GM WORLDWIDE ENGINEERING STANDARDS	Test Procedure	GMW17214

Axle Assembly Ultimate Strength Torsion 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 determine the maximum torque an axle assembly can withstand before fracturing and noting the mode of failure.

1.2 Applicability. This procedure is applicable to beam axles, front and rear drive modules, and power transfer units.

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.

- Component Technical Specification (CTS)
- Statement of Requirements (SOR)
- Subsystem Technical Specification (SSTS) (for Axle or Rear Drive Module)
- Validation Cross Reference Index (VCRI)

3 Resources

3.1 Facilities. The test facility shall have a valid International Organization for Standardization (ISO) certificate which is noted in the test report.

A bedplate large enough for securing the test rig and capable of withstanding dynamic loading of the rig/specimen is required.

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 hydraulic power system and test machine that is compatible with the strength of the components being tested. Since the test will be carried out using load control mode, the testing machine must have servo-hydraulic load-monitoring system mounted in series with specimen. The load and displacement must be monitored continuously until the failure occurs.

3.2.2 A low speed rotatory actuator is required to run this test. The actuator must be capable of operating at speeds less than or equal to 0.3 rpm and generating sufficient torque to fracture an axle. Speed must be controlled to within 0.05 rpm.

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3.2.3 Torque meters must be used in line with the rotary actuator to record torque and have sufficient capacity for the torque expected to fracture the test axle. A device such as a tone wheel should be used to record speed and displacement.

3.3 Test Vehicle/Test Piece. It is recommended that a minimum of two (2) samples be used in this testing. One (1) sample tested in the forward load direction, one (1) sample in the reverse loading direction. Ideally, three (3) samples would be used for each load condition and the results averaged.

3.4 Test Time.

Calendar time:	3 days
Test hours:	4 hours (each piece)
Coordination hours:	8 hours

3.5 Test Required Information. Possible sources are:

- Statement of Requirements (SOR)
- Subsystem Technical Specification (SSTS)
- Validation Cross Reference Index (VCRI)

3.6 Personnel/Skills. Test Technician. Should be proficient in proper selection and operation of the equipment listed in 3.2.

4 Procedure

4.1 Preparation. Fixturing should be designed and made to mount the test specimen to a bedplate. The axle shaft outputs must be held stationary with fixturing. An input adapter must be fabricated to connect the pinion flange to the input actuator.

4.1.1 All samples shall be inspected for geometrical conformance with the appropriate specimen drawing (and weld specification, if applicable). Any non-compliant specimens must be set aside and a compliant specimen be tested in its place.

4.1.2 Check that all parts and fixtures needed are included for the mounting.

4.1.3 Paint critical areas with an appropriate color (e.g., white) to make it easier to find cracks.

4.1.4 Test Stand Review. The test setup and methodology must be reviewed with the GM System Validation Engineer (SVE). The GM SVE may request review by the Design Release Engineer (DRE) and/or the Bill of Material Family Owner (BFO). Photographs and/or computer aided design images of the test must be provided.

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. Mount the test part in the fixturing so that the outputs will not rotate and the input is connected to the actuator. Rotate the actuator at a speed of 0.3 rpm. Continue to rotate the input at increasing torque until loss of load carry ability by the test part. Record input displacement, input torque, input speed, and time.

4.3.1 Unless otherwise specified, the GM SVE is to approve test setup.

4.3.2 Take photograph or digital image of test configuration.

4.3.3 New test samples shall be used. For product validation testing off-tool parts are mandatory. For design validation testing prototype parts may be used.

4.3.4 The test sample orientation on the test bench shall be the same as within the vehicle. Any deviation needs to be approved by the GM SVE and/or the DRE.

4.3.5 Test shall be controlled and monitored by a computer program. Load, displacement and cycles of the specimen shall be monitored through entire test until failure.

4.3.6 Failure mode is to be recorded and failure location shall be identified for each test specimen. Pictures shall be taken for typical failure modes and any anomalous failures documented and photographed.

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