CAGE Code 81205

# Boeing Quality Management System Requirements for Suppliers

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CONTENT OWNER:

**Boeing Enterprise Quality Process Council, 66-Z6-59PV**

**This Council has delegated responsibility, authority, and accountability to the Procurement Quality Integration Team (PQIT) to define, implement, sustain, and continuously improve Boeing processes for supplier quality management and product integrity.**

All future revisions to this document shall be approved by the content owner prior to release.

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**Signatures for original release**

| | | | |
|---|---|---|---|
| AUTHOR: | Signature on File | 6-5912 | 07-20-99 |
| | Barry A. Livingston | Org. Number | Date |
| AUTHOR: | Signature on File | 9-4832 | 07-20-99 |
| | Anthony P. Marino | Org. Number | Date |
| APPROVAL: | Signature on File | 6-5926 | 07-21-99 |
| | Gary A. Baker | Org. Number | Date |
| APPROVAL: | Signature on File | M-A757 | 07-21-99 |
| | Craig S. Korkoian | Org. Number | Date |
| APPROVAL: | Signature on File | AC-0781 | 07-21-99 |
| | Andrea L. Thresh | Org. Number | Date |
| COMPANY QUALITY PROCESS COUNCIL CHAIR : | Signature on File | 6-1001 | |
| | Elizabeth F. Otis | Org. Number | Date |
| DOCUMENT RELEASE: | Signature on File | G-8214 | 07-28-99 |
| | Barbara Swanson | Org. Number | Date |

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# 1.0 Scope

This document contains supplier quality management system requirements for The Boeing Company and includes two appendices and two addenda, the applicability of which shall be defined by contract.

# 2.0 Boeing Recognition of Accredited Aerospace Quality Management System (AQMS) Certification/Registration

This document also provides supplier requirements for Boeing recognition of certification/registration documentation issued by an accredited Certification/Registration Body (CRB) in accordance with International Aerospace Quality Group (IAQG) requirements.

### Boeing Recognition of Accredited Aerospace Quality Management System (AQMS) Certification/Registration

Boeing may elect to recognize quality system certification/registration by an accredited certification/registration body (CRB) as evidence of compliance to Seller's compliance to D6-82479. Boeing reserves the right to make final determination regarding compliance to these requirements.

When Seller utilizes CRB AQMS certification/registration as evidence of D6-82479 compliance, the Seller shall ensure the following:

1. The CRB is accredited to perform AQMS assessments. The CRB must use approved auditors and operate in accordance with the corresponding International Aerospace Quality Group (IAQG) certification/registration scheme.

   NOTE: IAQG sanctioned certification/registration schemes include but are not limited to AIR 5359, SJAC 9010, TS157, etc. Reference IAQG website for listing of accredited CRBs: http://www.iaqg.sae.org/iaqg/audit_information/registrars.htm.

2. The seller maintains objective evidence of CRB certification/registration on file at Seller's facility. Objective evidence shall include:

   a. The accredited AQMS certificate(s) of registration;

   b. The audit report(s), including all information pertaining to the audit results in accordance with the applicable certification/registration scheme;

c. Copies of all CRB finding(s), objective evidence of acceptance of corrective action(s), and closure of the finding(s).

NOTE: Certification records shall be maintained in accordance with Boeing specified contractual quality record retention requirements.

3. The CRB services agreement provides for "right of access" to all CRB records by Boeing, applicable accreditation body, applicable Registrar Management Committee (RMC) and other regulatory or government bodies for the purpose of verifying CRB certification/registration criteria and methods are in accordance with the applicable IAQG certification/registration scheme.

4. The CRB has Seller's written permission to provide audit results/data to IAQG membership as required by the applicable IAQG certification/registration scheme.

5. Boeing is immediately notified in writing should the Seller's certification/registration be suspended or withdrawn, or accreditation status of Seller's CRB be withdrawn. Send email notification to grpcrboversightrep@boeing.com .

6. Boeing-identified findings and Seller's quality performance data is provided to the CRB during certification/registration and surveillance activity.

7. CRB is provided access to applicable proprietary data (including Boeing proprietary data) to the extent necessary to assess supplier functions.

8. Seller complies with all CRB requirements imposed to issue and maintain AQMS certification/registration.

Boeing recognition of Seller's AQMS certification/registration does not affect the right of Boeing to conduct audits and issue findings at the Seller's facility. Boeing reserves the right to provide Boeing-identified quality system findings, associated quality system data, and quality performance data to the Seller's CRB.

# Appendix A—Quality Management System

This appendix describes the quality system requirements for Boeing suppliers as contained in ISO 9001 as supplemented by 9100*. Appendix A represents the international aerospace quality standard for quality assurance in design, development, production, installation, and servicing.

*NOTE: 9100 includes all IAQG sanctioned standards including but not limited to AS9100, EN9100 and JISQ9100.

# Appendix A: Quality Management System— ISO 9001 as Supplemented by 9100

The supplier is to maintain an effective quality system to ensure product and process integrity that is based on ISO 9001 as supplemented by 9100.

*Note: 9100 contains ISO 9001 requirements with supplementation sequenced appropriately therein.*

Additional information on ISO and ISO 9001 can be obtained at

http://www.iso.ch/

ISO standards can be purchased from the U.S. member body to ISO, which is the American National Standards Institute (ANSI) at http://webstore.ansi.org or from the ISO member body in your country.

