



Performance Requirements of Bonded Plastic Wheel Claddings

1 Scope

1.1 Material Description. This specification defines the adhesion requirements of plastic claddings that are fixed to the wheel using a liquid applied adhesive and/or an expanding foam. The adhesion of the cladding to the wheel is evaluated following environmental exposure by measuring the force required to push the entire cladding off the wheel using a tensile/compression test machine. This specification applies to substrates, paint, primers, adhesion promoters, adhesives and foam materials.

1.2 Symbols. Not applicable.

1.3 Applicability. Decorative plastic wheel covers or claddings that are permanently bonded to metal wheels.

1.4 Remarks. None.

2 References

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

2.1 External Standards/Specifications.

ISO/IEC 17025 TS 16949

2.2 GM Standards/Specifications.

GMW3059 GMW3221 GMW14124 GMW14270

2.3 Additional References.

- GM Supplier Quality (department or role representative)
- Statement of Requirements (SOR)
- Validation Guideline for Wheel Systems

3 Requirements

3.1 Requirements on Test Specimens. Reference GMW3221. All tests shall be performed at conditions per GMW3221, Code A, unless otherwise specified.

3.2 Sample Preparation. The bonded part shall be conditioned for 24 h per GMW3221, Code A, prior to environmental exposure unless otherwise stated. Parts shall be bonded using production intent processes, including production intent primers, adhesion promoters or other treatments.

3.3 Test Preparation and Evaluation.

3.3.1 Facilities.

3.3.1.1 Approved Adhesive Application (AAA) Testing. If tests are performed outside of GM, all testing shall be performed in an accredited laboratory. Laboratory accreditations to ISO/IEC 17025 are acceptable.

3.3.1.2 Production Part Approval Process (PPAP) Testing. If tests are performed outside of GM, use a laboratory from an organization that is either third party registered to TS 16949, or has laboratory accreditations to ISO/IEC 17025.

3.3.1.3 All testing is the responsibility of the GM supplier who bonds wheel claddings to metal wheels.

3.3.2 Component Testing. This testing must be performed for each combination of design, clad material, clad plating, paint, primers, adhesion promoters, and foam, adhesive and manufacturing location. Perform AAA testing as indicated in Appendix A, Data Sheet A1. AAA approval is required for PPAP.

3.3.2.1 All specimens for testing must be obtained from parts that have been molded, painted, and processed using the same equipment, tools, materials, processing conditions and manufacturing locations that will be used to manufacture production parts for vehicle assembly.

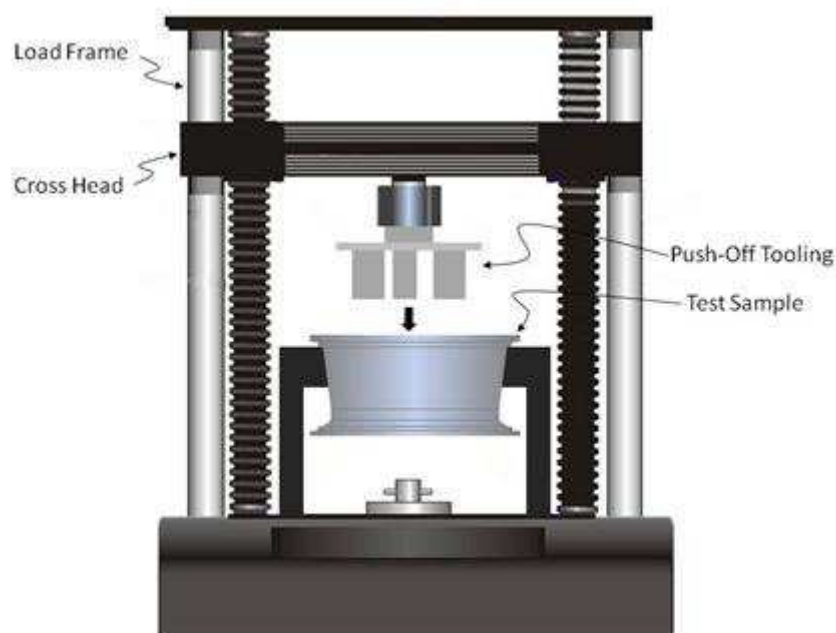
3.3.2.2 Each test must be completed on a minimum of three (3) samples.

3.3.2.3 When testing is completed, the tested parts and test report will be reviewed by the responsible GM Materials Engineer. Full AAA approval may be given at this time depending on the test results. Approved applications will be entered into the AAA database and have a AAA number assigned.

3.4 Component Testing.

3.4.1 Testing Machine (Figure 1). Shall have a force measurement accuracy of $\pm 2.0\%$ when calibrated and operated in compliance with practices listed in ISO 17025 and capable of maintaining a specified rate of loading, and comprised of the equipment per Figure 1, as well as 3.4.1.1 thru 3.4.1.4.

