The Engineering Society For Advancing Mobility Land Sea Air and Space®
INTERNATIONAL
400 Commonwealth Drive, Warrendale, PA 15096-0001

AEROSPACE STANDARD

SAE AS7110/3

Issued 1995-03

Submitted for recognition as an American National Standard

NATIONAL AEROSPACE AND DEFENSE CONTRACTORS ACCREDITATION PROGRAM REQUIREMENTS FOR ELECTRON BEAM WELDING

1. SCOPE

This Aerospace Standard (AS) is to be used to supplement AS7110. In addition to the requirements contained in AS7110, the requirements contained herein shall apply to suppliers seeking NADCAP accreditation for electron beam welding.

2. REFERENCES

2.1 SAE Publications:

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

AS7110 National Aerospace and Defense Contractors Accreditation Program (NADCAP) - Requirements for Welding

3. REFERENCE REQUIREMENTS

3.1 Applicable customer specifications shall be available at the facility.

4. MATERIAL/MATERIALS CONTROL

4.1 Base materials shall be as specified in applicable part drawings.

4.2 When required, filler metals shall be as specified on part drawings or customer specifications.

4.3 Cleaning materials, chemical solvents, or etching solutions shall be as specified on part drawings or certified/qualified welding procedures/schedules.

4.4 Unless otherwise approved by procedure certification, all back-up materials used to absorb residual electron beam energy shall be the same alloy as the part being welded.

5. EQUIPMENT CONTROL

5.1 The electron beam (EB) equipment shall be capable of producing welds meeting customer specifications. (Equipment conforming to NAS 976 is accepted as meeting this requirement.)

5.2 Equipment shall be qualified in accordance with applicable customer specifications if required.

5.3 All holding fixtures shall be capable of maintaining the desired configuration and tolerances during welding, providing back-up as required, and allowing the required work space between the workpiece and the gun.

5.4 Tooling shall be within 6 in of the joint and/or beam path, non-magnetic, or degaussed to acceptable limits.

5.5 Ferromagnetic materials and tooling, prior to welding, shall be degaussed to a level established by procedure certification.

6. QUALIFICATION OF WELD PROCEDURE/SCHEDULE

6.1 Weld procedures/schedules shall:

a. Identify those parameters specified by appropriate customer specifications
b. Be qualified in accordance with applicable customer specifications prior to production welding
c. Be requalified after failed test welds
d. Be requalified when a change is made in essential parameters

7. PROCESS CONTROL

7.1 Preparation

7.1.1 Joints shall be prepared in accordance with applicable specifications, drawings, or work instructions.

7.1.2 Edges shall be machined square and parallel to assure proper fit-up.

7.1.3 Joints shall be deburred after machining without rounding off the edges.

7.1.4 The faying surfaces of joints shall have a surface texture not greater than 125 microinches unless otherwise specified.

7.1.5 When specified, witness lines or features shall be applied in accordance with part drawings.

7.1.6 When run-on/run-off tabs are used, they shall be the same alloy as the part being welded.

7.1.7 When run-on/run-off tabs are used, they shall be removed after welding in such a manner as to prevent damage.

7.1.8 Surfaces of parts to be welded shall be prepared using chemical and/or mechanical cleaning or combinations thereof as applicable in accordance with customer requirements to the alloy being welded.

a. Welding shall commence within 40 hours of surface preparation, unless otherwise specified.
b. After surface preparation, parts shall be handled in the joint area with clean, lint-free gloves and covered or otherwise protected to prevent contamination.

7.1.9 Jigs, fixtures, and measuring devices shall be free of scale, grease, protective coatings, oxides, dust, oil, and other foreign matter detrimental to the welding process.

7.1.10 Gaps for production welds shall be equal to or less than those used for procedure/schedule certification.

7.2 Production Welding

7.2.1 EB welding shall be performed by operators qualified in accordance with applicable customer specifications.

7.2.2 EB welding shall be performed in a vacuum of 10^{-4} TORR or better.

7.2.3 The chamber shall be vented not less than two minutes after completion of welding.

7.2.4 Each weld shall be traceable to the date of welding and the welding operator.

7.2.5 For each arc-out, the location and reason (if known) shall be recorded.

7.2.6 Tack welding of details shall be accomplished by EB welding only and tack welds shall become a part of the finished weld if required.

7.2.7 Production parts shall be welded using an approved weld procedure/schedule.

7.3 Post-Treatment

7.3.1 Machining of face surface, root surface, or both shall be performed in accordance with specification and weld schedule.

7.3.2 Parts requiring heat treatment shall be processed in accordance with part drawings and specifications.

8. INSPECTION AND ACCEPTANCE CRITERIA

8.1 All welds, shall be visually examined at required minimum magnification or greater and shall meet the requirements of applicable customer specification.

8.2 When NDT is specified, it shall be performed and documented in accordance with applicable customer specification.

8.2.1 When NDT is specified, acceptance criteria shall be in accordance with customer requirements.

8.3 In-process control tests shall be performed in accordance with applicable customer specifications, if required.