



Hem Flange Adhesive Acceptance Criteria and Repair Methods

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 standard provides the acceptance criteria and repair methods for hem flange adhesive(s) applications in automotive products for which GM is responsible for establishing or approving product design.

1.2 Applicability. This standard applies to any application where a fabrication or body shop applied dispensed material is used inside a hem joint for bonding exterior automotive closures and body panels.

The criteria established in this standard become mandatory when referenced in product release information or an approved Product Quality Standard (PQS) document. Deviations from any adhesive criteria provided in this standard must be identified in product release information or an approved PQS document.

1.3 Remarks. Hem adhesive applications are considered satisfactory when applications meet the acceptance criteria defined in this standard, the sealer visual aid, and/or program specific PQS.

Note: For clarification of this standard, editorial comments or proposed changes, email the GM Welding and Joining Council at: weld.council@gm.com.

2 References

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

2.1 External Standards/Specifications.

None

2.2 GM Standards/Specifications.

GMW15563

2.3 Additional References.

These references are limited to internal use within General Motors and shall not be accessed outside this company. Contact the GM Product Engineer for further instructions.

- GM Global Quality Requirements for Corrective Action and Nonconforming Material;
GM Plants refer to: https://gmweb.gm.com/quality/oq/QR/IQ_Global/default.aspx,
Non-GM Plants contact Supplier Quality
- GM Record Retention Schedule (GMRRS); <https://gmrrs.gm.com/GMRRS/>,
Non-GM Plants contact Supplier Quality
- Global Manufacturing System (GMS) Operating Guidelines
- Process Quality Requirement System (PQRS) process control plan PCPB014

3 Requirements

3.1 General Acceptance Criteria.

3.1.1 Correct Material. The hem adhesive applied shall be the material specified in the design release documentation and/or the Process Data Sheet for Sealer Application (see Appendix A, Figures A1 and A2). The product is nonconforming if incorrect material is being applied.

3.1.2 Expired Material. The hem adhesive applied shall be use prior to the expiration date found on the material container. Use of expired material causes the product to be non-conforming.

3.1.3 Contaminated Substrate. Cleaning of the faying surfaces is not required unless visibly contaminated by dirt, dust, oil, corrosion, or other foreign matter. Preparation of the faying surfaces is not required unless specified in the material specifications.

3.2 Visual Acceptance Criteria.

3.2.1 Location. The bead position across the flange or panel may be adjusted to achieve proper wet out, fill the hem nose, squeeze out to the inside of the panel, optimize post-cure bond line, and to minimize or eliminate excess material squeezed out of the exterior part of the joint. The bead position on the flange, including the start and stop location, is properly located when installed within 6 mm from the start and stop location indicated in the design release documentation and/or the Sealer Visual Aid (see Appendix A, Figure A2). Beads not properly located require the process to be adjusted to the specified start and stop locations as well as bead position along the flange (see Appendix A, Figure A2, A3, and A4). The final location, assembly criteria, and post-cure teardown criteria based on the validation process will be documented in the Sealer Visual Aid or PQS (see Appendix A, Figures A2, A3 and A4). Any tune-in or process change requires verification.

3.2.2 Missing Bead. The hem adhesive applied shall be applied as defined in the Sealer Visual Aid or PQS. Missing beads cause the product to be non-conforming.

3.3 Measurable Acceptance Criteria.

3.3.1 Wet Out. Wet out is defined as the “footprint” of adhesive surface area on each of the panels of the hem joint that the adhesive covers pre-cure/before paint. Wet out acceptance criteria is to be documented through use of a PQS. Wet out is used for assessing hem adhesive in body hems (sunroofs and wheel openings), see Appendix A, Figure A6. See Appendix C, C2 for wet out details. Use Table 2, Table 3 and sunroof and wheel opening pre-cure fill sections for wet out targets for body hems.

