



Weld Acceptance Criteria and Repair Procedures Drawn-Arc Welded Automotive Studs, Nuts and Brackets

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 weld acceptance criteria and repair methods for evaluating drawn-arc welded studs, nuts and brackets in automotive products for which GM is responsible for establishing or approving the product design.

1.2 Applicability. The criteria established in this standard become mandatory when referenced on a weld design document. Deviation from any weld criteria provided in this standard must be identified on a weld design document.

1.3 Remarks.

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

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

1.3.3 As used in this standard, the words “shall” and “must” denote a requirement; the word “should” denotes a guideline; and the word “may” denotes a choice.

2 References

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

2.1 External Standards/Specifications.

None

2.2 GM Standards/Specifications.

GMW14058

GMW15563

2.3 Additional References.

- GM Global Quality Requirements for Corrective Action and Nonconforming Material (ID)
- GM Information Lifecycle Management Policy (ID)

(ID) = This item is limited to internal use within General Motors and shall not be accessed outside this company. Contact the GM Lead Engineer for further instructions.

3 Requirements

3.1 General Acceptance Criteria. Not applicable.

3.2 Visual Acceptance Criteria.

3.2.1 Spatter. A drawn-arc welded fastener with weld spatter on its threaded section that interferes with the mating fastener does not conform.

3.2.2 Weld Eruption. A drawn-arc welded fastener with weld eruption that interferes with the installation of the mating part does not conform, see Appendix A, Figure A1.

3.2.3 Missing Fastener. A drawn-arc welded fastener that is missing does not conform.

3.2.4 Cracks. A drawn-arc welded fastener shall be free from detectable surface cracks that are visible (without the aid of magnification) within or adjacent to the weld. Welded fasteners exhibiting cracks do not conform.

3.2.5 Holes. A drawn-arc welded fastener that contains holes or burn-throughs in either the fastener or mating part does not conform.

3.3 Measurable Acceptance Criteria.

3.3.1 Fastener Location. A drawn-arc welded fastener positioned outside of the location tolerance specified on the weld design document does not conform. When no location tolerance is specified, a stud or bracket fastener > 2 mm from the indicated design location does not conform. When no location tolerance is specified, a fastener > 1 mm from the indicated design location does not conform.

3.3.2 Fusion of Weldable Area. A drawn-arc welded fastener (except T-stud) that does not indicate a minimum of 75% of the weldable area with fusion to the mating part does not conform. The measurable quality of a drawn-arc welded T-stud is acceptable when destructive testing pulls parent metal from the stud or the mating part, see Appendix A, Figures A4, A6, and A8.

3.3.3 Measurement of Fusion.

3.3.3.1 Drawn-Arc Studs. Fusion can be measured by destructive testing. When a stud is separated from its mating part by a tensile load or by an oscillating side-to-side motion (see Appendix A, Figure A7), a weld button will be pulled either on the head of the stud or on the mating part, see Appendix A, Figure A2. When destructive testing, if the stem of the weld stud separates from the weld stud head, the fusion is considered acceptable.

3.3.3.2 Drawn-Arc Nuts. Fusion can be measured by destructive testing. When a nut is separated from its mating part by a tensile load or by an oscillating side-to-side motion (see Appendix A, Figure A7), a weld button will be pulled either on the base of the nut or on the mating part, see Appendix A, Figure A6.

3.3.3.3 Drawn-Arc Brackets. Fusion can be measured by destructive testing. When a bracket is separated from its mating part by a tensile load or by an oscillating side-to-side motion (see Appendix A, Figure A7), a weld button will be pulled either on the bracket itself or on the mating part, see Appendix A, Figures A2 and A6.

3.3.4 Reduction in Weld Stem Size. A stud whose stem diameter is reduced by > 10% as a result of the welding process does not conform, see Appendix A, Figure A5.

3.3.5 Functional Height for T-Stud. T-studs that do not satisfy the functional height requirements of the mating part do not conform, see Appendix A, Figure A5.

3.3.6 Nondestructive Testing. A nondestructive test (proof-load) of the fasteners may be used to judge acceptability provided that a Measure of Agreement Study has been conducted and approved by the local Quality Department.

3.4 Disposition/Repair Procedure.

3.4.1 Conformance Criteria. Disposition of product nonconforming to this standard shall be handled in accord with GM Global Quality Requirements for Corrective Action and Nonconforming Material.

3.4.2 Repair Methods. Drawn-arc welded fasteners shall be repaired according to the repair methods shown in Appendix B, Table B1, unless other repair methods are specifically indicated and authorized by the responsible Product Engineer.

4 Manufacturing Process

4.1 Process Control. The welding 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 plans (for GM manufacturing facilities).

4.2 Process Qualification. All welding processes must be qualified (during initial weld verification or subsequent requalification). Process qualification must be documented and retained per GM Information Lifecycle Management policy.

5 Notes

5.1 Glossary.

Conform: To comply with the general, visual, and measurable criteria of this standard

Crack: A fracture type discontinuity characterized by a sharp tip and high ratio (length to width) of the opening displacement on the exterior surface.

Discrepant: Welds that are inconsistent with criteria in this specification.

Evidence of Fusion: Any measurable amount of fusion produced during the welding process, see Appendix A, Figure A8 for T-Studs.

Fastener: For the purpose of this standard, a drawn-arc welded stud, nut or bracket is referred to as a fastener.

Fusion: The melting together of a fastener and the base metal to produce a weld.

Measure of Agreement Study: An Engineering study that demonstrates that the nondestructive load applied is in excess of a load that would meet the minimum acceptable criteria of this standard but not destroy or distort the parts being tested. The Engineering study demonstrates that there is a relationship between load applied (torque, tensile, push-out, etc.) and the minimum acceptable criteria of this standard. This relationship is usually established by measuring the applied load (to failure) over an expected range of welding variables.

Non-Conforming: See Conform and discrepant.

T-Stud: An abbreviation for trim stud (e.g., part number 11611803), see Appendix A, Figure A3 and Figure A5.

Weld Button: That part of the weld that tears out in the destructive testing of the welded fastener, see Appendix A, Figure A2 and Figure A6.

Weld Design Document: A product document that describes welding requirements such as number of welds, location of welds, applicable weld standards, weld patterns, surface appearance classification, weld notes, etc. This document is released and approved by the appropriate Design Release Engineer.

Weld Eruption: Material that flows around and/or above the head of the stud as a result of the welding process, see Appendix A, Figure A1.

Weld Spatter: Weld expulsion metal that remains attached to an adjacent metal surface.

Weld Stud Head: That part of the weld stud that is fused to the mating part, see Appendix A, Figure A3.

Weld Stud Stem: That part of the weld stud that engages a mating part, see Appendix A, Figure A3.

5.2 Acronyms, Abbreviations, and Symbols.

CCRW	Controls, Conveyors, Robotics and Welding (GM Manufacturing Center)
GMAW	Gas Metal Arc Welding
GTAW	Gas Tungsten Arc Welding
PQRS	Process Quality Requirement System