



Bonding Requirements for Valve Body Spacer Plate Assemblies

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. This specification covers the bonding requirements of constructional/laminated soft gasket/metal plate or soft gasket/metal plate/screen assemblies for transmission applications. Tests shall be conducted on both finished products and standard test coupons.

1.2 Applicability. This standard applies to transmission gasket applications where high pressure and high temperatures are expected. This specification covers both bonded gasket/plate assemblies and bonded gasket/plate/screen assemblies.

1.2.1 Soft Gasket Material. ASTM F104 callout as specified on the Detailed Part Drawing and/or on Material Specification Drawing Number referenced on part drawing.

1.2.2 Metal Plate Material. Material callout as specified on the Detailed Part Drawing.

1.2.3 Adhesive(s). Material callout and thickness as specified on the Detailed Part Drawing. Adhesive is water or solvent based that can firmly bond the specified soft gasket to the metal plate or soft gasket to the screen for the life of the spacer plate assembly in the transmission application. For screened applications the adhesive must fully fill the gaps within the screen to eliminate the potential for cross channel leaks when bolted into the transmission valve body.

1.2.4 Automatic Transmission Fluid (ATF). Assembly shall be compatible with ATF as specified on the Spacer Plate Assembly Drawing for the specific transmission application.

1.3 Remarks. The functional temperature environment is from -40 °C to 150 °C in the ATF specified, unless otherwise specified on the Part Drawing or Statement of Requirements (SOR). The maximum pressure range for automatic transmission is approximately 2067 kPa to 2411 kPa and for Continuously Variable Transmission (CVT) and Dual Clutch Transmission (DCT) applications, could be as high as 6200 kPa. The specific pressure range will be specified in the SOR for the respective transmission application.

2 References

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

2.1 External Standards/Specifications.

ASTM D1876 ASTM F104 ASTM F152

2.2 GM Standards/Specifications.

GMW3059

2.3 Additional References.

- Detailed Part Drawings
- Material Specification Drawing Number
- Part Drawing
- Spacer Plate Assembly Drawing
- Statement of Requirements (SOR)

3 Test Preparation and Evaluation

3.1 Resources.

3.1.1 Facilities.

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

3.1.1.2 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.

3.1.2 Equipment. Basic bonding test equipment requirements.

3.1.2.1 Fluid Temperature Monitoring Device. Capable of measuring -40 °C to 150 °C $\pm$ 3 °C accuracy.

3.1.2.2 Fluid Pressure Monitoring and Measuring Pressure Equipment (Pressure Gauge). Capable of measuring pressure as required per test instructions. Equipment must operate at the required temperatures and be compatible with the test fluid used (designated transmission fluid as defined on the Spacer Plate Assembly Drawing). Gauge must not corrode in this test environment.

3.1.2.3 Torque Wrench. Capable of measuring the specified test joint fastening specifications.

3.1.2.4 Flow Meters. Capable of measuring the specified flow of either air or oil with adequate resolution.

3.1.3 Test Vehicle/Test Piece. Standard test specimens (see Figure 1) should be cut directly from prototype or production parts, from areas where the soft gasket is bonded to both sides of the metal plate. For screened applications cut from areas where a gasket/screen/plate exist. The test specimen is a square with each side dimension of 15.87 mm ($\frac{5}{8}$ in) as shown in Figure 1.

