



Assist Step Loading and Durability Deflection Test - Subsystem Level

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 assist step stiffness, deflection and durability under load as mounted on a test fixture. In addition, this procedure is to validate the plastic step pad and trim cover for cracking or detachment.

1.2 Applicability. This test applies to static and articulating assist steps that provide improved vehicle ingress/egress.

1.3 Remarks. This test procedure describes a method to fixture, load, measure and document assist step deflection in the vertical direction, by pneumatic or hydraulic equipment.

2 References

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

2.1 External Standards/Specifications.

None

2.2 GM Standards/Specifications.

GMW14264

2.3 Additional References.

- CG583 Development/Validation Test and Vehicle Review
- Subsystem Technical Specifications (SSTS)
- Unigraphics (UG) File ANH43163.

3 Resources

3.1 Facilities. Test the assist step in an area with sufficient space for the test property, apparatus, and equipment. Testing required at each environment. Conditions differing from this should be noted in the test report.

Property Mounting: Mount the test property to the fixture securely to minimize deflection of non-critical components. Use production fasteners and nominal torque.

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 Load Transducer. A load transducer to measure and document the load applied to the step. The total load cell capacity must be at least 2700 N for assist steps capable of supporting two passengers (e.g., more than one door per side) or the wheel-to-wheel extreme rear load case.

3.2.2 Load Actuator. A load actuator with pivots to apply controlled force to the assist step. The contact area of the load to step surface shall be 150 mm (cross car) × 100 mm (front to rear) and constructed of a rigid material

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suitable to transfer the load. The load pad connection to the load actuator must be a flexible connection, as shown in Figure A2 in Appendix A.

3.2.3 Displacement Measurement. Measurement devices to measure the deflection distance of the assist step to the nearest 0.1 mm. Range (stroke) of measurement device is to be at least 50 mm.

3.2.4 Test Fixture Requirements. Supplier testing requires a rigid fixture that is portable for environmental exposures as shown in Figure 1. Fixture must accommodate any plastic trim pieces. Use the following requirements for the test fixture:

Component Level Fixture Requirements:

- Shall be capable of testing 2 sets (Left Hand and Right Hand) of assist steps so a total of four steps can be tested at the same time, see Figure 1. This reduces test time.
- Must accommodate all assist step design features (brackets/cover/plastic trim pieces) and provide mounting locations for all vehicle attachment points, including plastic trim.
- Fixture design shall use either a pneumatic or hydraulic cylinders with individual load control to apply load.
- Mounting surfaces for loading device(s) shall be rigid and not deflect more than 12 mm in vertical direction when any/all loads are applied.
- Mounting surfaces for step brackets shall be rigid and not deflect or permanently deform more than vehicle body. Use CAE to evaluate this deformation.
- Mounting surfaces for assist step attachment points shall be flat and within ± 0.5 mm in surface profile.
- Mounting holes for attachment points shall be ± 0.25 mm from nominal size and location.

