GM	WORLDWIDE ENGINEERING STANDARDS	Material Specification	GMW16569

Paint/Glass Bonding Compatibility

1 Scope

This specification covers the testing requirements for determining the compatibility of paint materials and processing with approved glass bonding materials. These requirements cover initial qualification and testing of variances in the paint layers, paint processing or stationary glass bonding systems.

1.1 Material Description. Not applicable.

1.2 Symbols. Not applicable.

1.3 Applicability. Validation of new or modified topcoat/paint systems related to fixed automotive glass bonding on all vehicles built by GM.

1.4 Remarks. Not applicable.

2 References

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

2.1 External Standards/Specifications.

None

2.2 GM Standards/Specifications.

GMW3041	GMW3368	GMW14729	GMW16898
GMW3059	GMW3371	GMW16568	GMW17345
GMW3221			

2.3 Additional References. None.

3 Requirements

3.1 Requirements on Test Specimens. Reference GMW3221.

3.1.1 Test Authorization and Reporting Requirements.

3.1.1.1 GM Test Identification Number. At the time of test initiation, the appropriate GM engineering group must issue a material test request. The associated number is to be used to track the status of the testing as well as for documentation and record keeping purposes. A cover sheet will be developed defining the general materials, requirements and test purpose. See Appendix B for an example of the cover sheet.

3.1.1.2 The appropriate GM Engineer must complete “Test Initiation Report Form Number 1” (see Appendix C for an example.).The appropriate testing category will be indicated, which in turn will define testing requirements per Appendix A, Table A1. Temperatures shown in Appendix A, Table A1 are in degrees Celsius.

3.1.1.3 The appropriate GM Engineer must complete the following categories per “Test Initiation Report Form Number 2” (see Appendix D for an example) for all layers: 998XXXX, supplier, supplier code, paint code WA numbers and required bake schedules. The GM Engineer must indicate specific bake times and temperatures when necessary. The supplier must submit the following information per Report Form Number 2 with the test report: actual bake schedules, material batch numbers and actual film builds. An authorized supplier representative must sign-off that the work has been done in accordance with this specification.

3.1.1.4 The supplier must review test data with appropriate GM engineering group. Test data and samples must be accompanied by the Test Work Order (TWO) cover sheet at time of review. All test data must be reported in a format approved by GM Paint and Polymers Center. The approving engineer will sign off that the results were reviewed and whether or not requirements were met.

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3.2 Test Materials and Processing.

3.2.1 Test Panels. Test panel substrates such as glass, plastic and coated metal must be approved by the appropriate GM engineering group prior to test. Base metal coated substrate must be phosphated, cold rolled or electro galvanized steel minimum.

3.2.2 Paint Materials. For all paint materials used, production representative batches must be used. For application of these materials (i.e., nominal film build) refer to the appropriate material specifications. The following information relating to each paint material used for each layer must be stated in the final test report:

- Layer type (i.e., Electro-deposition Primer (ELPO), topcoat, etc.)
- GM specification number: e.g., 998XXXX, L000 XXX XXX, 947XXXXXX
- Supplier
- Supplier product code (product name)
- Batch (Lot) number
- Dry film build thickness

3.2.3 Paint Processing (Bake Schedule). The bake schedule for the test layer is outlined in Appendix A, Table A1. Except where indicated, use the target bake schedule as stated in the appropriate material specification for all non-test layers. All bake schedules are specified as metal temperature. Use thermocouples to verify bake schedules. If the bake schedule is different than outlined in Appendix A, Table A1, the actual bake schedule must be documented in writing and verified by the appropriate GM engineering group.

3.2.4 Glass Bonding Materials. For testing of variances in the paint layers or processing, specify the appropriate urethane pinchweld primer and/or adhesive system. The target facility paint material will always be used as the default for glass adhesive system selection. Before initiating testing, verify the use of glass bonding materials with the appropriate GM engineering group. For application of glass bonding materials, refer to the appropriate material specifications. The following information for each glass bonding component must be stated in the final test report:

- Glass bonding material description (pinchweld primer and/or adhesive)
- GM specification number: e.g., 998XXXX, L000 XXX XXX, 947XXXXX
- Supplier
- Supplier code (product name)
- Batch (Lot) number

3.2.5 Glass Bonding Material Processing. Apply the pinchweld primer and/or urethane adhesive, as required, per the appropriate GM specification or per the material manufacturer's requirements.

Note: For topcoat qualification, maximum aging after bake and prior to pinchweld prime application is 1 h. Unless otherwise specified, glass bonding adhesive systems must be applied within 8 h of paint application and bake.