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9100 can be obtained through IAQG sanctioned national trade association, including:

**SAE, the Society of Automotive Engineers:** http://www.sae.org

**AECMA, the European Association of Aerospace Industries: http://www.aecma-stan.org/**

**SJAC, the Society of Japanese Aerospace Companies: http://www.sjac.or.jp/index.htm**

# Appendix B—Inspection and Test Quality System

This appendix describes the quality system requirements for Boeing suppliers as contained in SAE AS9003.

# Appendix B: Inspection and Test Quality System

The supplier is to maintain an effective quality system to ensure product and process integrity that is based on SAE AS9003.

Additional information on ISO can be obtained at

http://www.iso.ch/

ISO standards can be purchased from the U.S. member body to ISO, which is the American National Standards Institute (ANSI) at http://webstore.ansi.org or from the ISO member body in your country.

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SAE AS9003 can be obtained through:

**SAE, the Society of Automotive Engineers**

400 Commonwealth Drive

Warrendale, PA 15096-0001

Phone: 724-776-4970

Fax: 724-776-0790

Web site address: http://www.sae.org

**SAE web search tip:**

When searching this web site for AS9003, type **AS** uppercase, no space, **9003**

**AS9003**

# Addendum 1—AQS Continuous Improvement

Addendum 1 describes a process for continuous improvement. It includes requirements that emphasize the systematic establishment of performance measures, identification of improvement opportunities and implementation of improvement actions. Addendum 1 also includes requirements for Variation Management of Key Characteristics as contained in 9103**. This Addendum shall be accompanied in contract flowdown by either appendix A or B.

**NOTE: 9103 includes all IAQG sanctioned standards including but not limited to AS9103, EN9103 and JIS Q 9103.

# ADDENDUM 1 TABLE OF CONTENTS

# 1. Scope

This document contains AQS Continuous Improvement requirements intended to ensure continuous improvement, to reduce variation of key characteristics about engineering nominal specifications, prevent defects, reduce waste, increase profit, improve product quality, and exceed customer expectations. Addendum 1 consists of aerospace industry standard SAE AS9103 and Boeing specific requirements as provided in section 4 below. Organizations are evaluated for implementation of Addendum 1 through the use of the AQS Continuous Improvement Evaluation Tool. This tool reflects the requirements and intent of Addendum 1. AQS Continuous Improvement may be used in conjunction with other Boeing programs, such as the Preferred Supplier Certification (PSC) program, and may afford the organization an advantage in the source selection process.

Boeing document D1-9000-1, *AQS Tools*, is a detailed tutorial of many tools that may be used to continuously improve quality, and can help explain some of the requirements noted in this addendum. The AQS Continuous Improvement Evaluation Tool, D1-9000-1 AQS Tools and other supplementary materials can be found on the Doing Business with Boeing WEB site (www.boeing.com/companyoffices/doingbiz/supplier/).

# 2. AQS Continuous Improvement Philosophy

AQS Continuous Improvement described herein offers a number of tools that will identify improvement opportunities, reduce variation, and implement reliable and efficient processes. This approach can be used to achieve measurable improvements in quality, cycle time, and cost in the design, production, and/or business processes of an organization.

Though the responsibility for continuous improvement ultimately rests with the process owner, it is essential that executive management be involved.

# 3. Authority and Responsibility of Boeing Representatives

The Boeing representative shall determine the organization's compliance with this document.

# 4. Requirements

## 4.1 Continuous Improvement System

4.1.1 The organization shall develop and document a continuous improvement system.

4.1.2 The organization shall develop performance measures, such as measures of waste, defects, quality, cycle time, and customer satisfaction.

4.1.3 The organization shall analyze its products and processes to identify and implement improvement actions to positively impact the performance measures of section 4.1.2. Due consideration shall be given to key characteristics and the full range of process improvement tools in meeting this requirement.

4.1.4 The organization shall conduct periodic management reviews of these improvement activities, paying close attention to the effect on the performance measures, and modifying these activities as necessary.

Note: Compliance to the requirements of this standard for Continuous Improvement will be assessed by a Boeing Representative using *The Boeing AQS Continuous Improvement Evaluation Tool*.

## 4.2 Variation Management of Key Characteristics

The organization is to maintain an effective variation management system based on SAE AS9103, Variation Management of Key Characteristics, and Boeing specific requirements as follows:

In some cases, it may be impossible or prohibitively expensive to meet the control and capability requirements of AS9103 Section 5. These exceptions must be documented by the organization and shall require Boeing approval (ref. AS9103 Section 5.7).

Note: Compliance to the requirements of this standard for Continuous Improvement will be assessed through *The Boeing AQS Continuous Improvement Evaluation Tool*.

SAE AS9103 can be obtained through:

**SAE, the Society of Automotive Engineers**

400 Commonwealth Drive

Warrendale, PA 15096-0001

Phone: 724-776-4970

Fax: 724-776-0790

Web site address: http://www.sae.org

## 4.3 Variation Management in Design

This section is intended for organizations with design authority for Boeing products and a contractual obligation to D6-82479 Appendix A and Addendum 1, but other organizations with design capability are encouraged to participate in the process with their customer.

4.3.1 The organization is to maintain an effective system for Product Realization based on SAE AS9100.

Note: Compliance to the requirements of this standard for Continuous Improvement will be assessed through *The Boeing AQS Continuous Improvement Evaluation Tool*.

# Addendum 2—Quality System Requirements for Deliverable Software

Addendum 2 describes the quality system requirements for Boeing suppliers of deliverable software, and/or software that supports the development and maintenance of deliverable software. The definition of deliverable software is as follows:Software that is delivered as an end item or as part of a deliverable software-supported product that is either designed or modified to meet Boeing requirements. Deliverable software may be embedded at the factory or remotely loadable into the target system by means of computer-sensible media such as magnetic or optical media. It also includes software that may be electronically transmitted. Deliverable software includes source and executable code and all relevant requirements, design, configuration definition, test and support environment documentation as required by contract.

