



## Wheel Pilot Hole Strength 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 test is to measure the capability of wheel pilot holes to resist enlargement during vehicle assembly plant processing, garage type servicing, and normal vehicle use within the North American market road system.

**1.2 Applicability.** This test procedure is applicable for steel wheels intended for normal highway use and temporary use for passenger car vehicles, light duty trucks including dual wheel usages or multipurpose vehicles.

### 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.

GM Wheel Drawing(s)

### 3 Resources

**3.1 Facilities.** Roofed facility that ensures equipment does not deteriorate between calibration events.

#### 3.2 Equipment.

**3.2.1** Load frame test machine and console.

**3.2.2** Load application equipment as shown in Appendix C, Figures C1 and C2 or equivalent.

**3.2.3** Assorted plug gages as shown in Appendix C, Figure C3 or equivalent.

**3.3 Test Vehicle/Test Piece.** The finished wheels shall include all primer, topcoat, clear coat and/or plating normally applied, less any additional finishing provided by GM.

#### 3.4 Test Time.

Calendar time: 1 day

Test time: 6 hours

Coordination time: 1 hour

**3.5 Test Required Information.** Test parameters, per GM Wheel Drawing(s) or as stated by the requestor.

**3.6 Personnel/Skills.** Test operator shall be qualified based on appropriate education, training, experience, and/or demonstrated skills.

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## 4 Procedure

### 4.1 Preparation.

#### 4.1.1 Calibration.

**4.1.1.1** The load and deflection calibration ranges shall be of sufficient size to encompass all situations during testing.

**Note:** All load cells and displacement transducers used to calibrate the equipment shall be traceable to the National Institute of Standards and Technology (NIST) or equivalent.

**4.1.1.2** Load and deflection calibration accuracy shall be within  $\pm 2\%$ .

**4.1.1.3** Plug gauges and or coordinate measuring machines shall be calibrated within  $\pm 0.0025$  mm ( $\pm 0.0001$  in).

**4.1.1.4** Calibration frequency shall be every 5 years for plug gauge and at least yearly for all other machines and transducers.

### 4.2 Conditions.

**4.2.1 Environmental Conditions.** Room temperature:  $24\text{ }^{\circ}\text{C} \pm 14\text{ }^{\circ}\text{C}$  ( $75\text{ }^{\circ}\text{F} \pm 25\text{ }^{\circ}\text{F}$ ).

**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** Install pilot hole test fixturing on load frame base (not shown).

**4.3.2** Select proper expanding pilot hole collet for the wheel design being evaluated. Refer to Appendix B, Figure B1.

**4.3.3** Measure and record on the Appendix A, Data Sheet A1 the initial pilot diameter with pilot hole plug gauge or coordinate measuring machine. Refer to Appendix C, Figure C4.

**4.3.4** Install wheel onto collet and collet mandrel. Refer to Appendix C, Figure C2.

**4.3.5** Locate loading cylinder onto collet. Refer to Appendix C, Figure C2.

**Note:** Test wheel was removed to improve clarity.

**4.3.6** Slowly lower load frame aligning the loading ring with the loading cylinder assembly. Use of a ball bearing (not shown) as an aid to transfer the load from the load frame test machine, to the loading cylinder is recommended.

**4.3.7** Apply the load to the wheel disc.

**4.3.7.1** Typical computer set up.

**4.3.7.1.1** Set up typical computer control parameters, refer to Table 1.

**Table 1: Typical Computer Setup**

| Computer Setup  | Description                          | Scaling Values |
|-----------------|--------------------------------------|----------------|
| Deflection      | Zero until load                      | Not applicable |
| Dimension Units | Units to use when entering dimension | mm             |
| Load            | End Value                            | 10 kN          |
| Rate            | Platen rate                          | 0.25 mm/s      |
| X Axis          | Position                             | 20 mm          |
| Y Axis          | Load                                 | 20 kN          |

**4.3.8** After the specified load value stated on the test request has been reached, unload the machine.

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**4.3.9** Remove load.

**4.3.10** Plot load deflection curve for given load value. Refer to Appendix B, Figure B1, for sample plot at 10 kN load.

**4.3.11** Remove wheel, then measure and record on the Appendix A, Data Sheet A1 the final pilot hole diameter with pilot hole plug gauge or coordinate measuring machine. Refer to Appendix C, Figure C4.

**4.3.12** Repeat 4.3.1 through 4.3.11 for additional samples or load values as requested on the test request.

## 5 Data

**5.1 Calculations.** Not applicable.

**5.2 Interpretation of Results.** The wheel pilot hole as supplied shall not be enlarged more than 0.0254 mm (0.001 in) when tested to a 10 kN load.

**5.3 Test Documentation.** The test results documentation should include:

- Test results report.
- Completed test data sheets.
- Plots, example is shown in Appendix B.
- Photographs.

Sample data sheets are given in Appendix A, Data Sheets A1 and A2.

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

## 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.

## 7 Notes

**7.1 Glossary.** Not applicable.

**7.2 Acronyms, Abbreviations, and Symbols.**

|              |                                                |
|--------------|------------------------------------------------|
| <b>GAMR</b>  | Gross Axle Mass Rating                         |
| <b>GSSLT</b> | Global Subsystem Leadership Team               |
| <b>GTWTS</b> | Global Tire-Wheel Test System                  |
| <b>GVMR</b>  | Gross Vehicle Mass Rating                      |
| <b>NIST</b>  | National Institute of Standards and Technology |
| <b>XML</b>   | Extensible Markup Language                     |

## 8 Coding System

This standard shall be referenced in other documents, drawings, etc., as follows:

Test to GMW15303

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## 9 Release and Revisions

This standard was originated in April 2006. It was first approved by the Tire Global Subsystem Leadership team in November 2006. It was first published in December 2006.

| Issue | Publication Date | Description (Organization)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-------|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1     | DEC 2006         | Initial publication.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 2     | MAY 2007         | 1.1 removed note, 2.3 added reference, 3.3 changed verbiage and 5.2 changed to 0.001 in. (Tire Global Subsystem Leadership Team)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 3     | NOV 2012         | Revise to current template. 1.3 Was: This test procedure is applicable for steel wheels for passenger vehicles and light duty trucks with Gross Axle Mass Rating (GAMR) or Gross Vehicle Mass Rating (GVMR) of 4536 kg (10 000 lb), or less. 2.2 Was: None. 4.2.1 Was: 22 °C ± 5 °C (72 °F ± 9 °F). 4.3.1 Added: Appendix B. 4.3.2 Added: Appendix B. 4.3.5 Was: Figure B2, Removed: photo and parenthesis. 4.3.6 Note: Was: Figure B2. 4.3.7.1 Added. 4.3.7.1.1 Added. Table 1: Added. 4.3.11 Added: Appendix B. Removed: 4.4 Test Completion. Removed: 4.4.1 After testing is complete, turn off load frame and power down all electronic equipment. Removed: 4.4.2 Remove and store all test fixturing. 5.3 Was: Record all test information on the data sheet. Refer to Appendix A. Replace Appendix A with test system generated test data sheets. Added: Appendix D. Appendix B pictures were updated for clarity. (Tire and Wheel GSSLT) |
| 4     | DEC 2017         | Revised to current template. (Chassis Tire and Wheel Global Subsystem Leadership Team (GSSLT))                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

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