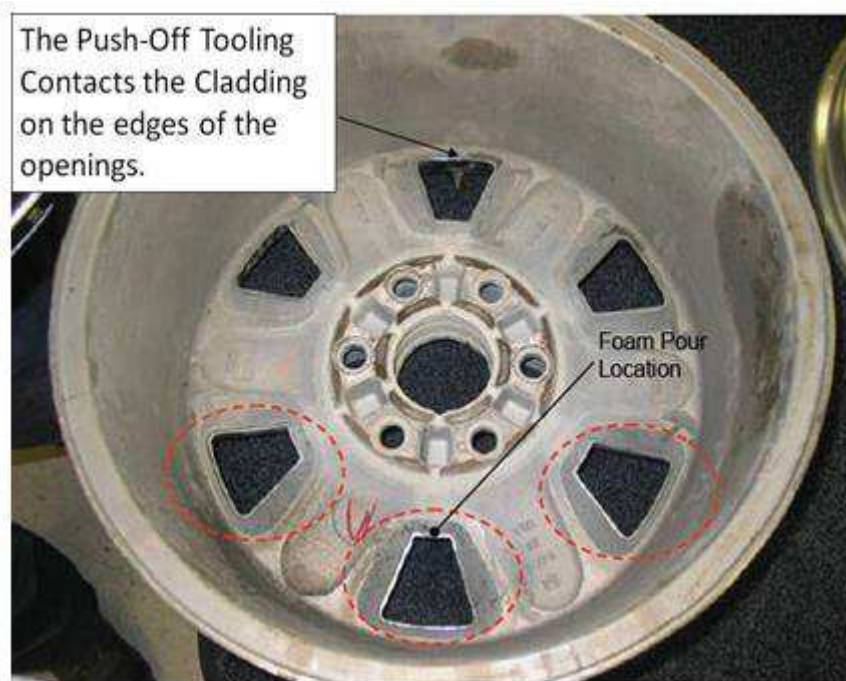
Figure 1: Configuration for Cladding Push-Off Test



3.4.1.1 Fixed Base. A fixed or essentially stationary member with the means to hold or clamp a complete wheel assembly.

3.4.1.2 Movable Member. A moveable member with tooling designed to contact the cladding on the reverse side along the edges (Figure 2). This movable member shall not contact any portion of the metal wheel backbone.

Figure 2: Reverse Side of Clad Wheel Showing the Areas Where the Push-Off Tooling Contacts the Cladding



3.4.1.3 Operation. The movable member with tooling will apply load to the cladding at a fixed rate of 25 mm/minute $\pm$ 0.5 mm/minute. The force measurement system shall record force versus displacement and peak or maximum force.

3.4.1.4 Test Equipment Approval. The testing system comprising the test machine and associated fixtures shall require GM Materials Engineering approval for use with this specification.

3.4.2 Initial Static Push-Off Test. Push off the cladding from three (3) production prepared samples. The push-off load shall be 12 000 N minimum. Inspect the backside of the cladding surface in the areas that receive treatment by primers, coatings, adhesive promoters, etc. There shall be 100% cohesive failure of adhesive or foam in these areas.

3.4.3 Water Soak Test. Immerse the clad wheel in water. The water level must completely cover the entire cladding. Maintain the water temperature at 70 °C $\pm$ 2 °C for 168 h. Remove the wheel from the water and allow it to recover at room temperature (20 °C $\pm$ 3 °C) for 24 h. Push off the cladding from three (3) wheels. The push-off force shall be 9000 N minimum on any sample. Inspect the backside of the cladding surface in the areas that receive treatment by primers, coatings, adhesive promoters, etc. There shall be 100% cohesive failure of the adhesive or foam in these areas.

3.4.4 Accelerated Age Test. Three hundred thirty six hours (336 h) in an air circulating oven at 85 °C. Remove the wheel from the oven and allow it to return to room temperature (20 °C $\pm$ 3 °C). Push off the cladding from three (3) wheels. The push-off force shall be 9000 N minimum on any sample. Inspect the backside of the cladding surface in the areas that receive treatment by primers, coatings, adhesive promoters, etc. There shall be 100% cohesive failure of the adhesive or foam in these areas.

3.4.5 Cycle Test. GMW14124, Cycle K, run 13 cycles. Allow the wheel to return to room temperature (20 °C $\pm$ 3 °C). Push off the cladding from three (3) wheels. The push-off force shall be 9000 N minimum on any sample. Inspect the backside of the cladding surface in the areas that receive treatment by primers, coatings, adhesive promoters, etc. There shall be 100% cohesive failure of the adhesive or foam in these areas.

3.5 Test Conditions. Tests shall be conducted using the latest issue of the test methods indicated. Suitable precautions should be taken to ensure that applicable safe limits are not exceeded when conducting test procedures, processes, and/or handling the materials required by this specification.