## STRUCTURE AND APPLICATION

This Addendum 2 includes aerospace requirements which have been separated into two sections. Section 1 is based upon the ISO 9001:2000/AS9100 quality system model. Section 2 is based upon ISO 9001:1994/AS9100 quality system model.,. The determination of whether Addendum 2 Section 1 or Section 2 applies is based upon the organization's current quality management system (QMS) status in regards to alignment/compliance with ISO 9001 version.

Organizations now having a ISO 9001:1994-based QMSmay utilize the section 2 of this standard, which is aligned with ISO 9001:1994 until Dec. 15, 2003. After Dec. 15, 2003, organizations must have transitioned to Section 1 of this standard, which is aligned with ISO 9001:2000/AS9100/AS9006 Section 2 of this standard based on the ISO 9001:1994 model will be withdrawn on December 15, 2003.

Organizations initially developing an ISO 9001/AS9100/AS9006-based QMS after December 15, 2003 must develop a QMS based on ISO 9001:2000/AS9100/AS9006 and shall utilize Section 1 of this standard.

The ISO 9001/AS9100 model, AS9100 and Addendum 2 section that is deployed shall be declared in the organization's quality manual.

# Section 1 – Deliverable Aerospace Software Supplement for AS9100A Quality Management Systems – Aerospace – Requirements for Software (based on ISO 9001:2000 as supplemented by AS9100A)

The supplier is to maintain an effective quality system to ensure product and process integrity that is based on SAE AS9006.

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SAE AS9006 can be obtained through:

**SAE, the Society of Automotive Engineers**

400 Commonwealth Drive

Warrendale, PA 15096-0001

Phone: 724-776-4970

Fax: 724-776-0790

Web site address: http://www.sae.org

**SAE web search tip:**

When searching this web site for AS9006, type **AS** uppercase, no space, **9006**

**AS9006**

# Section 2 – Quality System Requirements for Software (based on ISO 9001:1994 as supplemented by AS9100A)

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# 1. Scope

This document contains quality system requirements for suppliers of deliverable software, and/or software that supports the development and maintenance of deliverable software. Office system software that supports business or production objectives, such as inventory control systems, scheduling, or finance, is beyond the scope of this addendum. Factory software such as product acceptance software used to test hardware (e.g., automatic test equipment software) is covered in appendix A.

Suppliers who have Boeing document D6-82479 addendum 2 called out in their contract or purchase order(s) are required to maintain a software quality system in accordance with this addendum. Approval is granted after an evaluation by Boeing of the supplier's software development environment.

When the statement "No further requirements are necessary for software" is referenced within this addendum, the supplier shall refer to the corresponding appendix A section for the requirement.

# 2. Definitions

**Deliverable software.** Software that is delivered as an end item or as part of a deliverable software-supported product that is either designed or modified to meet Boeing requirements. Deliverable software may be embedded at the factory or remotely loadable into the target system by means of computer-sensible media such as magnetic or optical media. It also includes software that may be electronically transmitted. Deliverable software includes source and executable code and all relevant requirements, design, configuration definition, test, and support environment documentation as required by contract.

# 3. Authority and Responsibility of Boeing Representatives

Responsibility for approval of supplier quality systems rests with Boeing representatives. The quality evaluation performed by the Boeing representatives regarding compliance with this document shall determine Boeing approval status.

# 4. Quality System Requirements for Software

The supplier shall maintain an effective quality management system for deliverable software to ensure product and process integrity that is consistent with this addendum. This addendum is based on ISO 9001:1994, as supplemented by AS9100. The requirements herein are consistent with guidance established in ISO 9000-3:1997 and further clarify the requirements in AS9100 that are supplementary to ISO 9001:1994 as they pertain to deliverable software. Verification of compliance with these requirements will be accomplished by an evaluation of the deliverable software development and maintenance environments, which include the software engineering, support, and test environments, as well as relevant manufacturing operations.
AS9100 and ISO 9000-3:1997 may be obtained as described in appendix A of this document.

## 4.1 Management Responsibility

### 4.1.1 Quality Policy

No further requirements are necessary for software.

### 4.1.2 Organization

Suppliers having a software quality assurance activity performed by an individual process performer (e.g., software designer or tester) shall have procedures that define the specific tasks and responsibilities that are authorized and the corresponding requirements and training necessary to perform those tasks.

### 4.1.3 Management Review

No further requirements are necessary for software.

## 4.2 Quality System

### 4.2.1 General

No further requirements are necessary for software.

### 4.2.2 Quality System Procedures

No further requirements are necessary for software.

### 4.2.3 Quality Planning

Quality planning for software shall be consistent with all other requirements of a supplier's quality system and documented in a format suitable to the supplier's method of operating. Software quality planning shall address the following items,

- ensuring the compatibility of the requirements definition, design, coding, testing, and delivery processes and the applicable documentation:
- Quality requirements expressed in measurable terms, where appropriate.
- The life cycle model for software development.
- Defined criteria for starting and ending each project phase.
- Identification of verification and validation activities to be carried out.
- Identification of configuration management procedures to be carried out.
- Detailed planning (including schedules, procedures, resources, and approval) and specific responsibilities and authorities for Configuration management.
- Verification and validation of developed products.
- Verification and validation of purchased products.
- Verification of customer-supplied products.
- Control of nonconforming product and corrective action.
- Ensuring that activities described in the quality plan are carried out.
- Identification and selection of software subcontractors (if applicable).
- Identification of material, processes, or services to support operation and maintenance of the software product (e.g., compilers, translators, test equipment, and test software), if applicable.

