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

AEROSPACE STANDARD

SAE AS7110 | REV. B

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Superseding AS7110A

NATIONAL AEROSPACE AND DEFENSE CONTRACTORS ACCREDITATION PROGRAM REQUIREMENTS FOR WELDING/BRAZING

1. SCOPE

This Aerospace Standard (AS) establishes the requirements for suppliers of Welding/Brazing Services to be accredited by the National Aerospace and Defense Contractors Accreditation Program (NADCAP). These requirements may be supplemented by additional requirements specified by NADCAP Welding Task Group. Using the audit checklist (AC7110) will ensure that accredited Welding/Brazing suppliers meet all of the requirements in this standard and all applicable supplementary standards.

2. REFERENCES

2.1 SAE Publications

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15086-0001.

AS7001	National Aerospace and Defense Contractors Accreditation Program (NADCAP) - Program Description
AS7002	National Aerospace and Defense Contractors Accreditation Program (NADCAP) - Rules for Implementation
AS7003	National Aerospace and Defense Contractors Accreditation Program (NADCAP) – Program Operation
AS7110/1	National Aerospace and Defense Contractors Accreditation Program (NADCAP) – Requirements for (Torch & Induction) Brazing
AS7110/2	National Aerospace and Defense Contractors Accreditation Program (NADCAP) – Requirements for Flash Welding
AS7110/4	National Aerospace and Defense Contractors Accreditation Program (NADCAP) – Requirements for Spot, Seam Resistance, and Projection Welding
AS7110/5	National Aerospace and Defense Contractors Accreditation Program(NADCAP) – Requirements for Fusion Welding

AS7110/6	National Aerospace and Defense Contractors Accreditation Program (NADCAP) - Requirements for Laser Welding
AS7110/7	National Aerospace and Defense Contractors Accreditation Program (NADCAP) - Requirements for Friction/Inertia Welding
AS7110/8	National Aerospace and Defense Contractors Accreditation Program (NADCAP) – Requirements for Diffusion Welding
AS7110/9	National Aerospace and Defense Contractors Accreditation Program (NADCAP) – Requirements for Percussion Stud Welding
AS9000	Aerospace Basic Quality System Standard
AS9100	Quality Systems - Aerospace - Model for Quality Assurance in Design, Development, Production, Installation and Servicing

2.2 PRI Documents

Available from Performance Review Institute, 161 Thornhill Road, Warrendale, PA 15086-7527**.**

3. GENERAL QUALITY SYSTEM

The supplier's quality system shall be approved by one of the following:

a. NADCAP approval to PRI AC7004.
b. Certification/registration program recognized by NADCAP. Compliance with the requirements of AS9000 is required to support the NADCAP Welding Accreditation process.

3.1 Quality Policy

3.1.1 There shall be a documented quality system in place.

3.1.2 Management shall establish a documented, comprehensive quality policy.

3.1.3 The quality system shall be reviewed at least annually by upper level management and reviews shall be documented.

3.2 Organization

3.2.1 A formal organization chart shall exist that defines the organizations within the company.

3.2.2 The quality organization shall be functioning and without longstanding vacancies.

3.2.3 Documented audits of the quality system, process and/or product shall be carried out by personnel independent of those having direct responsibility for the work being performed.

3.3 Quality System

3.3.1 Documentation shall support that the details of the quality system are thoroughly implemented.

3.3.2 One of the goals of the quality system shall be continuous improvement of the welding / brazing processes.

3.3.3 Procedures and/or other instructions shall conform to a written system of revision control.

3.3.4 Employees shall perform their jobs in conformance with applicable procedures.

3.4 Communications

3.4.1 There shall be a policy that specifies continuous two-way communications between management and employees including solicitation, review, and acknowledgement of employee suggestions and comments.

3.5 Contract Review

3.5.1 Written procedures shall exist to assure that contractual requirements flow down internally and to sub-tier suppliers.

3.5.2 There shall be a documented review system for inquiries, requests for quotations, contracts, purchase orders, or other media that flow down contractual requirements.

3.5.3 Written procedures shall require review of purchase orders and purchase order amendments to assess ability to conform to requirements.

3.5.4 The review shall assure that all quality and technical requirements are identified and documented.

3.5.5 Procedures shall require incorporation of quality requirements in the planning of each job before entering the process.

3.5.6 Procedures shall ensure that the documentation requirements are included on job

orders entering the production system.

3.5.7 Records shall indicate that the contract review procedure is followed.

3.6 Purchasing

3.6.1 Written procedures shall provide for the selection of sub-tier suppliers on the basis of their ability to meet contract requirements.

3.6.2 Procedures shall exist that require flow down of customer's requirements to sub-tier suppliers.

3.6.3 Procedures shall require the use of customer approved suppliers/materials when required.

3.6.4 The supplier selection process shall take into consideration the supplier's previous record of performance and demonstrated capability, including the effective correction of quality system and product related nonconformances.

