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Superseding AMS-STD-2219

Fusion Welding for Aerospace Applications

CANCELLATION NOTICE

This specification has been "CANCELLED" by the Aerospace Materials Division, SAE, as of September, 2002, and has been superseded by AWS D17.1, Specification for Fusion Welding for Aerospace Applications. The requirements of the latest issue of AWS D17.1 shall be fulfilled whenever reference is made to the cancelled AMS-STD-2219. By this action, this document will remain listed in the Numerical Section of the Index of Aerospace Material Specifications, noting that it is superseded by AWS D17.1.

Cancelled specifications are available from SAE. Copies of AWS D17.1 are available from AWS, 550 NW LeJeune Road, Miami, FL 33126, or URL www.aws.org.

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NOTICE

This document has been taken directly from U.S. Military Specification MIL-STD-2219 and contains only minor editorial and format changes required to bring it into conformance with the publishing requirements of SAE technical standards. The initial release of this document is intended to replace MIL-STD-2219. Any part numbers established by the original specification remain unchanged.

The original Military Specification was adopted as an SAE standard under the provisions of the SAE Technical Standards Board (TSB) Rules and Regulations (TSB 001) pertaining to accelerated adoption of government specifications and standards. TSB rules provide for (a) the publication of portions of unrevised government specifications and standards without consensus voting at the SAE Committee level, and (b) the use of the existing government specification or standard format.

Under Department of Defense policies and procedures, any qualification requirements and associated qualified products lists are mandatory for DOD contracts. Any requirement relating to qualified products lists (QPL's) has not been adopted by SAE and is not part of this SAE technical document.

FOREWORD

This document supersedes MIL-W-8604A, Welding, Fusion; Aluminum Alloys; Process and Performance of; MIL-W-8611A, Welding, Fusion; Steel and Corrosion and Heat Resistant Alloys; Process and Performance of; and MIL-W-18326, Welding of Magnesium Alloys, Gas and Arc, Manual and Machine Processes for. The purpose of MIL-STD-2219 is to standardize the requirements for fusion welding of metals used for the aerospace community.

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1. SCOPE:

1.1 Purpose:

The purpose of this document is to provide minimum requirements for weld filler materials, workmanship, inspection and record requirements for fusion welding of alloys applicable to aircraft, missiles, other aerospace equipment, their parts and accessories.

1.2 Processes:

Fusion welding shall be accomplished using one of the following processes.

Flux Cored Arc Welding (FCAW)
Gas Metal Arc Welding (GMAW)
Gas Tungsten Arc Welding (GTAW)
Oxyfuel Welding (OFW)
Plasma Arc Welding (PAW)
Submerged Arc Welding (SAW)
Shielded Metal Arc Welding (SMAW)

1.3 Classification:

The welds shall be of the following classes:

Class A
Class B
Class C

These classifications refer only to the levels of inspections required and to the quality standard levels applied as outlined in Section 5 and Table 5-4. Clarification of classes is given in 3.3.

1.4 Requirements and information:

This document contains both mandatory requirements and guidance information. The mandatory requirements indicated by the words "shall" or "is required" are designed to serve as standards applicable to materials, workmanship, inspection, and quality control. Guidance information is indicated either by the words "should" or "may".

1.5 References within this document:

References in this document to a particular paragraph or section number of this document shall include all applicable subparagraphs under that paragraph or section number. For example, a reference to paragraph 4.4 shall include subparagraphs 4.4.1, 4.4.2, 4.2.4.1, etc.

2. APPLICABLE DOCUMENTS:

The following publications, 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.

2.1 SAE Publications:

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

AMS 2815	Identification, Welding Wire, Line Code System
AMS 2816	Identification, Welding Wire, Color Code, System

2.2 U.S. Government Publications:

Available from DODSSP, Subscription Services Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 1911-5094.

BB-A-106	Acetylene
BB-C-101	Carbon dioxide
BB-H-886	Hydrogen
BB-H-1168	Helium
BB-O-925	Oxygen
BB-N-411	Nitrogen

MIL-A-18455	Argon, Technical
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MIL-STD-105	Sampling Procedures and Tables for Inspection by Attributes
MIL-STD-410	Nondestructive Testing Personnel Qualification and Certification
MIL-STD-453	Inspection, Radiographic
MIL-STD-1595	Aerospace Welder Performance Qualification
MIL-STD-1949	Inspection, Magnetic Particle
MIL-STD-2154	Ultrasonic Inspection, Requirements for
MIL-STD-6866	Inspection, Penetrant Method of

2.3 ASTM Publications:

Available from ASTM, 100 Barr Harbor, West Conshohocken, PA 19428-2959.