### 4.2.4 Configuration Management

The supplier shall establish, document, and maintain a software configuration management process. The supplier shall develop and implement a configuration management plan that includes the following (at a minimum):

- Organizations involved in configuration management and responsibilities assigned to each.
- Configuration management activities to be carried out.
- Configuration management tools, techniques, and methodologies to be used.
- The point at which software items should be brought under configuration control.

## 4.3 Contract Review

### 4.3.1 General

No further requirements are necessary for software, except as noted below.

Software may be developed as part of a contract, as a product available for a market sector, or as software embedded in a hardware product. Contract review is applicable in all these circumstances.

### 4.3.2 Review

In regard to software, before submission of a tender, or the acceptance of a contract or order (statement of requirement), the tender, contract, or order shall be reviewed by the supplier to ensure that the concerns listed below, at a minimum, have been addressed:

- The technical feasibility of meeting the requirements.
- The software development standards and procedures to be used.
- Facilities, tools, software items, and data, to be provided by the customer, are identified and methods defined and documented to assess their suitability for use.
- The operating system or hardware platform.
- Agreement on the control of interfaces with the software product.
- Replication and distribution requirements.
- Assessment of possible contingencies or risks identified and the impact of these on subsequent activities.
- Life cycle processes imposed by the customer (if applicable).

- Information handled under the contract, which may be subject to concerns regarding intellectual property rights, license agreements, confidentiality, and the protection of such information (if applicable).
- Liabilities/penalties associated with the contract (if applicable).

### 4.3.3 Amendment to Contract

No further requirements are necessary for software.

### 4.3.4 Records

No further requirements are necessary for software

## 4.4 Design Control

### 4.4.1 General

The supplier shall establish and maintain documented procedures to control and verify the design of the software products in order to ensure that the specified requirements are met.

The following aspects inherent in the design activities shall be taken into account:

- A design method is documented and systematically used.
- Use of past experiences: using lessons learned from past experiences, the supplier should avoid recurrences of the same or similar problems by applying lessons learned from previous projects, analysis of metrics, and postproject reviews.
- Subsequent processes: to the extent practical, the software product should be designed to facilitate testing, installation, maintenance, and use.
- Security and safety: special consideration should be given to the design for testability or validation. For products where failure may cause damage to people, property, or the environment, design of such software should ensure definition of specific desired immunity from, and system response to, potential failure conditions.
- Rules for use of programming languages, consistent naming conventions, coding, and adequate commentary shall be specified and observed. Such rules shall be documented and controlled.

- Tools used in the implementation of the product, such as analysis, design, and verification tools, compilers, and assemblers shall be approved and placed under an appropriate level of configuration control prior to use. The scope of use of such tools and techniques shall be documented and their use shall be reviewed as appropriate, to determine whether there is need to improve or upgrade them.
- The responsibilities and authorities for the approval of the design data shall be defined.
- When the supplier subcontracts software design or development activities, the supplier shall control the subcontracted activity consistent with the requirements of section 4.4.

### 4.4.2 Design and Development Planning

The supplier shall have software development plans for each design and development activity. The development plan shall be reviewed and approved.

The development plans shall define how the project is managed, the progress reviews required, and the type and frequency of reports to management, the customer, and other relevant parties. Development planning shall address at a minimum the following items:

- The definition of the project, including a statement of its objectives and reference to any related customer or supplier projects and requirements.
- The definition of input and output of the project as a whole.
- The organization of the project resources, including the team structure, responsibilities, use of subcontractors, and material resources to be used.
- Organizational and technical interfaces between different individuals or groups, such as subproject teams, subcontractors, customer representatives, and quality assurance representatives.
- The identification of or reference to development activities to be carried out, required inputs to each activity, required outputs from each activity, and management and supporting activities to be carried out.
- The analysis of the possible risks, assumptions, dependencies, and problems associated with the development.
- Schedules identifying phases of the project, work to be performed, associated resources and timing, associated dependencies, and milestones.

- Identification of standards, rules, practices, conventions, tools, and techniques for development; configuration controls placed on tools; configuration management practices; method of controlling nonconforming products; methods of controlling nondeliverable software used to support development; procedures for archiving, backup, and recovery, including contingency planning; and methods of control for virus protection.
- The identification of related plans as appropriate (including system level plans), such as quality plan, risk management plan, configuration management plan, integration plan, test plan, installation plan, migration plan, training plan, maintenance plan, and reuse plan.
- Reliability, maintainability, and safety.

#### 4.4.2.1 Design and Development Management Planning

Requirements for this section are addressed within section 4.4.2.

#### 4.4.2.2 Reliability, Maintainability, and Safety

No further requirements are necessary for software.

### 4.4.3 Organizational and Technical Interfaces

The boundaries of responsibility for each part of the software product and the way that technical information will be transmitted among all parties shall be clearly defined in the development plans of suppliers or subcontractors.

Where mutually agreed upon, joint reviews involving the supplier and customer are scheduled on a regular basis, or at significant project events, to cover the following aspects, as appropriate:

- The progress of software development work undertaken by the supplier.
- The progress of agreed-upon activities being undertaken by the customer.
- Conformance of the development products to the customer's agreed-upon requirements specification.
- The progress of activities concerning the eventual users of the system under development, such as system conversion and training.
- Verification results.
- Acceptance test results.