3.3 Test Categorization. The following test requirement descriptions defined in Appendix A, Table A1, Rows A thru M are specific to the type of submission category for required paint and glass bonding material changes. Details of individual tests required are defined in 3.4.

Note: All technologies referenced below are designated by a GM specification number, Hazardous Materials Control System Identification (HMCS ID) number and Material Safety Data Sheet. Any modification to an existing technology must be approved by the appropriate GM engineering group with a written description of the modification.

3.3.1 Row A. Qualification of new or licensed monocoat, basecoat and/or clearcoat technology. All new monocoat, basecoat and/or clearcoat technologies must be qualified for use with approved glass bonding materials per GMW3041, Approval and Compatibility using Quick Knife Adhesion (QKA) (see GMW3368) and Overlap Shear (OLS) (see GMW3371) testing. Run Cold Cure QKA for the four (4) standard colors in under and over bake conditions. Perform the required tests outlined in Row A. Row H and Row J should be run concurrently. Row L should be run upon material introduction to an assembly plant.

3.3.2 Row B. Qualification of a modification to an existing monocoat or clearcoat technology. Based on the modification significance, it is the decision of the appropriate GM engineering group as to the required testing; Row A or Row B.

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3.3.3 Row C. Qualification of a modification to an existing basecoat. Perform the required tests as outlined in Row C.

3.3.4 Row D. Qualification of new/licensed ELPO, primer surfacer (color keyed or color specific) or seal coat technology used as a bonding surface. Perform the required tests as outlined in Row D. For color specific primer surfaces, Row H should be run concurrently for additional colors. Row L should be run upon material introduction to an assembly plant.

3.3.4.1 Approved masking tape should be used per Row J to evaluate QKA before and after humidity. If no plant-designated tape is specified for technology qualification, use American Tape PG 21 or equivalent.

3.3.5 Row E. Qualification of a modification to an existing ELPO, primer surfacer (color keyed or color specific) or seal coat technology used as a bonding surface. It is the decision of the appropriate GM engineering group as to the required testing; Row D or Row E. For color specific primer surfacers, Row H should be run concurrently for additional colors. Row L should be run upon material introduction to an assembly plant.

3.3.6 Row F. Qualification of a glass bonding adhesive sealing system. Perform the required tests as outlined in Row F. Under and over bake conditions will be run for Cold Cure QKA as specified. Row H should be run concurrently for additional colors. Row L should be run prior to and during material introduction to an assembly plant.

Note: This is a Materials Engineering responsible function.

3.3.7 Row G. Qualification of paint layering. Each paint layering system must be approved before it is used in production. Each layer may have been approved independently with other layers, but the exact combination of products was not tested as a layering system. If all layers have been previously approved according to this specification, perform the required tests as outlined in Row G for the new layering combination. Row H should be run concurrently for additional colors of basecoat and clearcoat changes. Row L should be run upon material introduction to an assembly plant.

3.3.8 Row H. Qualification of new topcoat or primer colors (annual programs). Each topcoat color or primer surfacer used as a bond surface must be qualified for use with the glass bonding materials (urethane adhesive and/or primer) released for production. Each topcoat color or primer surfacer used as a bond surface must be tested over a current production ELPO. Follow the bake schedule and other requirements outlined in Row H.

3.3.9 Row I. Qualification of approved pinchweld primers. Each previously approved pinchweld primer must be qualified for use with the specific plant paint system released for production (including topcoat, primer surfacer and ELPO).

3.3.9.1 Topcoats. Perform bakes and other tests for qualification of a pinchweld primer with topcoat as outlined in Row I, Topcoats A and B. Use white and a light metallic (Lt. Met.) topcoat for Row I, Topcoat A and all other colors for Row I, Topcoat B.

3.3.9.2 Primer Surfacer. If required, perform bakes and other tests for qualification of a pinchweld primer with primer surfacer as outlined in Row I, Surfacer.

3.3.9.3 ELPO. If required, perform bakes and other tests for qualification of a pinchweld primer with ELPO as outlined in Row I, ELPO.

3.3.10 Row J. Validation of masking tape for use in the windshield bond area for plant-specific application. Masking tape can be applied directly over electro-deposition primer, primer surfacer, or topcoat. The layer to which the tape is applied should be given the minimum bake. Apply tape within 1 h of coating bake completion. After the tape is applied, the next layer(s) of paint is (are) applied over the tape and baked at the upper bake limit. Use white topcoat over the tape for maximum solvent soak. Tape is removed after the last bake sequence and the panel is examined visually for evidence of adhesive residue. Apply the plant-specific pinchweld primer and/or urethane adhesive directly to the panel without solvent wiping and test as indicated in Appendix A, Table A1. When masking to primer surfacer, test with a red surfacer instead of gray for plants using color-keyed or color-specific products. All paint applications should be at target dry film. If no plant-designated tape is specified for technology qualification, use American Tape PG 21, Tesa Tape 7140 or 3M 2497ST Mask.