ASTM B 600	Recommended Practice for Descaling and Cleaning Titanium and Titanium Alloy Surfaces
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2.4 AWS Publications:

Available from American Welding Society, P.O. Box 351040, Miami, FL 33135.

AWS A2.4	Symbols for Welding and Nondestructive Testing
AWS A3.0	Welding Terms and Definitions
AWS B2.1	Welding Procedure and Performance Qualification

2.5 CGA Publications:

Available from Compressed Gas Association, Inc., Crystal Gateway 1, Suite 501, 1235 Jefferson Davis Highway, Arlington, VA 22202.

CGA G1.1	Commodity Specification for Acetylene
CGA G4.3	Commodity Specification for Oxygen
CGA G5.3	Commodity Specification for Hydrogen
CGA G6.2	Commodity Specification for Carbon Dioxide
CGA G9.1	Commodity Specification for Helium
CGA G10.1	Commodity Specification for Nitrogen
CGA G11.1	Commodity Specification for Argon

2.6 Order of precedence:

In the event of a conflict between the text of this standard and the references cited herein, the text of this standard takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. DEFINITIONS:

3.1 Acronyms:

The acronyms and letter designations used in this standard are defined as follows:

DCAS	- Defense Contract Administration Service
FCAW	- Fluxcored Arc Welding
GMAW	- Gas Metal Arc Welding
GTAW	- Gas Tungsten Arc Welding
HAZ	- Heat-affected-zone
NDE	- Nondestructive Examination
OFW	- Oxyfuel Welding
PAW	- Plasma Arc Welding
PQR	- Procedure Qualification Record
SAW	- Submerged Arc Welding
SMAW	- Shielded Metal Arc Welding

3.2 General definitions:

Unless otherwise defined herein, welding terms, definitions and symbols shall conform to AWS A2.4 and AWS A3.0.

3.3 Clarification of classes:

In this document, the classes detail what inspections are applicable and the allowable defect limits. It is up to the cognizant engineering organization to specify the inspections required for part after an assessment of part criticality is determined. The following clarification is given for information only to assist the design activity and is not mandatory.

Class A: Critical application. A weldment is critical where a failure of any portion would cause loss of system, loss of major component, loss of control, unintentional release of critical stores, or endangering of personnel.

Class B: Semi-critical application. A weldment is semi-critical when a failure would reduce overall efficiency of the system but loss of the system or endangering of personnel would not be experienced.

Class C: Non-critical application. A weldment is non-critical where a failure would not affect the efficiency of the system or endanger personnel.

When the class is not specified in the contract or on the drawing, Class A shall apply.

3.4 Acceptable:

Complies with or conforms to the applicable standard or specification.

3.5 Arc strike:

Any inadvertent localized heat-affected-zone (HAZ) or change in the contour of the finished weld or adjacent base metal resulting from an arc or heat generated by the passage of electrical energy between the surface of the finished weld or base metal and a current source, such as welding electrodes or magnetic inspection prods.

3.6 Buttering or build-up:

The deposition of filler metal on a base metal surface to restore base material or weld surface dimensions, or to interpose a layer of weld metal on the material surface of the joint prior to joining the material members together.

3.7 Cognizant engineering organization:

The engineering organization responsible for the design of the welded assembly. (See 6.5)

3.8 Finished weld:

Welds which have received final inspection and have been accepted.

3.9 Government representative:

Any Government representative specifically authorized to approve equipment, material, or procedures within the scope of this document. They can be, but are not limited to, the following:

- a. Contracting Officer
- b. DCAS
- c. AFPRO
- d. NAVPRO

There is no priority to this list. The contract shall specifically identify the designated Government representative.

3.10 Inspector:

Contractor, DCAS, and other Government representative qualified to accept or reject materials or workmanship.

3.11 Qualification:

Conformance to the stated requirements of a document.

3.12 Qualified welder/welding operator:

Any person who has met the requirements of MIL-STD-1595.

4. GENERAL REQUIREMENTS:**4.1 General requirements:**

The purpose of these qualification requirements is to ensure that qualified procedures are used by properly trained and qualified personnel. It shall be the responsibility of the contractor to ensure that only qualified personnel, procedures, and nondestructive test equipment are used in fabrication and inspection necessary to comply with this document. Procedures and personnel previously qualified or approved shall not require requalification provided that qualifications are appropriate for the production welding to be done and have not lapsed, and provided that qualification records are available to substantiate prior qualification or approval.