3.3.2 Bond Line. Bond Line is defined as the “footprint” of adhesive surface area on each of the panels in a hem joint that the adhesive covers post-cure. Bond line on one-part hem adhesive must be periodically validated after post sealer/primer bake for all closures hem adhesive. Two-part hem adhesive can be validated pre-paint provided the sample has air cured for a 24 h period. Bond line is used to assess hem adhesive on closures panels. See Appendix C for teardown validation.

3.3.3 Bond Line Width. For closure panels, the post-cure bond line width on the inner panel hem flange and outer panel hem flange mating surface is to be 100% of the inner flange width (see Appendix A, Figure A5) in the high-risk corrosion areas (see Appendix D). If the bond line width is < 100% of the inner hem flange in the high-risk corrosion areas then the bead is to be adjusted to eliminate the condition.

3.3.4 Voids, Skips or Interruptions. Any skips or interruptions in hem adhesive bond line or wet out in high-risk corrosion areas cause the product to be non-conforming and the bead needs to be adjusted. Any voids, skips or interruptions in hem adhesive bond line or wet out larger than 10 mm in areas other than high-risk corrosion areas cause the product to be non-conforming and the bead needs to be adjusted. See Table 1 for bond line length requirements. Skips or interruptions in high-risk corrosion areas (see Appendix D) cause the product to be non-conforming.

3.4 Disposition/Repair Procedure.

3.4.1 All known and suspect product with non-conforming hem adhesive bonds must be handled in accordance with Global Quality Requirements for corrective action and non-conforming material. See Appendix B, Table B1 to determine when a hem adhesive bond is nonconforming.

3.4.2 When required, repair of parts, assemblies, or vehicles with non-conforming hem adhesive bonds that are non-conforming shall be performed according to the methods specifically authorized by the appropriate Product Engineer.

Note: There is no repair for hem adhesive discrepancies.

Table 1: Bond Line Length Targets for Closures Hem Adhesive ^{Note 1}

Specified Hem Adhesive Bond Length Location – Lw	Maximum Allowable Length for any Single Discontinuity (Skip, Pre- and Post-Cure)
High-risk corrosion area	0 mm
All others	10 mm ^{Note 2}

Note: Lw = Specified Bond Length.

Note 1: Effective Bond Length is defined as $L_e = L_a - L_d$.

Where:

L_e = Effective Bond Length

L_a = Actual Bond Length

L_d = Combined Discontinuity Lengths

Note 2: No more than a 20% total discontinuity in a released bead allowed.

Table 2: Wet Out Length Targets for Sunroof Hem Adhesive ^{Note 1}

Specified Bond Length (Lw)	Maximum Allowable Length for any Single Discontinuity (Skip, Post Wet Out)	Length Tolerance (Lt)	Maximum Required Length
> 150 mm	10 mm	20% of Lw	$L_w - L_t$

Note 1: Effective Bond Length is defined as $L_e = L_a - L_d$.

Where:

L_e = Effective Bond Length

L_a = Actual Bond Length

L_d = Combined Discontinuity Lengths

Table 3: Wet Out Length Targets for Wheel Opening Hem Adhesive ^{Note 1}

Maximum Allowable Length for any Single Discontinuity (Skip, Pre- and Post-Cure)	Length Tolerance (Lt)	Maximum Required Length
0 mm	0% of Lw	$L_w - L_t$

Note: Lw = Specified Bond Length.

Note 1: Effective Bond Length is defined as $L_e = L_a - L_d$.

Where:

L_e = Effective Bond Length

L_a = Actual Bond Length

L_d = Combined Discontinuity Lengths

4 Manufacturing Process

4.1 Process Control. The source is responsible for establishing practices and test methods to assure that the criteria of this standard are met and are consistent with GMW15563 (for non-GM manufacturing facilities) and Process Quality Requirement System (PQRS) process control plan PCPB014 (for GM manufacturing facilities).

4.2 Adhesive Cure Control. The painting source is responsible for establishing practices and test methods to assure that the cure and/or post-cure cycle criteria are met and are consistent with the applicable material specifications. Process qualification must be documented and retained per the GM Record Retention Schedule (GMRRS).