3.6.5 Procedures shall afford the purchaser the right to verify, at source or delivery, the quality of purchased products and services.

3.6.6 There shall be a documented procedure for verification of raw material, including filler material, to the contractual requirements.

3.6.7 Records shall indicate that the procedures are followed.

3.7 Receiving

3.7.1 Written procedures shall exist for receiving inspection.

3.7.2 Receiving discrepancies shall be brought to the attention of customer/sub-tier supplier immediately.

3.7.3 Written procedures shall require that customer documents are attached to jobs and remain traceable to those specific jobs throughout processing when required.

3.7.4 Records shall indicate that the procedures are followed.

3.8 Product Identification and Traceability

3.8.1 Procedures shall provide for identification of parts and inspection and test/inspection samples (traceable to the applicable drawings, specifications, or other documents) during all stages of processing and delivery.

3.8.2 An examination of in-process parts/samples shall indicate conformance to the procedure.

3.8.3 Marking methods shall be compatible with base metal and customer specifications.

3.8.4 The procedure shall address the verification, storage, and maintenance of customer supplied products and materials and provide for immediate notification to the customer in event that product and materials are lost, damaged, and found unsuitable for use.

3.9 Stamp and Signature Control

3.9.1 Inspection stamps or other methods shall be used to identify inspection status

3.9.2 There shall be a written procedure for stamp or signature control that provides for control of issuance of stamps and/or authorized signatures.

3.9.3 A record shall be maintained showing stamps issued or authorized signatures, date of issue or authorization and to whom stamps were issued or signatures authority was granted.

3.9.4 Appropriate actions shall be included in the stamp/signature control procedure covering lost, mutilated, or worn stamps, reassigned stamps, bond time and removal of stamp or signature authority.

3.10 Control of Nonconforming Parts

3.10.1 There shall be written procedures to control identification, documentation, evaluation, segregation and disposition of nonconforming product including notification of the internal organizations and the customer.

3.10.2 Documents shall support that the nonconforming material is handled in accordance with the procedure.

3.10.3 Records shall support that all repairs are authorized by the customer.

3.10.4 Documentation shall support that all rework is authorized by the customer if required.

3.10.5 There shall be a written procedure for timely notification to customer of nonconforming material that has been shipped without prior customer approval.

3.11 Corrective Action

3.11.1 Procedures shall be established and maintained requiring the determination of the cause of all nonconformances and the implementation of corrective action needed to prevent recurrence.

3.11.2 The supplier shall periodically evaluate the history of nonconforming parts, the cause of each nonconformance, and the corrective actions to determine that the goal of reducing the frequency of nonconformance is being achieved.

3.12 Statistical Methods

3.12.1 If SPC is implemented, there shall be documented evidence that the SPC or process improvement programs have improved process yield since implementation.

3.12.2 If SPC is not implemented, the supplier shall have a plan to implement a SPC or a process improvement program.

3.12.3 For reaccreditation, the milestones of the plan shall have been met.

3.13 Internal Quality Audits

3.13.1 Written procedures shall require periodic internal audits that systematically evaluate compliance with all specifications, standards, and procedures.

3.13.2 The results of the internal audits shall be documented, reviewed, and acted upon by management.

3.13.3 Written procedures shall require work station audits to verify compliance to weld/braze schedules.

3.14 Sampling Plans

3.14.1 When allowed by the customer, the supplier shall have an established procedure for an internal standard sampling plan for inspection.

3.14.2 Records shall indicate that random samples are taken in accordance with the customer approved or specified sampling plan.

3.15 Inspection/Acceptance/Rejection Standards

3.15.1 Inspection instructions shall identify appropriate customer acceptance/rejection criteria.

3.15.2 When acceptance/rejection criteria does not exist provisions shall be made to contact the customer.

3.15.3 Records shall indicate that acceptance/rejection are based on criteria specified.

3.15.4 Brazed or welded joints shall be visually inspected by a trained inspector/personnel in accordance with customer requirements.

3.16 Test Reports and Records

3.16.1 Test/inspection results shall be recorded on or traceable to the documentation (traveler) that accompany the parts through processing.

3.16.2 Procedures shall specify periodic review of test results as part of a continuing program to improve product quality.

3.16.3 A written procedure shall specify record retention times if not specified by the customer.

3.16.4 There shall be provisions to accommodate unique record retention times when specified by the customer.

3.16.5 The procedure for records shall identify the types of records to be maintained, how they are identified, and the environmental conditions to prevent loss or deterioration.

3.17 Fixtures and Tools

3.17.1 Written procedures shall require that specially designed tools and fixtures are used for the specific parts they are designed for.

3.17.2 Records shall indicate that procedures are followed.

3.18 Training

3.18.1 There shall be a written procedure for the training of welders, brazers and inspectors to conform to contract requirements.