### 4.4.4 Design Input

The requirements specification should be provided by the customer. However, where mutually agreed upon, the supplier may provide the specification. In such a case, the supplier shall:

Establish documented procedures for developing the requirements specification, including

- Methods for agreeing on requirements and authorizing changes.
- Methods for the evaluation of prototypes or demonstrations, where used.
- Recording and reviewing discussion results on both sides.
- Develop the requirements specification in close cooperation with the customer and make efforts to prevent misunderstandings.
- Obtain the customer's approval of the requirements specification.
- The interfaces between the software product to be developed and other software or hardware products shall be specified either directly or by reference, in the requirements specification.
- Input data to design shall be defined and documented in terms of functional requirements.
- Interfaces between the software product and other products shall be defined and documented.
- The software requirements shall be expressed in terms that allow validation during product acceptance.

### 4.4.5 Design Output

The required output from the design activity shall be defined and documented in accordance with the chosen method. This documentation shall be correct, complete, and consistent with the requirements. Design outputs may include, as appropriate:

- Architectural design specification.
- Detailed design specification.
- Source code.
- User guides.

All pertinent data required to allow the software product to be identified, built, reproduced, verified, used, and maintained shall be defined, including:

- Drawings, parts lists, and specifications.
- A listing of those drawings, parts lists, and specifications necessary to define the configuration and the design features of the product.
- Information on material, processes, methods, and assembly of the product necessary to ensure conformity of the product.
- Design specifications, source code, version description documents, and user guides.
- Software design outputs (e.g., design specifications, version description documents, and user guides) shall include a review before release.

### 4.4.6 Design Reviews

The supplier shall plan and implement review processes for all software development projects. The supplier shall establish documented procedures for dealing with process and product deficiencies or nonconformities identified during these activities.

The results of any review, and any further activities required to ensure that the specified requirements are met, shall be recorded and checked when they are completed.

A documented design review procedure shall address the following as a minimum:

- What is to be reviewed, when, and the type of review.
- What functional groups would be concerned in each type of review and, if there is to be a review meeting, who would chair it.
- What records have to be produced, for example meeting minutes, issues, problems, actions, and action status.

Where specified, the supplier shall conduct design review meetings in cooperation with the customer. Both parties shall agree on the results of such reviews.

### 4.4.7 Design Verification

Verification of design shall be performed as appropriate during the development process. These verification activities shall be planned and conducted in accordance with the quality plan or documented procedures to ensure that process outputs meet the process input requirements.

The verification results and any further actions required to ensure that the design stage input requirements are met shall be recorded and checked when the actions are completed.

Only verified design outputs shall be submitted for acceptance and subsequent use. Any findings shall be adequately addressed and resolved.

## 4.4.8 Design Validation

Before offering the product for customer acceptance, the supplier shall validate the product in accordance with its specified, intended use, for example during final inspection and test.

The validation results and any further actions required to ensure that the specified requirements are met shall be recorded and checked when the actions are completed. Only validated products shall be submitted for acceptance and subsequent use.

### 4.4.8.1 Documentation of Design Verification and Validation

No further requirements are necessary for software.

### 4.4.8.2 Design Verification and Validation Testing

Software tests necessary for verification and validation shall be planned, controlled, reviewed, and documented to ensure and prove the following:

- Software test plans or test procedures
- Identify the software product being tested.
- Identify the software/hardware prerequisites for the test.
- Identify the hardware/software resources used.
- Define test objectives and conditions.
- Define the traceability matrix between requirements.
- Define the tests to be performed and evidence to be recorded.
- Define the evaluation and acceptance criteria.
- Test procedures describe the performance of the test and the recording of results.
- Configuration identification of the software product to be tested is verified.
- The requirements of the test procedures are observed.
- The acceptance criteria are met.

### 4.4.9 Design Changes

The supplier shall establish and maintain procedures for controlling the implementation of any software design changes that may arise at any time during the product life cycle, in order to

- Document and justify the change.
- Evaluate the consequences of the change.
- Approve or disapprove the change.
- Implement and verify the change.

## 4.5 Document and Data Control

### 4.5.1 General

Configuration management procedures shall be used to implement document and data control. In establishing the procedures to control documents and data, the supplier shall identify those documents and data, including customer-defined standards and data, that should be subject to control procedures.

The document and data control procedures shall be applied to relevant documents and data, including the following:

- Contractual documents, including specification of requirements.
- Procedural documents describing the quality system to be applied during the software life cycle.
- Planning documents describing the planning and progress of activities of the supplier and the supplier's interactions with the customer.
- Product documents and data describing or associated with a particular software product.

### 4.5.2 Document and Data Approval and Issue

The supplier shall maintain appropriate approval, access, distribution, and archiving procedures for all software documentation and media.

### 4.5.3 Document and Data Changes

No further requirements are necessary for software.

# 4.6 Purchasing

## 4.6.1 General

No further requirements are necessary for software.

## 4.6.2 Evaluation of Subcontractors

The supplier shall:

- Evaluate and select subcontractors on the basis of their ability to meet subcontract requirements, including the quality system and any specific quality assurance requirements.
- Define the type and extent of control exercised by the supplier over subcontractors. This shall be dependent upon the type of product, the impact of subcontracted product on the quality of final product, and, where applicable, on the quality audit reports or quality audit records of the previously demonstrated capability and performance of subcontractors.
- Establish and maintain quality records of acceptable software subcontractors.
- Ensure that the organization having responsibility for approving subcontractor quality systems has the authority to disapprove the use of sources.
- Periodically review subcontractor performance. Records of these reviews shall be maintained and used as a basis for establishing the level of supplier controls to be implemented.
- Maintain procedures that define the necessary actions to take when dealing with subcontractors who do not meet requirements.

