



Door Water Entry Test

1 Scope

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 quantify the total amount of water entry (leakage) into a door system including separate measurements on individual components, i.e., beltline seal, glass run channel, and door handle. To evaluate the flow of water on critical components, i.e., door latch and window regulator spools or cables.

1.2 Foreword. This procedure can be used for development or validation.

1.2.1 This procedure is not used for “in plant” audits.

1.3 Applicability. This procedure applies to all passenger vehicles having a sealed door system.

2 References

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

2.1 External Standards/Specifications.

None

2.2 GM Standards/Specifications.

GMW14528

2.3 Additional References.

CG2253

CG2255

CG2254

Note: The forms listed above can be found in the GM Standard Forms and Templates Library.

- Side Closures Global SSTS

3 Resources

3.1 Facilities.

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.

Note: Contact appropriate owners of these facilities to gain permission and any applicable safety instructions before use.

3.1.3 Test facility and equipment shall be in good, safe working order. Test equipment shall have a valid calibration label affixed to it and displayed in a prominent location.

3.1.4 Universal Water Test Booth (UWTB) with fixed nozzle positions (reference GMW14528).

3.1.5 Option for Development Tests. Standard water supply outlet with a capacity for delivering and measuring 30 L/minute (8 gal/minute) through a 16 mm ($\frac{5}{8}$ in) Inside Diameter (ID) hose. A calibrated flow measurement device is recommended to accurately measure flow rate.

3.2 Equipment.

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3.2.1 Flashlight to observe water leaks.

3.2.2 Fiber optic scope with video capabilities for observing and recording water leaks inside door cavity.

3.2.3 Towels for cleaning leaks inside vehicle.

3.2.4 Stopwatch to monitor test time.

3.2.5 Marine utility pump Number Teel 1P580E (self-priming) or equivalent for each door being simultaneously tested capable of pumping 19 L/minute (5 gal/minute) at 305 mm (1 ft) of head pressure.

3.2.6 Duct tape 3M 357 or equivalent for securing tubing.

3.2.7 Clear plastic mortar type mixing tub or clear plastic jar capable of capturing expected water volume plus 50% for each door being simultaneously tested. Water collection devices should also be equipped with drain system that facilitates easy/quick draining.

Note: Depending on door design, the water collection device may need to capture a total of as much as 75 L (20 gal). Depending on vehicle design, various water collection device shapes may be necessary to package inside test vehicle.

3.2.8 Graduated cylinders 1000 mL, 2000 mL, and 4000 mL for measuring water in collection device.

3.2.9 Tygon type clear plastic tubing with 9.5 mm ($\frac{3}{8}$ in) ID x 13 mm ($\frac{1}{2}$ in) Outside Diameter (OD) modified to attach to inlet and outlet of each pump being utilized.

3.2.10 Strip caulking for sealing minor tape seam leaks (3M 08578 or equivalent).

3.2.11 Fused/switched power supply capable of running marine utility pump(s) under load.

3.2.12 Body hoist.

3.2.13 A quantity of 16 mm ($\frac{5}{8}$ in) ID hose for delivering 30 L/minute (8 gal/minute) of water (reference GMW14528).

3.2.14 Inclination devise/facility to incline the vehicle to 6 degree side tilt and 11 degree longitudinal inclination.

3.3 Test Vehicle/Test Piece.

3.3.1 Test Vehicle.

3.3.1.1 Development vehicle representative of design intent but may not be representative of final production build process.

3.3.1.2 Validation vehicle representative of production and design intent.

3.3.2 The test vehicle shall also be within design trim height specifications (J-K, Z-D, etc.) This will ensure that the vehicle height will be property located relative to the water test booth nozzles.

