



## Door Handle System Inside and Outside Unlatching Effort 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.** To measure the efforts required to unlatch the door using the inside or outside handle.

**1.2 Applicability.** This procedure applies to all passenger cars and light duty trucks having conventional, swing open, side door systems, sliding side doors, rear "cargo" doors, liftgates, tailgates and endgates.

### 2 References

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

#### 2.1 External Standards/Specifications.

None

#### 2.2 GM Standards/Specifications.

GMW14803

GMW15085

GMW15938

#### 2.3 Additional References.

- CG190 Evaluation Report Template
- Global Door Subsystem Technical Specifications (SSTS), 3.1.5.5, 3.2.1.6.3, and 3.2.1.6.4

### 3 Resources

**3.1 Facilities.** The facility should contain the equipment described in 3.2 in addition to providing the conditions specified 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.

**Note:** The following list(s) include fixturing and instrumentation typically used by the GMNA Body Test Lab to perform this test. Other equipment may be substituted at the discretion of the testing facility as long as it provides the same data and/or data record, with equivalent accuracy as specified herein or by the requester.

##### 3.2.1 Fixturing.

**3.2.1.1** If not body mounted, a door can be mounted to any stable cart, pillar fixture, etc., if the door seal forces are accurately represented at the latch/striker interface per SSTS 3.2.1.6.3 and 3.2.1.6.4.

**3.2.1.2** Force gauge accessories such as a hook, flat head disc, or flexible strap to push/pull the inside and/or outside handle are required.

**3.2.2 Instrumentation.** Force gauge with a capacity approximately 1.5 times the specification (see 3.5).

**3.3 Test Vehicle/Test Piece.** It is recommended that the test parts/assembly be dimensionally certified before testing is started.

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**3.3.1** One (1) vehicle, body or buck with appropriate weather strips and latching system components, e.g., striker.

**3.3.2** One (1) fully assembled door including all panels and reinforcements, inside and outside handle assemblies, integral latching assembly, and any other parts which may influence the handle unlatching efforts such as interior trim which may induce additional friction to the handle actuation system, latch rods/cables, sound proofing material, lubricants, rust proofing materials, paint, door wiring harnesses, seals, etc.

**3.4 Test Time.** The following is an estimate of the amount of time (work hours) needed to perform this procedure.

**Note:** These time estimates are approximate averages. Actual times vary considerably depending on early component problems and subsequent availability of replacement parts, testing to varying multiples of cycle lives, varying requirements for frequency of environmental test conditions, scheduling problems for test facilities, test equipment malfunctions, scheduling of overtime and/or multiple shifts, scheduling of “witnesses” for tests, actual readiness of test samples upon receipt, unique or additional requests for detailed test information, running multiple samples. Times shown are for one (1) system, etc.

These times consider preparation and other downtime, actual test, and analysis of data in capturing a total calendar time. Report writing, approval, processing, etc., are not part of these times.

Calendar time: 1 d

Test time: 2 h

**3.5 Test Required Information.** Refer to 3.2.1.6.3 and 3.2.1.6.4 of the Global Door SSTs.

Testing worst case scenarios may uncover some potential problems. Discuss with requesting engineer if testing should include some worst case scenarios. Depending on which test is being performed and which level of parts or systems is being tested, consider if any of the following may apply: tolerance stack-ups, build variations, misalignment, minimum/maximum fastener torque(s), lubrication, environmental extremes, location of customer representative load application, symmetry (Left Hand vs. Right Hand), color, mold or die source, etc.

The following specifications or information are required to run this test:

**3.5.1** The required effort to unlatch the door using the outside handle.

**3.5.2** The required effort to unlatch the door using the inside handle.

**3.5.3** Load application locations on the outside handle. (Primary source: Outside Handle BFO)

**3.5.4** Load application locations on the inside handle. (Primary source: Inside Handle BFO)

**3.5.5** Fasteners torque values or ranges (maximum, minimum, etc.)

**3.5.6** Seal margin. (Applies to on body testing only.)

**3.5.7** Outer panel gap and flushness. (Applies to on body testing only.)

**3.5.8** Window positions during test. (Applies to on body testing only.)

**3.5.9** Environmental conditions.

**3.5.10** Weatherstrip Set Period. See 4.1.2.5. (Applies to on body testing only.)

**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 the estimated times shown in 3.4.

## 4 Procedure

### 4.1 Preparation.

**4.1.1 Sample Inspection.** The test and requesting engineers should inspect the test items to insure all material listed in 3.3 is of correct design level and assembled properly. Check for any non-conformities in the parts to be tested as this can influence measurement results.

**4.1.2 Sample Preparation.** This test is normally run on the test subject in an “as received” condition. If it is requested to be run in a specifically adjusted condition, follow the applicable procedure(s).

**4.1.2.1** As applicable to the test set-up, mount, adjust, and tighten the door hinges to their specified torque so that the requested alignment between the latch and striker is achieved. Refer to GMW15938, Door System Alignment to Body Determination. Alignment can affect handle efforts.

**4.1.2.2** Insure all other fasteners are torqued to their production specified values (unless otherwise specified).

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**4.1.2.3** Check door flushness and gaps, and adjust as instructed per the requesting engineer. Refer to GMW15938, Door System Alignment to Body Determination.

**Note:** If a deliberate overcrown condition on doors with upper frames (headers) is desired, it should be discussed with the requesting engineer. For doors without upper frames (headerless), window position and adjustment should be discussed with the requesting engineer.

**4.1.2.4** In those cases where glass position may influence the resultant load between the latch and the striker (e.g., headerless doors), record efforts per window positions specified in **3.5.8**.

