

Submitted for recognition as an American National Standard

NATIONAL AEROSPACE AND DEFENSE CONTRACTORS
ACCREDITATION PROGRAM
REQUIREMENTS FOR COATINGS

1. SCOPE

This Aerospace Standard (AS) establishes the requirements for suppliers of coatings services to be accredited by the National Aerospace and Defense Contractors Accreditation Program (NADCAP) in accordance with SAE AS7003. The requirements contained herein may be supplemented by additional requirements specified by NADCAP Coatings Task Group. Using the audit checklist (AC7109) will ensure that accredited Coatings 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
- AS7101 National Aerospace and Defense Contractors Accreditation Program (NADCAP) - Materials Testing Laboratories
- AS7109/1 National Aerospace and Defense Contractors Accreditation Program (NADCAP) - Requirements for Thermal Spray

SAE Technical Standards Board Rules provide that: "This report is published by SAE to advance the state of technical and engineering sciences. The use of this report is entirely voluntary, and its applicability and suitability for any particular use, including any patent infringement arising therefrom, is the sole responsibility of the user."

SAE reviews each technical report at least every five years at which time it may be reaffirmed, revised, or cancelled. SAE invites your written comments and suggestions.

SAE AS7109

2.1 Continued

- AS7109/2 National Aerospace and Defense Contractors Accreditation Program (NADCAP) - Requirements for Vapor Deposit
- AS7109/3 National Aerospace and Defense Contractors Accreditation Program (NADCAP) - Requirements for Cementation Processes
- AS7109/4 National Aerospace and Defense Contractors Accreditation Program (NADCAP) - Requirements for Stripping
- AS7109/5 National Aerospace and Defense Contractors Accreditation Program (NADCAP) - Requirements Coating Evaluation Laboratory Practices
- AS7109/6 National Aerospace and Defense Contractors Accreditation Program (NADCAP) - Requirements for Plating of Coated Parts
- AS7109/7 National Aerospace and Defense Contractors Accreditation Program (NADCAP) - Requirements for Heat Treating for Suppliers of Coatings

2.2 PRI Publications

Available from Performance Review Institute, 163 Thornhill Road, Warrendale, PA 15086-7527.

- AC7109 NADCAP - Audit Criteria for Coatings
- AC7109/1 NADCAP - Audit Criteria for Thermal Spray
- AC7109/2 NADCAP - Audit Criteria for Vapor Deposit
- AC7109/3 NADCAP - Audit Criteria for Cementation Processes
- AC7109/4 NADCAP - Audit Criteria for Stripping
- AC7109/5 NADCAP - Audit Criteria for Coating Evaluation Laboratory Practices
- AC7109/6 NADCAP - Audit Criteria for Plating of Coated Parts
- AC7109/7 NADCAP - Audit Criteria for Heat Treating for Suppliers of Coatings

2.2 U.S. Government Publications

Available from DODSSP Subscription Services Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

MIL-STD-45662 Calibration Systems Requirements

3. GENERAL QUALITY SYSTEM

The NADCAP Coatings Task Group recognizes SAE AS7004, SAE AS7106, and SAE AS7107 as equivalent to portions of this document with exceptions as noted in the NADCAP Auditor Handbook.

SAE AS7109

3.1 Quality Policy

- 3.1.1 There shall be a system in place regarding management's establishment of a comprehensive quality policy.
- 3.1.2 The quality policy shall be reviewed at least annually by the president or other top location managers, and actions shall be taken to correct any deficiencies.

3.2 Organization

- 3.2.1 A formal organization chart shall exist that defines the organizations within the company, the responsibility and authority of the quality organization, and its relationship with other organizations within the company.
- 3.2.2 Internal audits of the quality system, processes 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 One of the goals of the quality system shall be continuous improvement by reduction of process variation.
- 3.3.2 Procedures and other instructions shall conform to a written system of revision control.

3.4 Communications

- 3.4.1 There shall be evidence of on-going communications between management and employees including solicitation, review, and acknowledgement of employee suggestions and comments.

3.5 Contract Review & Process Planning

- 3.5.1 Procedures shall exist for review of inquiries, requests for quotation, purchase orders, and contracts by all appropriate personnel.
- 3.5.2 Procedures shall assure the supplier's ability to conform to requirements.
- 3.5.3 Procedures shall assure that the quality and technical requirements are included on job orders entering the production system.
- 3.5.4 Procedures shall ensure that the supplier is working to correct revision levels, drawings, specifications, etc.
- 3.5.5 Records shall indicate that the procedures are followed.