5 Notes

5.1 Glossary.

Bond Line: Intermediate layer of adhesive used to connect substrates of similar or dissimilar materials.

Faying Surfaces: Pre-bonded pair of close-fitting surfaces that are to be connected.

Missing Bead: Bead not applied, complete absence of adhesive applied to entire joint bond line.

Post-Cure: State of adhesive after curing which occurs in the Electrodeposition Priming Operation (ELPO) oven.

Product Quality Standard (PQS): Measurable requirements for product characteristics which, when satisfied, ensure the product meets internal and external customer requirements, refer to GMS Operating Guidelines.

Skip: Complete absence of hem adhesive in a portion of the bond line or wet out length, see Figure 1.

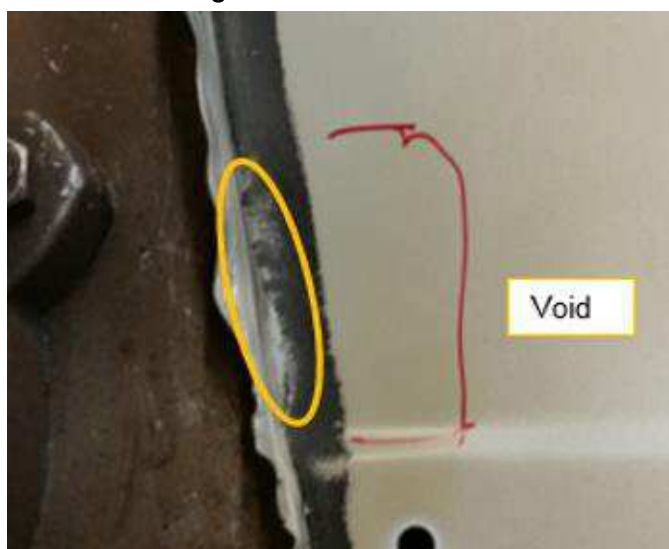
Figure 1: Skip Visual Aid



Source: The source is the facility installing or applying the hem adhesive.

Void: Partial absence of hem adhesive in a portion of the bond line or wet out length, see Figure 2.

Figure 2: Void Visual Aid



Wet Out: Pre-cure (before paint) foot print of adhesive surface area of each of the flanges in a joint the adhesive covers, see Figure 3.

Figure 3: Wet Out Visual Aids



5.2 Acronyms, Abbreviations, and Symbols.

ELPO	Electrodeposition Priming Operation
GMRRS	GM Record Retention Schedule
GMS	Global Manufacturing System
La	Actual Bond Length
Ld	Combined Discontinuity Lengths
Le	Effective Bond Length
Lt	Length Tolerance
Lw	Specified Bond Length
PQRS	Process Quality Requirement System
PQS	Product Quality Standard

6 Coding System

This standard shall be referenced in other documents, drawings, etc., as follows:

GMW17153

7 Release and Revisions

This standard was originated in March 2014. It was first approved by the GM Global Weld Council in October 2014. It was first published in October 2014.

Issue	Publication Date	Description (Organization)
1	OCT 2014	Initial publication.
2	JAN 2019	Added body hem criteria, updated definitions. Revised Applicability in 1.2 to cover "body panels" as well as closure panels. Updated wording in: 1.2, 1.4, 2.3, 3.1.3, 3.2.1, 3.3.1, 3.3.2, 3.3.3, 3.3.4, Table 1, 3.4, 3.4.1, 3.4.2, 4.1, 4.2, 5.1, Figure A4, Figure A5, Figure A6, Table B1, C1. Revised "repair procedures" to "repair methods" throughout. Updated Wet Out and Bond Line Usage (3.3.1 to 3.3.4). Updated repair for non-conforming hems (3.4.2). Added Table 2. Added definitions of: Missing bead, Post Cure, Void, Wet Out. Clarified Figure A5 for Closure Hem Adhesive Post Cure Application Targets. Revised Figure A5. Added Figure A6. Revised heading in Table B1. Renamed C1. Added Section C2. Revised Figure C6. Added Section C2. (Global Welding and Joining Council)