

MIL-W-45211A(MR)

25 NOVEMBER 1961

SUPERSEDING

MIL-W-45211(Ord)

4 AUGUST 1961

MILITARY SPECIFICATION**WELDING, STUD, ALUMINUM****1. SCOPE**

1.1 Type of welding. This specification covers the welding of aluminum studs or similar parts to aluminum base materials (see 7.1).

2. APPLICABLE DOCUMENTS

2.1 The following documents of the issue in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein.

SPECIFICATIONS**MILITARY**

MIL-I-45208 — Inspection Requirements, General Specification for

STANDARDS**MILITARY**

JAN-STD-19 — Welding Symbols

MIL-STD-20 — Welding Terms and Definitions

(Copies of specifications, standards, drawings, and publications required by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

3. PROCEDURE REQUIREMENTS

3.1 Recorded welding procedure. Unless otherwise specified in the contract or order, the contractor, prior to production fabrication of any weldment, shall establish or have the manufacturer establish and record the cleaning and welding procedures to cover all welding to be performed under this specification. This information shall be prepared in duplicate on an approved form utilizing symbols and terms in accordance with Standards JAN-STD-19, MIL-STD-20, or as specified on the drawing. The cover sheet shall be signed by the manufacturer and the contractor. The recorded welding procedure shall be submitted to the procuring activity with the test records as specified in 5.6. Any changes in any of the factors listed in table I shall require revision of the recorded test procedure and repetition of the bend test.

3.2 Factors. The factors to be included in the welding procedure shall be as shown in table I.

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MIL-W-45211A(MR)**TABLE 1. Factors in the recorded welding procedure and changes requiring quality control test**

Factors to be included in recorded Welding procedure	Procedure changes requiring revised procedures and bend test
1. Base metal alloy composition	When a change in alloy or alloy composition outside the aluminum producer's declared chemical range is made.
2. Thickness range of base metal	When the thickness range is changed.
3. Stud alloy	When a change in alloy is made.
4. Stud design or size	When the design or cross-sectional area of the stud is changed.
5. Ferrule	When ferrules are added or removed.
6. Weld time range	When weld cycle range is changed.
7. Shielding gas	When changing from one inert gas to another, from one inert gas to a mixture of inert gases or from one mixture to another mixture of inert gases.
8. Shielding gas flow range	When a change in the declared flow range is made.
9. Stud welding gun	When a change in the type of gun or a modification in a specific type of gun is made.
10. Power source	When a change in type is made.
11. Stud and base metal cleaning	When method of cleaning is changed from the recorded methods in the welding procedure.
12. Welding current range	When current setting changes outside the declared range are made.
13. Type of current	When a change in type or polarity is made.
14. Pre-heat or post-heat treatment	When either factor is changed.

4. MATERIAL REQUIREMENTS

4.1 Base material. The base materials shall be aluminum alloys weldable by fusion welding.

4.1.1 Thickness of base material. Unless otherwise specified in the contract or order, the thickness of the base material to which the stud is to be welded shall not be less than 0.064 inch.

4.2 Stud material. Unless otherwise specified in the contract or order, stud material shall be commercial aluminum alloy capable of being fusion welded and complying with the minimum mechanical properties specified on the drawing or in the contract or order.

4.2.1 Diameter of stud material. Unless otherwise approved by the procuring activity, the diameter of the stud shall not exceed 1/2 inch.

4.3 Shielding gas. The inert gas shall be suitable for the welding of aluminum.

4.4 Surface preparation. The surfaces of the materials to be welded shall be cleaned

by a suitable method in order to remove all dirt, oils, and oxides in the weld area.

5. PREPRODUCTION REQUIREMENTS

5.1 Certification of recorded welding procedures. Prior to welding the first production assembly of each specific design, the contractor or the manufacturer, or both shall weld and test the welds in one assembly or simulated specimen under Government surveillance. The assembly or specimen shall be welded in accordance with the recorded welding procedure. This certification test shall be carried out on each welding machine that will be used for the production of weldments of each specific design.

5.2 Test requirements. Three test specimens shall be prepared for each welding procedure condition. Specimens shall simulate production conditions and each specimen shall contain one stud or similar part. Studs shall be tested in tension, torsion, or bending until failure occurs.

5.3 Test procedure. When a specific test is required on certain minimum mechanical properties are required, they will be indi-

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cated on the drawing, contract or order. Test methods for each different stud or similar part will be part of the welding procedure.

