



Decklid Closing Handle Durability 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 evaluate the performance of the closing handle/pull cup in the decklid.

1.2 Applicability. This procedure applies to all vehicles that have a closing handle or pull cup in the decklid.

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.

- CG190 - GM Evaluation Report (ID)
- CG583 - Development/Validation Test and Vehicle Review (ID)
- CG3343 - A1SL Decklid Pull Cup Testing Video
- Decklid Subsystem Technical Specification (SSTS)

(ID) = This document is limited to internal use within General Motors and shall not be accessed outside this company. Contact the GM Lead Engineer for further instructions.

3 Resources

3.1 Facilities. The facility should have all of the equipment listed in 3.2 and be capable of providing the conditions required in 4.2.

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 Windshield glass urethane adhesive.

3.2.2 Glass primer.

3.2.3 Sandpaper, 100 grit or coarser.

3.2.4 Nylon strap, similar to seat belt material but with a looser weave.

3.2.5 Two (2) metal plates that can be clamped to the nylon strap and attached to the cable. 6.35 mm bolts were used in previous GM North America (GMNA) testing.

3.2.6 Braided cable, ~2 mm in diameter that connects the clamp to the weight. A nylon coated cable was used in previous GMNA testing.

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3.2.7 Grooved pulley to prevent movement of the cable as the weight is raised and lowered. The pulley must have a roller bearing for consistent friction and can be any diameter.

3.2.8 Two (2) proximity probe sensors to monitor the correct location of the clamp. The upper sensor is used to check that the clamp is in the correct position when the force is applied to the handle/pull cup (weight is in the lowered position). The lower sensor is used to check that the clamp is in the correct position when there is no force being applied to the handle/pull cup (weight is raised).

3.2.9 Two (2) metal rings to allow the rotation of the cable.

3.2.10 Free-rotating pneumatic actuator with sufficient capacity to meet the load and speed requirements.

3.2.11 Electronic controller to count cycles, to interface with the sensors, and control the air valves.

3.2.12 Fixture to securely attach the rear closure to a moveable cart and attach all needed pulley, sensors, and actuator.

3.2.13 Proper weight to obtain the SSTS force at the nylon strap. **Note:** The weight required will depend on factors such as the SSTS force, moment arms of the fixture, and pulley friction.

3.2.14 Moveable cart that can be transported in and out of environmental chambers and is large enough to securely support the rear closure and all listed equipment.

Note: The preceding test equipment description is how A1SL testing was performed in GMNA. This should only be used as a guideline as there are many methods to apply the correct force at the correct angle, and monitor the cycle counts.

3.3 Test Vehicle/Test Piece. The test must be performed on a rear closure that includes the handle/pull cup and all interfacing trim.

3.4 Test Time. See 4.3 - Instructions.

3.5 Test Required Information. The requesting engineer is responsible for providing specifications appropriate to the particular vehicle line being tested. (Submission of the Program SSTS along with the test request is recommended.) Any unique test requirements must be listed in the CG583 form.

The following information is required to run this test:

3.5.1 The total number of cycles per life and the number of lives.

3.5.2 The force that must be applied for all of the cycles and the angle of force application.

3.5.3 The sequence and percentage of cycle counts in each environmental condition (hot, cold, humid, ambient).

Note: These percentages may be different than those for the subsystem slam durability testing because all plastic handles must include testing in humid environment.

3.5.4 Inspection Items. The list of what things must be inspected and the frequency of the inspections.

3.6 Personnel/Skills. Prior experience in setting up and running similar tests and experience in the use of the referenced test equipment are critical to achieving a successful test.

4 Procedure

4.1 Preparation. Required: Prior to start of test; the responsible validation engineer for the test will provide an approval form (CG583 form which is available in Global Document Management (GDM)). This form will provide approvals for proper test setup, representative product content, and test buck attributes. Typical signatures include: Design Engineer (DE), Design Release Engineer (DRE), Validation Engineer, Analytical Engineer, Test Engineer and other System Management Team (SMT) Engineers as required.