**4.1.2.5** Measure and record the door seal force. It is suggested that the weatherstrip undergo a compressive set with the door closed before testing begins. The time period for this set depends on variables such as temperature, material, and weather-strip design. The usual time period is 48 h.

**4.1.3 Facilities and/or Equipment Preparation.** Record the instrumentation calibration information on Data Sheet A1 Instrument Calibration or an equivalent document.

## **4.2 Conditions.**

**4.2.1 Environmental Conditions.** Unless otherwise specified in this document's text or by the requesting engineer, the typical environmental conditions for this test are the temperature, humidity and pressure at the major test facility (3.1). Unless otherwise noted, these conditions are typically  $22\text{ }^{\circ}\text{C} \pm 3\text{ }^{\circ}\text{C}$ , relative humidity of  $40\% \pm 20\%$ , and atmospheric pressure equivalent to the local barometric pressure which is variable during any given day and from day to day.

**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 Set-Up Instructions.** Perform any functional/operational tests/evaluations as requested or as may be referenced in Section 2. To obtain correct performance measurements, it is recommended that the handles, inside manual lock actuator, and key cylinder be manually cycled approximately five (5) times prior to recording effort values. This "break-in" of a new system will reduce the influence of burrs, mold flash, etc., that may be present in the newly assembled system. Perform these cycles at this time.

### **4.3.2 Test Operation Instructions.**

**4.3.2.1** Determine the location on the outside/inside handle that a customer would normally grip to unlatch the door (see 3.5). See Figures A1 through A5 for inside and outside handle examples.

**4.3.2.2** Depending on the design of the handle (see 4.3.4.1), use the appropriate force gage hook accessory or adapter. Determine the force required to unlatch the door. Unless otherwise specified, the force gage should remain approximately normal to the handle's outer surface throughout the entire travel. Use a smooth and constant effort on the handle to reduce the possibility of false readings due to sudden starts or stops.

**Note:** Typically this test is run using a hand held force gauge. If more detailed data is requested, a Handle Effort Automated Pull System (HEAPS), developed by the North American Body Test Lab (or similar device), can be used. This system increases accuracy by maintaining a constant handle speed and a controlled stopping point.

**Note:** During the Door System-Freeze Performance Test (GMW15085), a door that is frozen to the seals can make it a challenge to know when the unlatched condition is achieved. When loading the door handle, pay close attention to a slight release noise in the latch, even though the door may not move. This is the measurement to be recorded. Much higher efforts will be required to ajar the door by pulling it away from the frozen seals.

**4.3.2.2.1** Three (3) or more trials should be performed on each handle to obtain an average effort reading.

**Note:** It is important to note that this test involves the unlatching of the door only. The effort required to open the door beyond its unlatched position is part of the Door System "Hold-Open" Detent Efforts Test procedure (GMW14803) and **should not** be included in the data for this test.

**4.3.2.3** Repeat 4.3.2.1 through 4.3.2.2.1 for other window positions, environmental conditions, etc., as requested.

### **4.3.3 Post Test Instructions.**

**4.3.3.1** Check for rivet and/or attachment looseness or movement. Measure and record any areas of visible deformation and/or breakage. Note especially any of these discrepancies in the handle, the area immediately adjacent to the handle, and the hinge area of the handle.

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**Note:** Every post test operation/measurement/inspection must typically have a pre-test equivalent to have any meaning or significance. A crack detected at end of test means nothing unless there is pre-test documentation verifying no crack existed prior to start of test.

## 5 Data

Record the test information on Data Sheet A2 Door Handle System (Inside and Outside) Effort Test.

**5.1 Calculations.** Not applicable.

**5.2 Interpretation of Results.** Not applicable.

**5.3 Test Documentation.** See Appendix A for sample Data Sheets (A1 and A2). Test to be documented consistent with form CG190, located in the General Motors Global Document Management (GDM) database.

## 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.

**Effort:** The effort measured in this test is the minimum force required to unlatch a door from the fully latched position. It does not include the effort applied through the handle to pull/push the door open.

**Fork Bolt:** The mechanical rotating lever in the latch that interfaces with the striker for retaining the door in the latched position.

**Fully Latched Position (Primary Latch Position):** The position when the door is fully closed and latched.

**Handle:** In this procedure, a handle is any lever or similar device used to unlatch a door.

**Latch:** A mechanical device employed to secure the door in a closed position relative to the vehicle body with provisions for controlled release or operation.

**Overcrown:** A designed interference condition that exists between the door upper frame and body, when the door is in the closed position, to prevent water leaks and wind/road noise.

**Seal Margin:** The distance from the weather seal's mounting surface (flange, channel, etc.,) to the weather seal's mating surface when the door is in the completely closed and latched position.

**Secondary Latched Position:** The position when the door is partially latched but still ajar.

**Note:** The secondary latched position may be included in the side door latch, as an added mechanical feature to reduce the possibility of the door opening freely, in the event the door is not closed to the fully latched position. It should be recognized that the doors are intended to be in the fully latched position whenever the vehicle is in motion. This is true for all closures.

**Striker:** A mechanical device with which the latch engages on the opposing member of the body.

**Unlatched:** Where the fork bolt is no longer fully engaged with the striker, and therefore, no longer holding the door closed.

**Upper Frame (Header):** For a door, the structural member above the beltline and around the window.

### 7.2 Acronyms, Abbreviations, and Symbols.

|              |                                     |
|--------------|-------------------------------------|
| <b>GDM</b>   | Global Document Management          |
| <b>GSSLT</b> | Global Subsystem Leadership Team    |
| <b>HEAPS</b> | Handle Effort Automated Pull System |
| <b>SSTS</b>  | Subsystem Technical Specifications  |

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