3.3.11 Row K. Validation of plant-specific variance to eliminate masking or shielding of the windshield bond area when the polishing area is further than 607 mm from the windshield bond area. Polish must be approved to an approved GM indirect materials list. Use white topcoat at target bake and film as indicated in Row K. Panels must be evaluated for Tape Link-Up and QKA under three (3) conditions:

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a. Control: No polish.

b. Apply 76 µm (approximately 5 cc) wet polish and air dry 30 minutes. Wipe one (1) pass with dry cloth leaving visible dry polish residue.

c. Apply 76 µm (approximately 5 cc) wet polish and air dry 30 minutes. Wipe one (1) pass with cloth dampened with Naphtha.

3.3.12 Row L. Validation of plant-specific variance due to introduction of new coatings or a modification of a coating that will be used as a bonding surface.

3.3.12.1 Test plant prepared, 100 mm × 300 mm, painted panels per GMW3368 (QKA) after:

1. Initial cure: 7 days at 22 °C ± 3 °C and 50% ± 5% relative humidity (RH).
2. Initial cure and 168 hours humidity per GMW14729, Option A.

3.3.12.2 At the discretion of the appropriate GM Engineering Group, vehicle level validation may be required. Unless otherwise specified, test five (5) plant-processed vehicles, paint and glass install, and allow glass adhesive to cure 7 days in-plant. Remove glass per normal plant repair processes and perform modified QKA on all appropriate bonding flanges. Evaluate QKA on glass opening noting the opening, the side of the opening and percentages and types of separation per GMW3368.

3.3.13 Row M. Vehicle validation for glass bonding performance on all new colors is required. Select one (1) of the vehicles for the new color workability trial and perform QKA on entire windshield glass bonding area. This vehicle must represent a single pass through the entire paint process. Evaluate QKA on windshield opening per GMW16898 and GMW3368, documenting the percentages and types of separation. Perform test according to New Color Introduction Task Instruction Sheet (TIS).

3.4 Specific Test Requirements, Methods and Conditions Commonly Used for GMW16569 Testing.

3.4.1 Performance Requirements for Bonding and Sealing of Stationary Automotive Glass GMW3041. Refer to the sections, Performance Requirements-Cured and Approval and Compatibility for complete definitions of the test requirements called out in this specification. The following reference requirements are:

3.4.1.1 Tape Link-up Time, GMW16568. Perform tape test on panel prepared with pinchweld primer at 30 minute intervals until sample passes. The sample passes when there is no transfer of primer to masking tape. This test is used as information for quality control procedures. Guideline: link up should occur within 8 h.

3.4.1.2 Quick Knife Adhesion (QKA) Test, GMW3368. Follow the procedure for sample preparation and testing in GMW3368. Refer to GMW3041 for QKA requirements.

3.4.1.3 Overlap Shear Adhesion (OLS) GMW3371. Follow the procedure for sample preparation and testing in GMW3371. Refer to GMW3041 for OLS requirements.

3.4.2 Environments. Seven (7) days, 14 days, 21 days, and 28 days Cold Cure with initial 168 h and post 168 h humidity (GMW14729, Option A) QKA per GMW3368. Cure test samples for 7 days, 14 days, 21 days, and 28 days in cold cure conditions; perform QKA at each interval or until 100% cure and cohesive separation is established. When 100% cure and cohesive separation is established, expose sample to 168 h at 38 °C ± 3 °C and 95% ± 5% RH per GMW14729, Option A. Allow samples to recover 24 h and perform QKA.

3.4.2.1 Initial Cure. Unless otherwise specified, cure test samples for 168 h at 22 °C ± 3 °C and 50% ± 5% RH prior to performing required tests.

3.4.2.2 Humidity GMW14729, Option A. After the specified cure, expose samples for 168 h at 38 °C ± 3 °C and 95% ± 5% RH per GMW14729, Option A. Unless otherwise specified, allow samples to recover 24 h prior to performing required tests.

4 Manufacturing Process

Test sample preparation shall emulate manufacturing processes with respect to aging, dwell and bake times, temperatures and humidity. All such parameters shall be defined by the responsible GM Engineering Group within the guidelines of this document prior to the onset of testing.

5 Rules and Regulations

5.1 Legal Regulations. All materials must satisfy applicable laws, rules, regulations and recommendations valid in the country of usage.

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