



Pass-Through Water Leak Evaluation

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 define a set of bench-level tests that determine any exterior to interior pass-through components seal ability to resist water ingress into the cabin.

1.2 Applicability. This procedure applies to any pass-through, including the Heating, Ventilation, Air Conditioning (HVAC) module front of dash and HVAC module floor pass-through seal interfaces including the Thermal Expansion Valve (TXV) pass-through, heater core tube pass-through, drain tube pass-through, and stud or bolt fastener pass-through, if fastener seal type is applicable.

All HVAC module specific seal interfaces listed in the preceding, must be evaluated following heat aged preparation of test piece(s) with seal(s) installed.

For all other pass-through component interfaces, please verify heat aging requirements as well as any specific unique test setups with the GM component Bill of Materials (BOM) Family Owner (BFO).

1.3 Remarks.

1.3.1 This procedure includes the following static water tests:

- Seal water absorption test.
- Low pressure spray test.
- Water Submersion test.
- High pressure spray test.
- Absolute minimum seal compression test.

1.3.2 Each test evaluation should be performed three (3) times per test setup and/or configuration. All three (3) samples evaluated for a particular test setup must meet/pass criteria requirements to be valid. See 5.2 for test meet/pass criteria.

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.

- MEG SSTC2507 fan spray nozzle available at www.pressureparts.com/nozzles-1/nozzles-meg-ss.
- Permagum sealing compound available at www.grainger.com/product/PARKER-VIRGINIA-Off-White-Gray-Sealant-Compound-4E307.

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3 Resources

3.1 Facilities. Work area should be approximately level and have adequate drainage capability.

3.1.1 Calibration. The test facilities and equipment shall be in good working order and shall have a valid calibration label.

Test equipment shall have a valid calibration label affixed to it and located in a prominent position.

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.

Alternative test facilities and equipment must be approved by the GM BFO.

3.2 Equipment.

3.2.1 A container large enough to hold full-sized seal(s) which are submerged in water to complete seal water absorption test.

3.2.2 Equipment for determining flow rates for static hose test. A calibrated flow measurement device is recommended to accurately measure water flow rate.

3.2.3 High pressure spray wand system equipped with 6.35 mm (¼ in) MEG SSTC2507 fan spray nozzle. Operating pressure set to 7600 kpa (1100 psi) at 13 L/minute.

3.2.4 Low-pressure hose with a 16 mm Inside Diameter (ID) hose.

3.2.5 Timing device with stopwatch functions.

3.2.6 A custom water box sized to fit around the largest {bench test equivalent} pass-through size and shape of actual vehicle pass-through opening of interest. Water box shall be used in conjunction with the representative vehicle body sheet metal interface as part of a bench test setup using universal fixture supplies and brackets to support test equipment securely with safety in mind. The size and shape of the water box should follow the design identified in Figure 1 with main structure made from aluminum and transparent acrylic sheet unless GM BFO approves a different approach.

Note: If it is expected that sealed pass-through interface will experience dynamic movement during the manufacturing process, this movement needs to be duplicated as part of the bench testing fixture/adaptor design so as to match the same sealing interaction as vehicle production intent. Example: HVAC module pass-through movement during Instrument Panel (IP) installation against Body in White (BIW) Front of Dash (FOD) during the Slide and Drop IP load build process.

3.2.6.1 Features of the water box will include the following:

- a. A removable lid.
- b. A hole/slit in the front face of the box to enable the high-pressure hose nozzle to fit through.
- c. Removable drainage plug at the base of the box.
- d. Representative pass-through insert panel holding frame.
- e. Representative dynamic pass-through interface movement fixture/adaptor mentioned above as required.

