lights must not be obscured by styling add-ons, covers or camouflage packages. The horn may be disabled because of steer angle transducer installation.

6.1.3 A helmet is required in accordance with the regulations of the test facility. The vehicle should never be operated in a manner where the vehicle leaves the roadway or goes onto the shoulder for any reason.

6.1.4 Check for proper attachment of the steering wheel to the gear via the intermediate shaft. If it feels loose or abnormal, do not run the test until the parts are properly assembled according to the intended design.

6.1.5 Check to be certain that all wheel lugs are present and have the specified torque. Loose or missing wheel fasteners are to be replaced, installed or tightened before the test may begin.

6.1.6 The driver's seatbelt must be worn at all times during the test. Passengers accompanying the test operator must also be safely belted in the vehicle, preferably in the right rear seat.

Note: Passengers are allowed for observation or training purposes.

6.1.7 If a crossbar is used to hold the steering wheel angle transducer base plate, the passenger side airbag is to be disabled or disconnected.

6.2 Test Specific Safety Precautions.

6.2.1 During the on-vehicle testing, be sure to have significant run off area in all directions.

6.2.2 Be prepared for brake pull to one (1) side or the other as uneven braking forces may exist if rim slip occurs only on one (1) side of the vehicle.

6.2.3 If mounting tires with very little lubrication or dry mounting, be cautious of the pressure required for bead seating. Do not exceed manufacturer recommended maximum bead seating pressure without proper caging of the tire/wheel assembly.

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