



Steering Wheel Rim Roll Flex Durability

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. To evaluate the fatigue durability of the steering wheel structure.

1.2 Applicability. Steering wheels used in passenger cars, Multipurpose Passenger Vehicles (MPV), and trucks.

2 References

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

2.1 External Standards/Specifications.

None

2.2 GM Standards/Specifications.

None

2.3 Additional References. None

3 Resources

3.1 Facilities. Not applicable.

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.

3.2.1 A 360 degree fatigue test machine, as shown in Appendix A, Figure A1, which is able to:

- Rotate the steering wheel at a rate of $30 \text{ min}^{-1} \pm 2 \text{ min}^{-1}$ (30 rpm $\pm$ 2 rpm).
- Apply a load to the steering wheel without sudden impact.
- Apply the loads ranging from $310 \text{ N} \pm 10 \text{ N}$ to the rim on the steering wheel perpendicular to the axis of rotation.
- Apply the loads to the steering wheel through $150 \text{ mm} \pm 5 \text{ mm}$ diameter by $50 \text{ mm} \pm 5 \text{ mm}$ wide roller. The roller is to be mounted to allow free rotation upon contact with the steering wheel.
- Accommodate steering wheels of various rim diameters and depth sizes.
- Mount the steering wheel to the machine on a simulated steering shaft.
- Count the number of steering wheel rotations.
- Microswitch attached to load arm in order to stop rotations if surpass the 25 mm deflection limit.

Note: All instrumentation is to be calibrated as required; record instrumentation details and date of calibration on Data Sheet A1 in Appendix A, unless the information is otherwise preserved in the testing laboratory records.

3.2.2 Test Article. Steering Wheel Assemblies – all variants with airbags, if applicable.

3.3 Test Vehicle/Test Piece. Not applicable.

3.4 Test Time.

Calendar time: 7 days

Test time: 9 h

Coordination time: 24 h

3.5 Test Required Information. Not applicable.

3.6 Personnel/Skills. Not applicable.

4 Procedure

4.1 Preparation.

4.1.1 Mount the steering wheel assembly to the simulated steering shaft of the fatigue test machine using a torque specified by requesting engineer and noted in Data Sheet A2 (see Appendix A).

4.1.2 Align the load applying roller of the test machine with the rim of the steering wheel in such a way that the load is applied parallel to the axis of the steering wheel.

4.1.3 Adjust the test machine weights to deliver $310 \text{ N} \pm 10 \text{ N}$ at the steering wheel rim.

4.1.4 Adjust microswitch to stop rotation if beyond the 25 mm maximum deflection.

4.2 Conditions.

4.2.1 Environmental Conditions. Not applicable.

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 Operate the system at $30 \text{ min}^{-1} \pm 2 \text{ min}^{-1}$ ($30 \text{ rpm} \pm 2 \text{ rpm}$).

4.3.2 Check the steering wheel after 15 001 revolutions and record steering wheel condition.

4.3.2.1 Remove foam from spoke to rim junction to examine structure.

4.3.3. Evaluation. The steering wheel assembly shall complete a minimum of 15 000 cycles, when the applied load is 310 N, with no visible evidence of fatigue separation.

5 Data

5.1 Calculations. Not applicable.

5.2 Interpretation of Results. Not applicable.

5.3 Test Documentation. Record pertinent test results on data sheets (see Appendix A).

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.

Steering Wheel Armature/Frame: The metal support structure of a steering wheel.

Steering Wheel Assembly Variants: The complete steering wheel with different rim trims or levels (polyurethane, leather, sport, or premium).

Steering Wheel Molding Assembly: The primary molded component of the steering wheel.

7.2 Acronyms, Abbreviations, and Symbols.

MPV Multipurpose Passenger Vehicles