3.2.7 Water leak assessment materials for problem solving (i.e., water present indicator paste).

3.2.8 Camera and video recorder to assist in documenting test procedure and results during testing.

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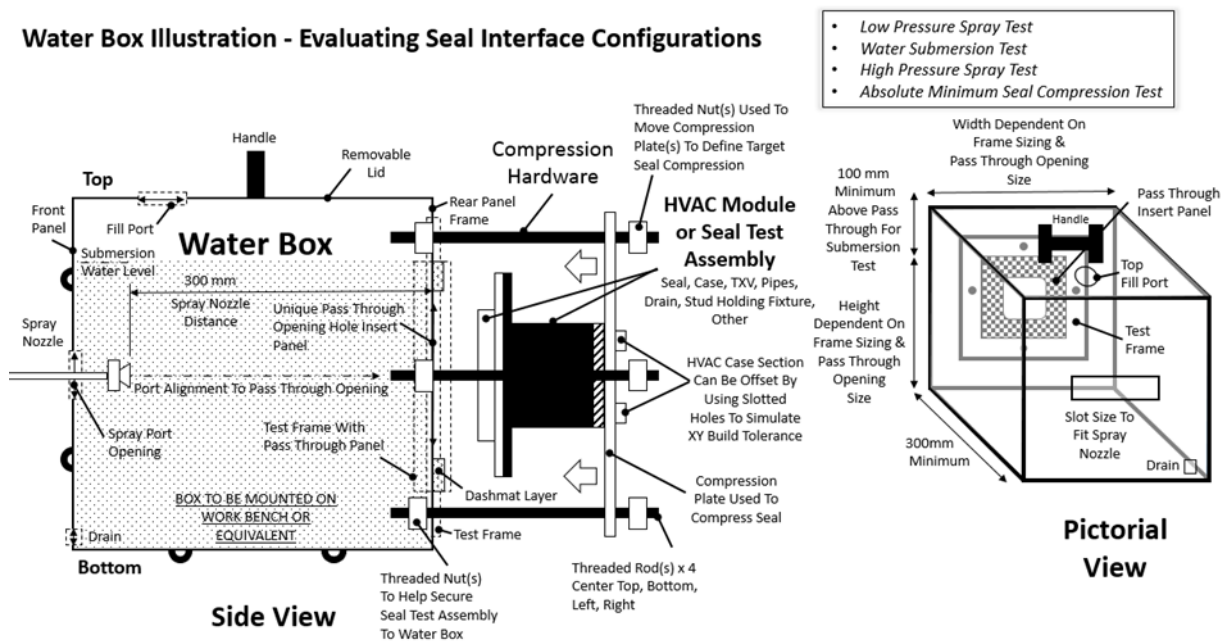


Documents

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Figure 1: Water Box (HVAC Module Interface Shown as Example)

Water Box Illustration - Evaluating Seal Interface Configurations



3.3 Test Piece.

Note: The components required include all pass-through points of interest, pass-through components including but not limited to:

3.3.1 Representative Pass-through Sheet Metal Panel/Material Layers. Use of representative pass-through metal panels, related layered materials (i.e., dashmat material layer or equivalent for typical HVAC pass-through interfaces) with correct pass-through opening size, shape and correct material thickness acceptable until BIW panel or actual sample material layers are made available by GM. All Process Validation (PV) testing must include use of BIW panel to be defined as a valid test setup. It is to the supplier's advantage to make testing pass-through panel as representative as possible for Design Validation (DV) testing which may include prototyping the panel to include sheet metal forming as required.

Note: Plastic or aluminum plate pass-through opening panels, in which the front of the seal compresses against, are no longer acceptable for pass-through water intrusion evaluation tests.

3.3.2 Module Assembly. Any test module assembly shall follow specifications similar to those noted in the following for the HVAC module assembly. Use latest design level HVAC module with FOD or floor seal installed. This includes the heater pipes, refrigerant pipes and TXV, and mounting bolts as applicable.

3.3.3 Seal Test Assembly (Alternate to 3.3.2). Use latest design intent sealing support structure in holding fixture setup with pass-through seal installed. This includes the associated components, e.g., the heater pipes, refrigerant pipes and TXV, and mounting bolts as applicable.

3.3.4 Heat Aged Pass-through Seal(s). Testing shall be evaluated using seals after "heat aging" process applied to test piece and based on selection of interface topics in 1.2. Prepared by taking an uncompressed "as-received" seal installed on the Module Assembly or Seal Test Assembly and performing the following test setup requirement similar to the HVAC module requirement described in the following.

- Place the HVAC Module or Seal Test Assembly with seal(s) attached in a climate chamber set to 105 °C.
- Circulate 120 °C coolant through the heater core or equivalent via the heater core tubes.
- Duration of heat aging: 100 h.

Note: If a pass-through seal interface is to be exposed to > 105 °C temperature(s) under-hood, heat age test evaluation values need to be increased to better represent the higher thermal requirements. Contact GM BFO for advice for these types of applications.

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