SAE AS7109

- 3.6 Job Documentation
- 3.6.1 Procedures shall require that documentation (e.g., traveler) detailing each operation accompany each job.
- 3.6.2 Procedures shall require traceability from the documentation to the parts (e.g., by part number, order, lot, etc.).
- 3.6.3 In-process documentation shall include process status and inspection status.
- 3.7 Drawings, Documentation, and Changes
- 3.7.1 Procedures shall be established and maintained to control all documents and data related to product quality.
- 3.7.2 The supplier shall have a procedure for a formal approval and release system for controlled documents whether maintained manually or electronically.
- 3.7.3 Procedures shall ensure that the pertinent issues of appropriate documents are available at all locations where operations essential to the effective functioning of the quality system are performed.
- 3.7.4 Procedures shall ensure that obsolete or illegible documents are promptly removed and/or appropriately marked from all points of issue or use.
- 3.7.5 Changes shall be:
- a. Identified, where practicable, in the document or in appropriate attachments
 - b. Historically maintained
- 3.7.6 A master list or equivalent document control procedure shall be established to identify the current revision of documents to preclude the use of nonapplicable documents.
- 3.7.7 The procedures shall assure compliance with contract requirements for proposing, approving, and implementing engineering changes.
- 3.7.8 When customer approved fixed processes are in place, process changes shall be made only after approval by the cognizant customer organization.
- 3.8 Purchasing - Source Selection
- 3.8.1 Procedures shall provide for the selection of suppliers on the basis of their ability to meet requirements.

SAE AS7109

- 3.8.2 The recorded history in-plant and/or source inspection and testing of supplier performance and supplier corrective action data shall be included in supplier selection decisions.
- 3.8.3 Procedures shall afford the purchaser the right to verify, at source or delivery, the quality of purchased products and services.
- 3.8.4 Documents shall support that the verifications are performed as required.
- 3.8.5 The results of the verifications shall be used to preclude nonconforming purchases.
- 3.9 Product Identification and Traceability
- 3.9.1 Procedures shall be established and maintained for identification of parts and evaluation samples from applicable drawings, specifications or other documents, during the stages of manufacture, production, test, delivery, and/or installation.
- 3.9.2 Individual products or batches shall have a unique identification for traceability that is recorded by the supplier.
- a. Responsibility and accountability for traceability shall be clearly defined.
 - b. Supplier shall have a system for controlling split lots to assure that traceability is maintained.
 - c. Test and/or evaluation samples shall be clearly marked to maintain traceability to the parent product.
- 3.9.3 There shall be a procedure to require that quality records are kept for at least a minimum length of time in accordance with customer requirements.
- 3.10 Stamp and/or Signature Control
- 3.10.1 There shall be a procedure that provides for control of stamps and/or authorization of signatures.
- 3.10.2 A record shall be maintained showing stamps issued or authorized signatures, date of issue, and to whom issued/authorized.
- 3.10.3 Appropriate actions shall be included in the stamp/signature control procedure covering lost, mutilated, or worn stamps, reassigned stamps, and removal of stamp or signature authority.

SAE AS7109

3.11 Control of Nonconforming Parts

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

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

3.11.3 There shall be a procedure for timely notification to customer of nonconforming material that has been shipped.

3.11.4 Records shall support that rework processes are authorized by the customer.

3.12 Corrective Action

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

3.12.2 The supplier shall analyze 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.

3.13 Delivery and Service

3.13.1 There shall be a procedure to provide for the protection of the parts after final inspection and during shipment.

3.13.2 Parts awaiting shipment shall be protected in accordance with the procedure.

3.13.3 Shipping documents shall conform to customer requirements.

3.14 Statistical Quality Control and Analysis

3.14.1 Statistical process control (SPC) methods shall be implemented when required by customer contract. The following SPC methods shall be employed:

- a. Procedures shall define the means to identify the following:
 - 1) The key parameters (time, temperature, etc.) that affect final product quality
 - 2) Statistical determination of their capability (e.g., Cp, Cpk)
- b. The determination of each process parameters shall affect final product quality based on analysis of production or experimental test results.
- c. The statistical distribution of each new process parameter shall be determined and corrective action taken when observations indicate an out-of-control condition.

SAE AS7109

3.14.1 Continued

- d. Records of parameters affecting final product quality shall indicate stability or improvement.
- e. There shall be a documented system of statistical monitoring of key coating parameters.
- f. There shall be documented reactions to out-of-control conditions that were statistically identified.
- g. There shall be evidence of improved process variable performance over time.