4.2 Conditions.

4.2.1 Environmental Conditions. Reference the SSTS paragraph information to specify the Environmental conditions.

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 Requesting validation engineer, DE, DRE and Computer Aided Engineering (CAE) shall inspect the test items to ensure all material is at correct design level.

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4.3.2 Test Setup. Assemble test equipment to the handle/pull cup so the force given in 3.5.2 can be consistently applied at the angle and duty cycles given in 3.5.

Note: The following test assembly description is how A1SL testing was performed in GMNA. This should only be used as a guideline as there are many methods to apply the appropriate force at the correct angle and monitor the cycle counts.

Note: Examples of the test setup used in GMNA to test the A1SL pull cup are shown in Figures A1 thru A3. Additionally, an example of the GMNA A1SL testing can be found in the GDM CG3343 video "A1SL Decklid Pull Cup Testing Video". External test labs can request this video through the responsible engineer.

4.3.2.1 Assemble nylon strap to handle/pull cup. For a bar style handle, the nylon strap should be attached around the handle and should pull from the center of the handle. For a pull cup, one method used to attach the nylon to the cup is the following:

- Use sandpaper to roughen the inside surface of the pull cup. This should be done to the location where the customer will place their hand.
- Apply the primer to the area in (a) per the manufacturer's instructions.
- Use the adhesive to bond the nylon strap to this location. To ensure a better bond, holes can also be punched in the nylon strap at this location to create a larger bond area with the adhesive. Mechanical fasteners should not be used as they will compromise the structural integrity of the cup.

4.3.2.2 Assemble clamp to nylon strap.

4.3.2.3 Install handle/pull cup and all interfacing trim to the rear closure.

4.3.2.4 Fixture rear closure to moveable cart.

4.3.2.5 Locate pulley to obtain the correct angle of force application per 3.5.2.

4.3.2.6 Mount the actuator parallel to the cable at the opposite end of pulley from the weight. When the actuator is at its shortest stroke it must carry 100% of the weight. When extended, all of the force will be placed onto the handle/pull cup. The actuator rod end should be attached to the cable using a piece of cable crimped into a loop. This ensures enough slack in the system so that the actuator can give 100% of the weight onto the handle/pull cup when it is in the extended position.

4.3.2.7 Determine the weight that will be needed by attaching a force gage to the end of the cable opposite of the weight. Add weight to the cable until the force measured is the force given in the SSTS.

4.3.2.8 Install the end of the braided cable to the clamp using a metal ring.

4.3.2.9 Determine the position of the clamp in two positions: When there is no force on the handle, and when the SSTS force is applied. Install a proximity sensor at each of these locations.

4.3.2.10 Install the electronic controller in order to extend and compress the actuator, count the number of cycles, and ensure the clamp is in the correct position per the sensors.

4.3.2.11 Test Speed. Electronic controller should apply the load (lower the weight) smoothly, and in a quick manner to represent how the customer will apply the load to the handle/pull cup. The validation engineer, DE/DRE should confirm that the speed used is acceptable before the start of test. The load should be held on the handle (keep the weight in the lowered position) for 2 s. There is no requirement for the cycles per minute and this test can run as fast as possible as long as the load hold time is maintained.

4.3.3 When material is ready to test, inspect for any cracks or dents on the handle and closure and document any variation/deviation in the assembly. These areas to be reviewed per matrix developed in 3.5.4.

Note: The rear closure should be inspected prior to installing the pull cup to ensure all damage on the attachment features (sheet metal tabs, weld nuts, etc.) has been reviewed and recorded.

4.3.4 Perform Pretest Inspection according to 3.5.4 and record observation in Data Sheet A1.

4.3.5 One cycle is defined as applying the load to the handle, holding the load for the time given in 4.3.2.11, and then releasing the load.

4.3.6 Begin cycling the handle/pull cup according to SSTS.

4.3.7 Force will be applied to the handle through all environments and cycle counts as given in 3.5. Inspections should be performed as needed per 3.5.4 and observations recorded in Data Sheet A1. When obtaining measurements in hot, cold, or humid conditions, the test property must be allowed to acclimate to the new temperature for 4 h before any measurements are taken or cycling is started.

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