GM	WORLDWIDE ENGINEERING STANDARDS	Material Specification	GMW14085

Acceptance Criteria and Repair Procedures Mechanical Clinch Joining

1 Introduction

This standard addresses mechanical clinch joining of steel to steel, steel to aluminum and aluminum to aluminum.

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 procedure for circular mechanical clinches in automotive products for which GM is responsible for establishing or approving the product design.

1.2 Applicability. The criteria established in this specification become mandatory when referenced on a weld or assembly drawing. Deviation from any criteria provided in this specification must be identified on a weld design document or other product engineering design document.

1.2.1 Usage. Clinches are considered satisfactory when clinches meet the expected design service loads and satisfy functional performance requirements. The evaluation criteria contained in this document have been established as a basis for the manufacturing acceptance of clinched products and are the same for all clinches regardless of service load. Furthermore, clinches identified as discrepant often retain a percentage of their mechanical properties and may contribute to the integrity of the clinched product. Application of this specification for other uses, such as post-crash clinch quality assessment, may lead to erroneous results or conclusions.

1.2.2 Clarification. For clarification of this specification or editorial comments, email the GM Global Weld Council at weld.council@gm.com.

1.3 Remarks. Proposed changes to this standard must be presented to the GM Weld Council. To suggest a change to this standard, reference the “Procedure for Weld Standard Changes” on the Weld Council’s webpage.

2 References

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

2.1 External Standards/Specifications.

None

2.2 GM Standards/Specifications.

GMW14057 GMW14058 GMW15563

2.3 Additional References.

- GM Global Quality Requirements for Corrective Action and Nonconforming Material. GM Plants refer to GM to: https://gmweb.gm.com/quality/oq/QR/IQ_Global/default.aspx (Contact supplier quality for non-GM plants.)
- GM Record Retention Schedule (GMRRS); https://gmrrs.gm.com/GMRRS/ (Contact suppler quality for non-GM plants.)
- Process Quality Requirement System (PQRS) process control plans (for GM manufacturing facilities); https://pqrs.gm.com/secured/index.html (Contact supplier quality for non-GM plants.)

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3 Requirements

3.1 General Acceptance Criteria.

3.1.1 Categories of Clinches. There are two (2) categories of mechanical clinches: Structural Clinches and Process Clinches.

3.1.1.1 Structural Clinches. Structural clinches are required for performance of the clinched product. All clinches are structural unless noted as process clinches on the weld design document. Structural clinches shall be evaluated to the requirements of 3.1.2, 3.2.1, 3.3.1 and 3.3.2.

3.1.1.2 Process Clinches. Process clinches facilitate in-process assembly but are not required for structural performance of the product. Process clinches must be approved and identified on the weld design document by Product Engineering. Process clinches shall be evaluated to the requirements of 3.1.2.

3.1.2 Presence and Location. Clinches that are missing or placed outside the location tolerance indicated on the weld design document drawing are discrepant. If no location tolerance is specified, clinches may be located up to 10 mm from the position shown on the weld design document.

3.2 Visual Acceptance Criteria.

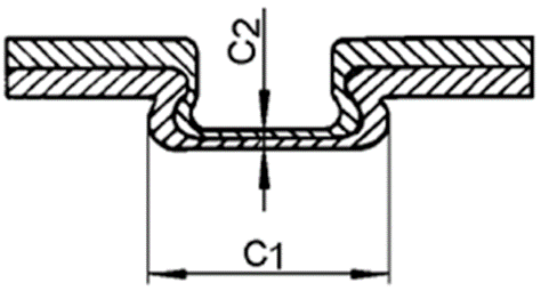
3.2.1 Cracks. Steel to steel clinches must not have any cracks in or around the clinch which are visible without the aid of magnification. Clinches which exhibit visible cracks in or around any clinches are discrepant. Steel to aluminum or aluminum to aluminum clinch crack acceptance criteria to be documented in either the product Statement of Requirements or on an approved Product Quality Standard (PQS).

3.2.2 Visual Appearance of Clinch. If the surface around the clinch appears distorted due to mis-alignment of the clinch tooling to the sheet metal, the process must be adjusted to correct the distortion.

3.3 Measurable Acceptance Criteria. Examples of measurement techniques can be seen in Appendix A, Figures A1 and A2.

3.3.1 Size. A clinch whose measured dimensions are within the specified range (determined from testing of the specified materials and thicknesses) is an acceptable clinch. The bottom thickness measurement (Figure 1, dimension C2) and the button diameter (Figure 1, dimension C1) are both to be measured to determine clinch acceptance. The acceptable specified measurement range is to be recorded on the Clinch Tool Data Sheet which is supplied by the clinch tool equipment manufacturer. Clinches which are outside the acceptable range are discrepant.

Figure 1: Clinch Weld Size Measurements



3.3.2 Edge Distance. The specified clinch button diameter must be contained within all edges of the sheet metal. A clinch is discrepant if the distance between the edge of the button and any edge of the sheet metal is less than the total material thickness of the joint.

3.3.3 Cross-Section Analysis. Cross-sectional analysis is required when there is an unresolved acceptance criteria issue. A typical mechanical clinch cross section is shown in Appendix A, Figure A3.

3.3.4 Test Coupon Strength. When the clinch test coupon strength (peel and/or shear strength) is < 85% of the value established by the equipment manufacturer, the process must be adjusted to increase the strength of clinch test coupons to a minimum of 90% of the initial established value.

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