3.18.2 Records shall indicate that training is scheduled and attended as required.

3.18.3 Inspection personnel shall be trained in accordance with customer requirements.

4. QUALITY PLANNING

4.1 Job Documentation

4.1.1 Written procedures shall require that work instructions detailing each operation accompany each job.

4.1.2 Written procedures shall require traceability to the parts (e.g., by part number), when required.

4.1.3 The in-process documentation shall include process status, inspection status, engineering changes, drawing revisions, and all other relevant information.

4.2 Change Control System

4.2.1 Documents shall be reviewed and approved for accuracy by authorized personnel prior to issue and/or appropriately marked and identified.

4.2.2 Procedures shall ensure that the pertinent issues of appropriate documents are available and accessible at all locations where operations essential to the effective functioning of the quality system are performed.

4.2.3 Procedures shall ensure that obsolete or illegible documents are promptly removed and/or appropriately marked from all points of issue or use.

4.2.4 Changes shall be identified, where practicable, in the document or in appropriate attachments, historically maintained, and made only through the authorized release system.

4.2.5 A document control procedure shall be established to identify the applicable revision of documents to preclude the use of nonapplicable documents.

4.2.6 The procedures shall assure compliance with contract requirements for proposing, approving, and implementing engineering changes.

4.2.7 The procedures shall clearly delineate the supplier's responsibility for change control with sub-tier suppliers.

4.3 Measuring and Test Equipment

4.3.1 Calibration procedures shall be established, documented, and maintained to describe the following:

a. Identification number
b. Frequency of checks
c. Assurance that the inspection, measuring, and test equipment is capable of the necessary accuracy and precision.
d. Provisions for the supplier to maintain and provide a written description of the calibration system, covering measuring and test equipment, calibration intervals, sources of calibration, environmental conditions and measurement standards (including a list of measurement standard sources of calibration) that are traceable to the National Institute of Standards and Technology (NIST) or other recognized measurement standard organization.

4.3.2 Procedures shall require and supporting records shall show an individual record of calibration for each item, including date of certification, results of last calibration (variable data), and any out-of-tolerance conditions.

4.3.3 Calibration intervals shall be based upon stability, purpose, degree of usage, and customer requirements.

4.3.4 The results of previous calibration shall be used to adjust calibration intervals.

4.3.5 Calibration standards shall be traceable to NIST or other recognized standards, and the report or data sheet shall attest to the date, accuracy, and conditions of calibration including environmental conditions.

4.3.6 The calibration system shall provide for a gage identification method indicating, as a minimum, the date of last calibration, the date of next calibration, recall procedures and records assuring adherence to the calibration schedule.

4.3.7 Calibration records shall reflect traceability to the device being calibrated, personnel performing calibration, reference standards, and procedures used

4.3.8 The documentation shall define a "significant out-of-tolerance condition". There shall be a system in place to notify users and customers when this is exceeded.

4.3.9 The procedures shall make provision for the calibration and control of inspection, measuring and test equipment that is on loan, provided by the customer, or employee owned.

4.3.10 Requirements for tamper resistant seals shall be identified and used as prescribed.

4.3.11 Items that are not calibrated to their capability or which have other limitations of use shall be identified as such to preclude their use for acceptance of articles.

4.4 Process Control

4.4.1 Written procedures shall ensure that parts are processed/welded/brazed in conformance with applicable customer specifications.

4.4.2 Records shall indicate that the procedures are followed.

4.5 Automated Processes and Recordings

4.5.1 Where automated welding / brazing processes and/or record-keeping are used, there shall be a written system in effect to assure the integrity of the process and records

4.5.2 Written procedures shall include a method of ensuring electronic/magnetic programs cannot be altered without authorization.

4.5.3 Written procedures shall include a method of ensuring that electronic/magnetic records cannot be altered.

5. MATERIAL HANDLING AND PROTECTION

5.1 Corrosion/Mechanical Damage Protection

5.1.1 Written procedures shall ensure proper handling, packaging, and corrosion protection of parts.

5.1.2 Records shall indicate that the procedure is followed.

5.2 Lot Integrity

5.2.1 Written procedures shall specify how lots and sub-lots of identical parts are to be identified to preclude mixing and ensure lot integrity.

5.2.2 Travelers or other documentation, both completed and in-process, shall demonstrate the procedures are followed.

5.3 Housekeeping

5.3.1 The supplier representative shall state that they comply with safety and health requirements that are stipulated by international, federal, state, and local governments and or customer requirements.

5.4 Temperature Control

5.4.1 Welding procedure shall identify pre-, interpass, and post-weld thermal treatments as required.

5.4.2 Written procedures shall specify the method for determining heat-up time or start of soaking time, and cooling rate.

5.4.3 Temperature indicating devices shall be capable of measuring with the required precision.

5.4.4 When metal temperature is specified, records shall demonstrate that the metal was at the designated temperature for the specified time.