



Electronic Stability Control (ESC) System Performance with Flat Tire

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 GMW is to verify that the Electronic Stability Control (ESC) system performs properly when a flat tire is detected. In addition, the ESC system must perform properly when the vehicle is equipped with run flat tires. Finally, the ESC system's flat tire compensation must not function on vehicles not equipped with run flat tires.

1.2 Applicability. This standard is applicable for vehicles with ESC.

1.3 Remarks. Not applicable.

2 References

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

2.1 External Standards/Specifications.

FMVSS 135

2.2 GM Standards/Specifications.

None

2.3 Additional References.

- CG4274, ESC Flat Tire Functional Checkout
- Vehicle Technical Specification (VTS), ESC-specific

3 Resources

3.1 Facilities. Dry asphalt test surfaces are located on Vehicle Dynamics Test Area (VDTA) or equivalent.

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. As this procedure is primarily designed to subjectively assess vehicle performance while executing maneuvers with a deflated tire, the following instrumentation may be necessary:

3.2.1 Data Acquisition System (DAS) capable of collecting data channels at 100 Hz sample rate.

3.2.2 Longitudinal velocity sensor.

3.2.3 Longitudinal accelerometer at vehicle's center of gravity ($\pm 1.25g$).

3.2.4 Lateral accelerometer at vehicle's center of gravity ($\pm 1.25g$).

3.2.5 Instrumented steering wheel with steering wheel angle sensor.

3.2.6 Side slip angle sensor.

3.2.7 Roll sensor.

3.2.8 Yaw velocity sensor.

3.2.9 Brake pressure sensors located at each corner and at the master cylinder.

3.2.10 Brake pad temperature thermocouples at each corner (66 °C to 93 °C).

3.3 Test Vehicle/Test Piece. This test procedure applies to any two (2) axle, pneumatic rubber tired vehicle at all load conditions.

3.4 Test Time.

Calendar time: 1 day

Test time: 2 hours

Coordination time: 3 hours

3.5 Test Required Information. Possible sources are:

- ESC-specific VTS
- Applicable regional regulation

3.6 Personnel/Skills. Experienced chassis test technician for vehicle instrumentation. Vehicle program chassis controls engineer to conduct test.

4 Procedure

4.1 Preparation.

4.1.1 Build or verify the test vehicle brake apply system. Record vehicle and brake system information in the test record (see Appendix A, Data Sheet A1). The vehicle to be tested must be in safe operating condition for maneuvering levels approaching the limit of vehicle performance. Condition of tire, brake and suspension components should be inspected carefully. All vehicle safety equipment must be in proper operating condition.

4.1.2 Information about the vehicle and the brake system should be stored with the test data.

4.1.3 Perform burnish snubs in accordance with FMVSS 135 test specifications or equivalent. Install new tires before burnishing.

4.1.4 Install instrumentation. All instrumentation must be securely fastened to the vehicle due to the nature of test maneuver. Instrumentation should be located on the passenger seat. See 3.2 for sensor and DAS requirements. Verify that all instrumentation is functioning properly. Calibrate instrumentation as necessary.

4.1.5 Ballast the vehicle to curb weight, meaning the mass of the vehicle in running order including fuel, fluids, driver plus 75 kg for measuring equipment.

4.1.6 Inflate tires to manufacturer's recommended pressure or per test engineer's instructions.

4.2 Conditions.

4.2.1 Environmental Conditions. Wind speed should be less than 16 km/h.

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 Dry asphalt test surfaces are required.

4.2.2.2 Loading condition is curb weight, meaning the mass of the vehicle in running order including fuel, fluids, driver plus 75 kg for measuring equipment.

4.3 Instructions. Follow the instructions and record vehicle reactions according to CG4274.

5 Data

5.1 Calculations. Not applicable.

5.2 Interpretation of Results. Results of vehicle reactions from testing and any comments are recorded in CG4274.

5.3 Test Documentation. The vehicle information, test information and test results shall be published following GM corporate protocol using the Evaluation Report template and the approved engineering document management system/repository.