A list of approved software subcontractors shall be maintained and shall specify the scope of approval.

## 4.6.3 Purchasing Data

- Purchasing documents for software shall contain data clearly describing the product ordered, including, where applicable:
- Precise identification of the product ordered, such as product name and/or product number.
- Requirements specification, or the identity of it (or the procedure to identify requirements specifications where not fixed at the time ordered).

- Standards to be applied (e.g., communications protocol, architectural specification, engineering standard, or regulatory guidance).
- Procedures and/or work instructions.
- Requirements on personnel.

The procedures in section 4.3 shall also apply to subcontracts.

### 4.6.4 Verification of Purchased Product

No further requirements are necessary for software.

#### 4.6.4.1 Supplier Verification at Subcontractor Premises

No further requirements are necessary for software.

#### 4.6.4.2 Customer Verification of Subcontracted Product

When specified in the contract, the supplier's customer or representative shall be afforded the right to verify at the source, or upon receipt, that the purchased software product conforms to specified requirements.

## 4.7 Control of Customer-Supplied Product

The supplier shall establish and maintain documented procedures for the control of verification, storage, protection, and maintenance of a customer-supplied product or data.

## 4.8 Product Identification and Traceability

The supplier shall establish and maintain procedures for identifying software items during all phases, starting from specification, through development, replication, and delivery. These procedures shall apply after delivery of a product if required by contract.

Throughout the product life cycle, there shall be procedures to trace the components of the software item or product (for example, that each software requirement is traced from systems requirements to software requirements, design, code, and test).

The supplier shall establish and maintain a configuration management system for software products, which provides the capability to:

- Identify uniquely the versions of each software item.
- Identify the versions of each software item that together constitute a specific version of a complete product.
- Identify the build status of software products under development, delivered, or installed.
- Control simultaneous updating of a given software item by two or more people working independently.
- Provided coordination for the updating of multiple products in one or more locations as required.
- Identify and track all actions and changes resulting from a change request, or problem, from initiation through release.

Procedures shall be applied to ensure that the following can be identified for each software item:

- The documentation.
- Any associated development tools.
- Interfaces to other software items and to hardware.
- The hardware and software environment.
- Source code and executable code.

The supplier shall establish and maintain configuration status accounting procedures to record, manage, and report on the status of software items, change requests, and the implementation of approved changes.

When required by contract, configuration management shall maintain identification and traceability of unique software releases to their targeted environment.

# 4.9 Process Control

## 4.9.1 General

The supplier shall have documented processes for the replication, delivery, and installation of software items or products.

The supplier shall have documented procedures to perform replication that consider the following:

- Identification of the master and the copies, including format, variant, and version.
- Disaster recovery plans.
- The period of obligation of the supplier to supply copies and the capability of reading master copies.
- The type of media for each software item and associated labeling.
- Checks against the possibility of software viruses.
- Copyright and licensing concerns addressed and agreed upon.
- Controlling the environment under which the replication is effected to ensure repeatability.

The release of software shall establish a baseline that documents the tests completed and the resolution of identified deficiencies.

For software product installations, the supplier and customer shall agree on their respective roles, responsibilities, and obligations, and such agreements shall be documented.

### 4.9.1.1 Production Documentation

No further requirements are necessary for software.

### 4.9.1.2 Control of Production Process Changes

No further requirements are necessary for software.

### 4.9.1.3 Control of Production Equipment, Tools, and Numerical Control (NC) Machine Programs

No further requirements are necessary for software.

#### 4.9.1.4 Control of Work Occasionally Performed Outside the Supplier's Facility

No further requirements are necessary for software.

### 4.9.2 Special Processes

Not applicable to software.

## 4.10 Inspection and Testing

### 4.10.1 General

The supplier shall establish, document, and review plans for unit, integration, system, and acceptance tests, in accordance with the quality plan or documented procedures.

When the supplier subcontracts inspection or test activities, the supplier shall control the subcontracted activity consistent with the requirements of section 4.6 of this addendum.

### 4.10.2 Receiving Inspection and Testing

4.10.2.1 No further requirements are necessary for software.

4.10.2.2 No further requirements are necessary for software.

4.10.2.3 No further requirements are necessary for software.

4.10.2.4 When certification test reports are used to accept the software product, the supplier shall ensure that data in said reports is acceptable per applicable specifications.

### 4.10.3 In-Process Inspection and Testing

Inspection and testing of the software product shall be conducted in accordance with the quality plan and documented procedures.

The software product shall be held until the required inspection and tests have been completed or necessary reports have been received and verified, except when the product is released under positive-recall procedures.

### 4.10.4 Final Inspection and Testing

Before offering the software product for customer acceptance, the supplier shall validate the operation of the product in accordance with its specified intended use, under conditions similar to the application environment. Any differences between the validation environment and the actual application environment, and the risks associated with such differences, shall be identified, justified, and recorded.

Final software testing shall be performed to complete the evidence of conformance to specified requirements.

Final inspection and testing of the software product shall be conducted per documented procedures.

Documented procedures shall ensure that no software product is released until all specified activities are complete and data and documentation are available and authorized.

The method of handling problems detected during the acceptance procedure and their disposition shall be agreed upon between the customer and supplier and documented.

### 4.10.5 Inspection and Test Records

No further requirements are necessary for software.

### 4.10.6 First Article Inspection

The supplier's system shall provide a process (where required by contract) for the inspection, verification, and documentation of the first production article.