5.4 When studs are tested by bending, testing shall be carried out as specified in the contract or order or on the drawing. Bending may be facilitated by the use of tools so positioned that bending does not occur in the weld area.

5.5 **Visual examination of welded assembly or simulated specimens.** All welds shall be subject to visual examination to determine compliance with 6.4.1.

5.6 **Reporting of results.** The manufacturer shall record the results of this certification and shall submit copies of the results together with the recorded welding procedure through the contractor and contracting officer for review by the procuring activity.

5.7 **Rejection.** Failure of the welded assembly or simulated specimens to meet the requirements for visual examination (see 5.5) and for mechanical properties (see 5.2 and 5.3) shall result in the rejection of the recorded welding procedure.

6. PRODUCTION REQUIREMENTS

6.1 **Quality control.** The contractor shall establish or have the manufacturer establish and use the systematic quality control procedure specified in MIL-I-45208.

6.2 **Operations.** All stud welding operations shall be in accordance with the contractor's recorded welding procedure.

6.3 **Procedure inspection.** All welding operations shall be subject to inspection for compliance with the certified welding procedures and quality control procedures of the contractor and manufacturer.

6.4 **Weldment inspection.**

6.4.1 **Visual examination.** All welds shall be examined to insure that there is complete fusion and also to insure that there is no undercutting or other defect which indicates that the welds were made with improper procedures.

6.4.2 **Production test.** Production testing shall be conducted in accordance with requirements of section 5 and shall be carried out as follows:

- (a) At the start of each work shift.
- (b) After any part of the equipment has been repaired or adjustments made in the mechanical operation of the welding gun.
- (c) When the operator is changed.

7. NOTES

7.1 **Intended use.** The intended purpose of this specification is to cover stud welding of aluminum for mounting electrical line, gasoline line, small parts, etc., to the bodies of vehicles. Stud welding should not be used where high strength joints are required.

7.2 **Certification testing.** This certification test is intended to ascertain that the specific welding unit being used has the electrical and mechanical capacity to satisfactorily produce a particular weldment. This test need not be repeated so long as the design and materials of the part being welded remain unchanged, except as may be required by 6.1.

7.3 **Definitions.**

7.3.1 **Contractor.** As used in this specification, the term "contractor" is defined as the organization having a direct contract with the Government activity.

7.3.2 **Manufacturer.** The term "manufacturer" is defined as the organization actually performing the operations covered by this specification.

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Project No. M107-A019

Note. Review/User information is current as of the date of this document; draft circulation should be based on the information in the current DODISS.

SPECIFICATION ANALYSIS SHEET			Form Approved Budget Bureau No. 119-R004
<p style="text-align: center; margin: 0;"><u>INSTRUCTIONS</u></p> <p style="margin: 0; font-size: x-small;">This sheet is to be filled out by personnel either Government or contractor, involved in the use of the specification in procurement of products for ultimate use by the Department of Defense. This sheet is provided for obtaining information on the use of this specification, which will insure that suitable products can be procured with a minimum amount of delay and at the least cost. Comments and the return of this form will be appreciated. Fold on lines on reverse side, staple in corner, and send to preparing activity.</p>			
SPECIFICATION			
ORGANIZATION		CITY AND STATE	
CONTRACT NO.	QUANTITY OF ITEMS PROCURED	DOLLAR AMOUNT \$	
MATERIAL PROCURED UNDER A <input type="checkbox"/> DIRECT GOVERNMENT CONTRACT <input type="checkbox"/> SUBCONTRACT			
1. HAS ANY PART OF THE SPECIFICATION CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE? IF "YES", GIVE PARAGRAPH NUMBER AND WORDING.			
2. RECOMMENDATIONS FOR CORRECTING THE DEFICIENCIES			
3. COMMENTS ON ANY SPECIFICATION REQUIREMENT CONSIDERED TOO RIGID			
4. IS THE SPECIFICATION RESTRICTIVE? <input type="checkbox"/> YES <input type="checkbox"/> NO IF "YES", IN WHAT WAY?			
5. REMARKS (Attach any pertinent data which may be of use in improving this specification. If there are additional papers, attach to form and place both in an envelope addressed to preparing activity)			
SUBMITTED BY (Printed or typed name and activity)			DATE

DD FORM 1426

REPLACES NAVSHIPS FORM 4863, WHICH IS OBSOLETE

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