3.14.2 If SPC is not required by customer contract or employed the following shall apply:

- a. The company shall have another defect-prevention system in effect.
- b. The company shall have a plan to implement SPC.
- c. The supplier quality system shall provide for the effective use of a sampling inspection plan.
- d. There shall be written and approved procedures for sampling (material, product, service, and in-process) consistent with customer requirements.
- e. Supplier's procedures shall be adequate to assure risks inherent with sampling plans are analyzed to determine the protection afforded by the plans.
- f. Samples shall be taken as scheduled, documented, and traceable to their source (i.e., lot, date, time, location).
- g. Personnel shall be trained in procedures and techniques for using sampling devices.
- h. If used, supplier-developed sampling plans shall be available for review and approved by the customer when required by contract.

3.15 Internal Quality Audits

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

3.15.2 The results of the internal audits shall be reviewed and acted upon by management.

3.15.3 The use of audits shall be an integral part of the management system.

3.15.4 There shall be a corrective action follow-up system.

3.16 Training and Testing of Personnel

3.16.1 Procedures shall require periodic testing to assure that approved personnel maintain proficiency in their assigned tasks.

3.16.2 Records shall indicate that tests are given and the results reviewed with employees.

SAE AS7109

- 3.16.3 The results of testing shall be used to assure personnel proficiency.
- 3.16.4 There shall be procedures that assure personnel performing coating and associated quality and test functions are trained and certified to perform assigned tasks.
- 3.16.5 Records shall indicate that training and certification are completed in accordance with the procedure.
4. TESTING AND GENERAL PROCESS INSPECTION AND TRAINING
- 4.1 For specific test methods and lab systems, AS7109/5 shall apply.
- 4.2 Periodic Maintenance of Equipment
- 4.2.1 Procedures shall require maintenance at a specified frequency or condition by qualified personnel (employees or vendors) in accordance with specifications and customer requirements.
- 4.2.2 There shall be records that indicate that maintenance is performed in accordance with the procedures.
- 4.3 Test Materials and Specimens
- 4.3.1 There shall be a procedure that specifies the control and identification of test materials and specimens, as well as when and where they are to be used.
- 4.3.2 Records shall indicate that the test materials and specimens are controlled and tests shall be performed in accordance with the procedure.
- 4.3.3 Retention of metallographic specimens shall be in accordance with customer requirements.
- 4.4 Calibration
- 4.4.1 The following shall be documented for measuring equipment and standards:
- a. Description of equipment and approved operating range, including the precision of the instrument being calibrated.
 - b. Agency/organization performing the calibration (including its qualifications).
 - c. The accuracy of the standards used and their traceability to primary standards.
 - d. Detailed calibration procedures and detailed calibration results.
 - e. Periodicity and dates of calibration, including verification that calibration was carried out and given satisfactory results.
- 4.4.2 Measuring and testing equipment shall be listed and identified.

SAE AS7109

- 4.4.3 Calibration procedures for equipment and standards shall recognize MIL-STD-45662.
- 4.4.4 Calibrations shall be traceable to national or international standards.
- 4.4.5 The standards used shall have certificates or technical data sheets.
- 4.4.6 Calibration validity shall be documented.
- 4.4.7 Certificates or technical data sheets shall indicate the standard against which characteristics for calibration is based.
- 4.4.8 Equipment and standards shall be calibrated under suitable environmental conditions.
- 4.4.9 Clear identification shall prevent mixing among calibrating (primary), calibrated (working), and non-calibrated equipment and standards.
- 4.4.10 Preventive maintenance shall be carried out by a plan at least once per year (unless SPC indicates no deterioration in equipment performance).
- 4.4.11 Calibration status stickers (last/next) shall be posted on each piece of equipment as required.
- 4.4.12 "Calibrated"/"Not Required." stickers shall be used where applicable.
- 4.4.13 New or repaired equipment shall be calibrated prior to use.
- 4.4.14 Calibration status shall be checked by one of the following:
 - a. Date(s) indicated on the equipment
 - b. Last calibration
 - c. Next calibration
- 4.4.15 Pre-set equipment shall be protected against tampering.
- 4.4.16 Equipment shall be stored and handled so as to prevent damage.
- 4.4.17 Equipment that is not under calibration control shall be identified to prevent mixing with similar equipment requiring calibration.
- 4.4.18 Out-of-order equipment shall be segregated and clearly identified.
- 4.4.19 Procedures shall ensure that employee owned equipment is submitted to the above controls.