The purpose of the software aspects of the First Article Inspection (FAI) is to audit the documentation, software end item, and procedures to ensure that the end item configuration is defined, meets the customer's requirements, and can be consistently reproduced. A successful FAI results in acceptance of the product baseline by the customer and allows the delivery of production units to the customer.

The supplier shall ensure conformity of new or modified software versions before delivery by demonstrating that:

- All life cycle data and documents are complete.
- All problem reports and changes are resolved.
- The deliverable object code can be recreated from the source.
- All deviations, if any, are granted.
- The software can be loaded into the target and initialized.
- The deliverable media or end item is correctly tested, virus checked, and labeled.
- The source is identified and under configuration control.

These objectives may be met through verifications throughout the software life cycle.

# 4.11 Control of Inspection, Measuring, and Test Equipment

## 4.11.1 General

No further requirements are necessary for software.

## 4.11.2 Control Procedure

No further requirements are necessary for software, with the following exception. Calibration is a verification technique that is not directly applicable to software. However, it may be applicable to hardware and tools used to test and validate the software.

# 4.12 Inspection and Test Status

The supplier shall have means of identifying the stage of development of software components and their test status. Inspection and test records shall be used to identify inspection and test status.

## 4.12.1 Authorized Personnel

No further requirements are necessary for software.

## 4.12.2 Acceptance Authority Media

No further requirements are necessary for software.

# 4.13 Control of Nonconforming Product

## 4.13.1 General

Where a software item manifests a defect during the development or maintenance process, the investigation and resolution of such defects shall be controlled and recorded.

## 4.13.2 Review and Disposition of Nonconforming Product

The supplier shall define the responsibility for review and disposition of nonconforming software product.

The supplier shall establish documented procedures for dispositioning nonconforming software products, including

- Any discovered problems and their possible impacts to other parts of the software/system, and notification of responsible parties so the problems are tracked until they are resolved.
- Areas impacted by modifications shall be identified and re-tested, and the method for determining the scope of re-testing shall be identified in a documented procedure.
- Priority of the nonconformities.

Repair or rework to achieve fulfillment of specified requirements shall create a new software version. In software development, disposition of a nonconforming product shall be documented and may be achieved by

- Repair or rework to meet the requirements.
- Acceptance with or without repair by concession.
- Treatment as a conforming product after amendment of requirements.
- Rejection.

The supplier's documented procedures shall define the process for approving personnel making product review decisions.

### 4.13.2.1 Material Review Authority

Disposition of nonconforming software shall be made by a software change board or equivalent. This disposition shall include concurrence by the customer if the nonconformity results in a departure from the contract requirements.

#### 4.13.2.2 Regrading Material

Not applicable to software.

#### 4.13.2.3 Scrap Material

Not applicable to software.

#### 4.13.2.4 Notification

No further requirements are necessary for software.

## 4.14 Corrective and Preventive Action

### 4.14.1 General

Documented procedures for implementing corrective and preventive action for software products and processes shall be established and maintained.

Where corrective action affects the software product, the configuration management process shall be invoked to manage the changes.

Corrective actions that involve changes to software life cycle processes shall be reviewed by management and implemented by means of document and data control procedures.

The supplier shall implement and record changes in the documented procedures resulting from corrective or preventive action.

### 4.14.2 Corrective Action

No further requirements are necessary for software.

### 4.14.3 Preventive Action

No further requirements are necessary for software.

# 4.15 Handling, Storage, Packaging, Preservation, and Delivery

## 4.15.1 General

The supplier shall establish and maintain documented procedures for handling, storage, packaging, preservation, and delivery of software products.

These procedures shall cover the specified requirements for

- Cleaning (if applicable).
- Prevention, detection, and removal of foreign objects.
- Special handling for sensitive products.
- Marking and labeling, including safety warnings.
- Shelf life control.
- Hazardous materials (if applicable).
- Electromagnetic and electrostatic environment.
- Temperature and humidity control

## 4.15.2 Handling

The supplier shall provide methods and means of handling a product that prevent damage to software products caused by alteration of contents or infection by computer virus.

The supplier shall also provide methods and means of handling a product to prevent deterioration of the media.

## 4.15.3 Storage

The supplier shall establish and maintain designated storage areas to prevent damage or deterioration of software products.

The supplier shall establish appropriate methods for authorizing receipt to and dispatch from designated storage areas.

To detect deterioration, the condition of a software product shall be assessed at documented intervals.

A system shall be established for

Storing software items.

- Controlling access to and retrieval of software items.
- Maintaining versions of software products in established baselines.

Software items shall be held in an environment that

- Protects them from unauthorized change or corruption.
- Permits the controlled access to and retrieval of the master and any copies.

## 4.15.4 Packaging

No further requirements are necessary for software, with the following exception. In cases where electronic storage is used, there may be no physical activity related to this requirement.

## 4.15.5 Preservation

The supplier shall establish a documented procedure to preserve and segregate software items that includes requirements for

- Regular back-up of software.
- Ensuring the timely copying of software to replacement media.
- Storage of software media in a protected environment (e.g., temperature, humidity, electromagnetic, and electrostatic).
- Storage of software media in separate protected environments to ensure disaster recovery.

## 4.15.6 Delivery

The supplier shall establish and maintain documented procedures for verifying the correctness and completeness of copies of the software product delivered, which include:

- Preventive action to protect the software product from damage during delivery.
- Verification that an appropriate level of software virus checking has been performed.
- Taking appropriate measures to protect product integrity.

The supplier shall establish documented procedures for electronic transmission (when required by contract) that address verification methods.

The supplier shall ensure that the accompanying documents for the software product are present at delivery as specified in the contract/order and protected against loss and deterioration.