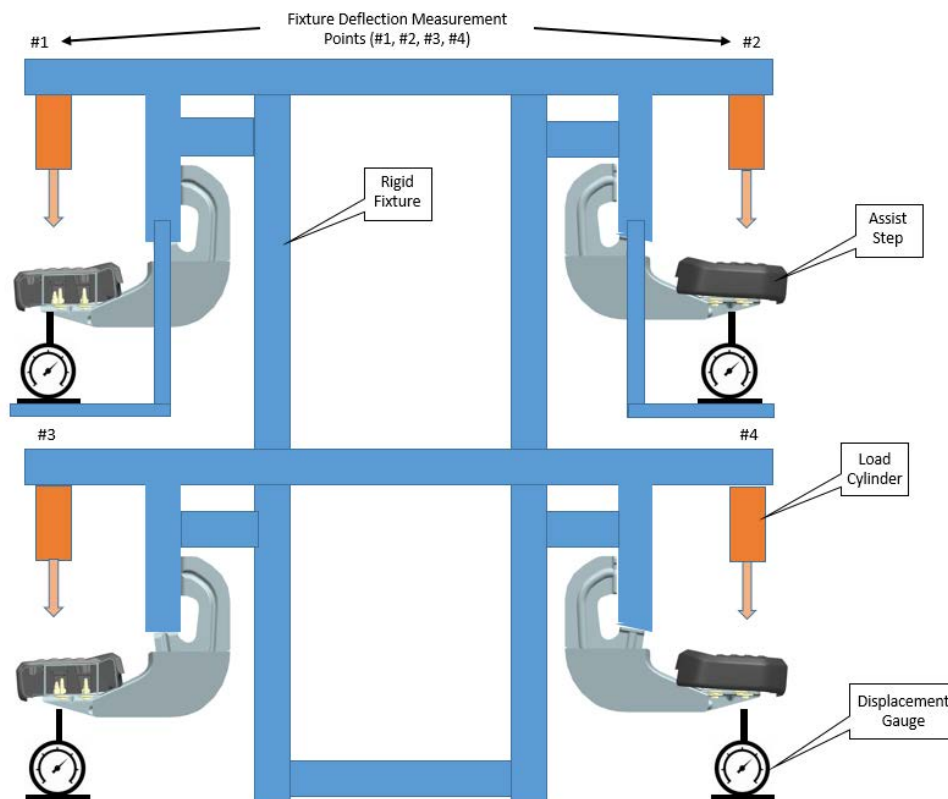


Figure 1: Test Fixture

3.3 Test Vehicle/Test Piece. The assist steps must meet the requirements for Design Validation (DV) and Process Validation (PV) testing. All parts including mounting fasteners must be from the production process and facilities, including all interfacing parts.

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3.4 Test Time.

Calendar time:	10 d to 50 d
Test time:	278 h
Coordination time:	24 h

3.5 Test Required Information. Take photographs and measurements of the test parts to be tested as installed before, during and after the test. Take the photographs at the appropriate distance and angle to emphasize and make clear deflection or appearance degradation in assist steps, interfacing components and trim. The test setup must be approved by the GM Computer Aided Engineering (CAE) Engineer, GM Design Release Engineer (DRE) and GM Validation Engineer (VE). A CG583 form (Test Setup Approval) must be completed and signed by the GM Design Release Engineer, GM Validation Engineer and CAE Engineer.

3.6 Personnel/Skills. Test personnel shall include the CAE Engineer, DRE and the VE along with a test lab technician or test engineer.

4 Procedure

4.1 Preparation.

4.1.1 Fixture Setup. Mount the assist steps to the fixture with production fasteners. Ensure all fasteners are torqued to the proper specification and marked with a paint pen to observe rotation upon test completion.

4.1.2 Measurement Locations for Displacement. Position the deflection measuring devices or gauges in the following Fore/Aft locations, as determined by the CAE Engineer, DRE and VE. Remove any plastic locally around the measurement positions. Ensure the deflection measurement device is mounted to a rigid surface. The general locations for measurement are as follows:

- Extreme front end of useable step surface.
- Extreme rear end of useable step surface.
- Front Entry/Exit (between the **A** and **B** pillars) as defined by the CAE Engineer, DRE and VE.
- Rear Entry/Exit, if applicable (between the **B** and **C** pillars) as defined by the CAE Engineer, DRE and VE.
- Center of length of the longest span between support brackets and/or attachment points from the assist step to the vehicle structure.
- Box Step rearmost position (if applicable)

4.1.3 Load Actuator(s) Position for Static Step. Position the load application device(s) at the Fore/Aft points listed in 4.1.2. The load actuator cross-car centerline should be placed **25.0 mm inboard of the outside stepable edge** as shown in Figure A1 in Appendix A. Ensure the load pad remains in position throughout the duration of the test.

4.1.4 Load Actuator(s) Position Articulating Step. Position the load application device(s) at the points listed in 4.1.2. This system extends outboard to accommodate entire foot. Therefore, the load actuator cross-car centerline should be placed at the **center of the step**. Ensure the load pad remains in position throughout the duration of the test.

4.1.5 Pre-Test Inspection and Documentation. Prior to the start of test or applying loads; the test setup should be photographed, measurements verified and a visual inspection conducted for all the parts. Any observed gaps, cracks, or other irregularities are to be noted and compared with post-test results. CG583 form must be completed with all required signatures. Ensure all fasteners are checked for torque and paint marked to determine movement during or after test.

4.2 Conditions.

4.2.1 Environmental Conditions. All environments listed within the SSTs.

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.

The GM Release Engineer, Validation Engineer and CAE engineer, shall agree on any deviations from this procedure. The deviations shall be detailed in the test report.

4.3 Instructions.

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