3.4 Test Time. Time includes preparation, diagnosis, documentation, data analysis, repairs and, vehicle cleanup.

Calendar time: 0.5 to 1 day

Test hours: 4 to 8 hours

Coordination hours: 1 hour

3.5 Test Required Information. Refer to the Side Closures Global SSTs.

3.5.1 The engineer or technician shall perform steps 3.5.1.1 and 3.5.1.2

3.5.1.1 Fill out vehicle and test information on appropriate data sheet.

3.5.1.2 Calculate the leak L/minute (gal/minute) rate based on quantity of water captured and test time duration.

3.6 Personnel/Skills.

3.6.1 Experience and knowledgeable about facility operation and equipment usage/safety.

3.6.2 Experience in observing, recording and determining source of water entry into door systems.

3.6.3 Water leak detection experience or training is recommended.

3.6.4 Root cause analysis experience or training is recommended.

3.6.5 Reporting (writing, speaking, basic computer knowledge) is helpful.

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4 Procedure

4.1 Preparation.

4.1.1 Water Collection System Preparation.

4.1.1.1 Acquire one electric pump for each door being simultaneously tested that is capable of moving water at a rate as described in 3.2.5. Ensure that flexible, clear plastic tubing is attached to each pump inlet that is long enough to draw water from the respective test area (lowest point). Also ensure that flexible, clear plastic tubing is attached to each pump outlet that is long enough to empty water into a water collection device.

4.1.1.2 Acquire one clear plastic water collection device as described in 3.2.7 for each door being simultaneously tested. Each device must be equipped with a drain spigot to empty water once testing is completed.

4.1.1.3 Acquire power supply for electric pump(s). Power, Alternating, or Direct Current (AC or DC) for the electric pump(s) must be capable of safely functioning within a wet environment.

4.1.2 Test Vehicle Preparation.

4.1.2.1 Remove the door trim from each door being tested.

4.1.2.2 Tape (seal) the following items on each door being tested; lower hem flange, drains, and any holes along lower surface that would allow water to escape collection within lower door cavity.

Note: If test vehicle has weatherstrips located on the door, special care must be taken to ensure no leakage occurs from the door cavity during testing.

4.1.2.2.1 Door Component Water Leak Test Preparation. Per engineering direction, incrementally tape over all exposed door components, i.e., outside handle, beltline strip ends, beltline strip section, glass run channel, mirror patch/mirror glass to housing, and front, rear, and top door cutlines (triple seal vehicles only).

4.1.2.3 Install electric pump(s) and plastic water collection device(s) within vehicle compartment in an accessible area that does not impede the inspection of any door(s) being monitored.

4.1.2.4 Route the flexible plastic tubing from the inlet side of the electric pump(s) into the appropriate door(s). Place the end(s) of the pump inlet plastic tube(s) at the lowest possible point in the door cavity and secure.

4.1.2.5 Route the flexible plastic tubing from the outlet side of the electric pump(s) into the appropriate plastic water collection device(s) and secure.

4.1.2.6 Attach power supply to electric pump(s) and power source, and briefly apply power to pump(s) to ensure operation.

4.1.2.7 Install a cowl screen cover over the plenum/windshield base area and secure. This will prevent the potential for water entering into interior via the Blower Air Inlet (BAI) inlet.

4.1.3 Vehicle Preparation in the UWTB.

Note: Contact appropriate owner of this facility to gain permission and any applicable safety instructions before use.

4.1.3.1 Locate fore/aft position of vehicle inside the UWTB by aligning front axle to ± 2.54 cm (± 1 in) of reference mark located on floor drain grid. (Trucks shall use the forward reference mark only.) Locate the vehicle centerline position by aligning centerline of front bumper with lateral reference mark on floor drain grid.

4.1.3.2 Close all doors, decklid/hatch and sunroof.

4.1.3.3 With engine running, cycle all windows down and then to fully closed position. Operate each window control separately to prevent excessive voltage drop.

4.1.3.4 Set Heating, Ventilation, Air Conditioning (HVAC) mode and fan to **off** position.

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.

4.3.1 Door Water Entry Pre-Test.

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