## 4.16 Control of Quality Records

No further requirements are necessary for software, with the following exception.

Where records are held on electronic media, consideration of the retention times and accessibility of the records should take into account the rate of degradation of the electronic images and the availability of the devices and software needed to access the records.

## 4.17 Internal Quality Audits

No further requirements are necessary for software.

## 4.18 Training

No further requirements are necessary for software.

## 4.19 Servicing

For the purposes of this requirement, servicing is recognized as being related to maintenance and customer support.

When specified by contract, the supplier shall establish and maintain procedures for performing, verifying, and reporting that the software maintenance activity meets the specified requirements.

All maintenance activities shall be carried out and managed in accordance with a maintenance plan and/or plans and procedures defined and agreed upon beforehand by the supplier and customer.

# 4.20 Statistical Techniques

## 4.20.1 Identification of Need

No further requirements are necessary for software.

## 4.20.2 Procedures

No further requirements are necessary for software.

# Active Page Record

| Page Numbers | Revision Level | Revision Type (Added, Deleted) |
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| A-1 | C | |
| A-2 | C | |
| B-1 | C | |
| B-2 | C | |
| Addend. 1-1 | C | |
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| Addend. 1-4 | C | |
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| Addend. 2-13 | C | |
| Addend. 2-14 | C | |
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|---|---|---|
| Addend. 2-20 | C | |
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| Addend. 2-23 | C | |
| Addend. 2-24 | C | |
| Addend. 2-25 | C | |
| Addend. 2-26 | C | |
| Addend. 2-27 | C | |
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# Revision Record

**Revision Letter** **A**

**Changes in this Revision**

Changed "Content Owner" on page i.
Added Company Quality Process Council Chair signature line.
Changed the titles and references of Appendix A through C.
Deleted Appendix C; Quality systems for Distributors.
Changed Appendix D and E to Addendum 1 and 2.
Changed affected page numbers.
Added Addendum 1 text for AQS Requirements.
Added Addendum 2 text for Software Requirements.

**Signatures**

| | | | |
|---|---|---|---|
| AUTHOR: | Signature On File | 6-5912 | 3-20-00 |
| | Barry A. Livingston | Org. Number | Date |
| AUTHOR: | Signature On File | 9-4832 | 3-20-00 |
| | Anthony P. Marino | Org. Number | Date |
| APPROVAL: | Signature On File | 6-5926 | 3-20-00 |
| | Gary A. Baker | Org. Number | Date |
| APPROVAL: | Signature On File | MA-757 | 3-20-00 |
| | Craig S. Korkoian | Org. Number | Date |
| APPROVAL: | Signature On File | AC-0781 | 3-20-00 |
| | Andrea L. Thresh | Org. Number | Date |
| COMPANY QUALITY PROCESS COUNCIL CHAIR : | Signature On File | 6-1001 | 3-20-00 |
| | Elizabeth F. Otis | Org. Number | Date |
| DOCUMENT RELEASE: | Signature On File | G-8214 | 7-17-00 |
| | Scott Pace | Org. Number | Date |

# Revision Record

**Revision Letter** **B**

**Changes in this Revision**

Updated Scope and Appendix A to incorporate SAE AS9100: 2001.
Deleted Appendix B text and replaced with reference to SAE AS9003
Updated Addendum 1 to incorporate SAE AS9103.
Updated format and font to Addendum 2.
Updated Active page record.
Added Rev. B Revision Record.

**Signatures**

| | | | |
|---|---|---|---|
| AUTHOR: | Signature on File | 3-4A41 | 10-24-01 |
| | Tim Lee | Org. Number | Date |
| AUTHOR | Signature on File | 9-4832 | 10-24-01 |
| | Anthony P. Marino | Org. Number | Date |
| AUTHOR: | Signature on File | B1-261 | 10-24-01 |
| | Nik Sutton | Org. Number | Date |
| APPROVAL: | Signature on File | 6-5912 | 11-19-01 |
| | Julie Sanders | Org. Number | Date |
| APPROVAL: | Signature on File | MA-757 | 11-15-01 |
| | Kristy Heffernan | Org. Number | Date |
| APPROVAL: | Signature on File | AC-0781 | 10-18-01 |
| | Andrea L. Thresh | Org. Number | Date |
| COMPANY QUALITY PROCESS COUNCIL CHAIR : | Signature on File | 5-V150 | 10-19-01 |
| | Norma Clayton | Org. Number | Date |
| DOCUMENT RELEASE: | Signature on File | G-8214 | 11-29-01 |
| | Rebecca Byers | Org. Number | Date |

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# Revision Record

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| **Revision Letter** | **C** |
| **Changes in this Revision** | Added requirements for Boeing recognition of accredited AQMS certification/registration and incorporated AS9006 into Addendum 2. |
| **Signatures** | |

| | | | |
|---|---|---|---|
| AUTHOR: | Edmond Chavarrie | 0BMA<br>Org. Number | 10/31/03<br>Date |
| AUTHOR | Anthony P. Marino | 9-4832<br>Org. Number | 11/3/03<br>Date |
| APPROVAL: | Julie Sanders | 6-5912<br>Org. Number | 10/23/03<br>Date |
| APPROVAL: | William Valencia | 18-01-M76<br>Org. Number | 10/28/03<br>Date |
| APPROVAL: | Lawrence Weng | AC-0781<br>Org. Number | 10/28/03<br>Date |
| COMPANY QUALITY PROCESS COUNCIL CHAIR : | Sandra Postel | 66-Z6-1030<br>Org. Number | 10/28/03<br>Date |
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