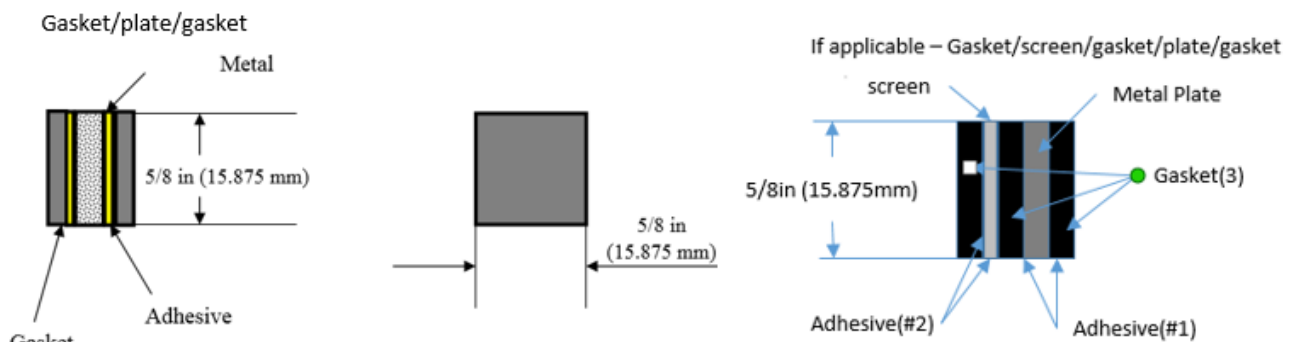


Figure 1: Test Specimen Size

3.1.4 Test Time. As required to setup test and to run.

3.1.5 Test Required Information. See 3.5.

3.1.6 Personnel/Skills. Technicians (operators) must be experienced in fixture construction and operation.

3.2 Preparation. Die cut testing specimens from sheet or finished gasket assembly.

3.3 Conditions. Sample conditioning is required for gasket materials that are sensitive to moisture and temperature.

3.3.1 Environmental Conditions. Prior to testing, specimens shall be preconditioned for 4 h at 21 °C to 29 °C in a desiccator containing anhydrous calcium chloride. Specimens shall then be transferred to a controlled humidity cabinet or room with gentle circulation of air, and conditioned for at least 20 h at 21 °C to 29 °C with 50% $\pm$ 5% relative humidity.

3.3.2 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.

3.4 Instructions. See Section 4.

3.5 Data.

3.5.1 Calculations. Not applicable.

3.5.2 Interpretation of Results.

3.5.2.1 Appearance. The finish product shall not show any surface contamination (assembly shall satisfy the contamination/sediment levels defined on the detailed part drawing), surface damage or any bond line separation after Methyl Ethyl Ketone (MEK) soak per 4.1. Upon completion of thermal cycle (see 4.4) or humidity aging (see 4.5) the gasket/plate or gasket/screen/plate assemblies shall not show any bubbling or delamination (bond line failure). There shall be no loose or partially cut screen wire that could break-off during handling, assembly or transmission operation. The plate assembly shall be free of any loose residual glue that may extrude from under the gaskets during the bonding process. For screened plate assemblies, after pressure cycling resulting from transmission usage, the gasket shall show no signs of tearing or flaking in the non-compressed areas due to leakage between the layers of the assembly. Some amount of delamination (separation) of the gasket and screen in these non-compressed areas is acceptable as long as no tearing or flaking occurs. Test conditions shall be developed and mutually agreed to by the supplier and GM engineering.

3.5.2.2 Bonding, Integrity and Durability. Shear test shall be performed on specimens, cutting from finished parts (not aged), and humidity conditioned parts per the testing schedule described in 4.3. The expected results are, see 3.5.2.2.1 thru 3.5.2.2.4.

3.5.2.2.1 No obvious movement of gasket facing relative to the steel plate and if applicable the stainless steel screen.

3.5.2.2.2 No obvious delamination.

3.5.2.2.3 The horizontal load versus displacement curve as shown in Figure 4 should exhibit a flat horizontal section after the maximum load is reached.

3.5.2.2.4 The load should not drop off after it reaches the flat horizontal section of the curve (see Figure 4). When the load curve drops off it is indicating delamination and/or sliding.

3.5.3 Test Documentation.

3.5.3.1 Test date, time and operator.

3.5.3.2 Supplier, product code and batch number.

3.5.3.3 Testing specimen: Prepared from sheet or finished gasket assembly.

3.5.3.4 Sample conditioning environment and time period.

3.5.3.5 All data collected during specific test to include pictures showing part condition after test.

3.5.3.6 Any deviation of testing conditions (temperature, pressure, flow rate, test time, etc.)

3.6 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.

3.7 Documentation. Samples of components or material released to this standard shall be tested for conformity with the requirements of this standard and approved by the responsible GM Department prior to the start of delivery of production level components or materials.

Any change to the component or material, e.g., design, function, properties, manufacturing process and/or location of manufacture requires a new release of the product. It is the sole responsibility of the supplier to provide the customer, unsolicited, with documentation of any change or modification to the product/process, and to apply for a new release.

If not otherwise agreed to, the entire verification test shall be repeated and documented by the supplier prior to start of delivery of the modified or changed product. In some cases, a shorter test can be agreed to between the responsible GM department and the supplier.

3.7.1 Test Results. See 3.5.