



Ball Stud Static Strength

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 determine the static strength of ball joint studs.

1.2 Applicability. This procedure will apply to all passenger car and light truck suspension designs using ball joint assemblies.

1.3 Remarks. Not applicable.

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.

Not applicable.

3 Resources

3.1 Facilities. The facility must be of adequate size to house the test equipment.

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 Test machine capable of applying forces to a maximum of 60 000 N (13 500 lb).

3.2.2 The stud end shall be retained with a support fixture which simulates the interface to the mating part in vehicle application. This includes proper distance from the ball center to the support fixture. The support fixture can be made from a donor knuckle or tool steel such as **O1** oil hardening tool steel quenched and tempered to HRc 57 to HRc 62 or equivalent. See Appendix A, Figures A1 and A2.

3.2.3 Plotter to record a load vs. deflection curve. See Appendix B, Figure B1.

3.3 Test Vehicle/Test Piece. Not applicable.

3.4 Test Time. Not applicable.

3.5 Test Required Information. Not applicable.

3.6 Personnel/Skills. The test technician should be familiar with the test machine and the instrumentation required to obtain test data.

3.7 Development/Validation Items.

3.7.1 Ball studs must conform to the drawings and details provided by GM Engineering.

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Documents

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3.7.2 Sample material must be manufactured from production tooling. Deviation requires approval from the design responsible engineer.

Note: All instrumentation is to be calibrated as required, record instrumentation details and date of calibration using Appendix C: Sample Data Sheet.

4 Procedure

4.1 Preparation.

4.1.1 Prepare the test machine to apply the load at a rate of 25 mm (1 in) per minute.

4.1.2 The fixture, which holds the ball stud, must provide clearance to allow deflection (bending) of the stud to occur.

4.1.3 Prepare a plotting device to record a load vs. deflection curve.

4.2 Conditions.

4.2.1 Environmental Conditions. Test to be performed in ambient ($20\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$) temperature.

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. Not applicable.

4.4 Procedure.

4.4.1 Install ball stud in test fixture. The retention method should simulate the vehicle application.

4.4.2. Start application of load at the rate prescribed in 4.1.1.

4.4.3 Continue force application until yielding occurs and the force is significantly reduced.

4.4.4. Identify the Minimum Yield Load on the deflection curve plot.

4.4.5 Repeat 4.4.1 thru 4.4.4 for a total of six (6) samples.

5 Data

5.1 Calculations. Upon test completion, calculate the minimum load to yield prediction at R99C50.

5.2 Interpretation of Results. Recommended minimum yield strength is 120% of maximum vehicle loading or as specified by the responsible GM engineer.

5.3 Test Documentation. Test report to include a completed load vs. displacement curve as shown in Appendix B, Figure B1 and data chart shown in Appendix B, Figure B2. Report the test and inspection results on a data sheet, see Appendix C: Sample Data Sheet including photographs of the post-test studs, see Appendix B, Figure B3.

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.

7 Notes

7.1 Glossary.

R99C50: Reliability 99% Confidence 50% statistical probability calculation

7.2 Acronyms, Abbreviations, and Symbols.

HRc (Rockwell) Hardness Rating, "C" scale

8 Coding System

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

Test to GMW15160

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9 Release and Revisions

This standard was originated in February 2006. It was first approved by the Global Chassis Suspension Team in April 2009. It was first published in May 2009.

Issue	Publication Date	Description (Organization)
1	MAY 2009	Initial publication.
2	SEP 2014	Revised to current template. (Chassis Suspension Global Subsystem Leadership Team)

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