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U.S. Department
of Transportation
**Federal Aviation
Administration**

U.S. Department of Transportation

# Federal Aviation Administration

# Standard

## COMPUTER PROGRAM QUALITY PROGRAM REQUIREMENTS

# 1. SCOPE

1.1 Scope. This standard establishes the minimum requirements for a computer software quality program to be established and maintained by a contractor under FAA contract for furnishing computer software and related documentation.

1.2 Applicability. When referenced in the contract or specification, this standard shall apply to the acquisition of computer software and related documentation; whether the acquisition involves either software alone or software as a portion of a system or subsystem. Unless specifically exempted, this standard shall also apply to non-deliverable design, test, support, and operational software developed under or utilized for the contract or specification. For purposes of determining applicability of this standard, the term software includes firmware.

1.3 Definitions. Definitions, acronyms, and abbreviations applicable to this standard are listed in Appendix A.

# 2. APPLICABLE DOCUMENTS

2.1 Government documents. The following documents of the issue in effect on date of invitation for bids or request for proposal, form a part of this standard to the extent specified herein.

STANDARDS:

Military:

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| DOD-STD-2167 | Defense System Software Development |
| MIL-STD-1521 | Technical Reviews and Audits for Systems, Equipments, and Computer Software |

(Copies of Government specifications, standards, drawings, and publications required by suppliers in connection with specified procurement functions should be obtained from the procuring activity or as directed by the Contracting Officer.)

2.2 Non-Government documents. The following documents form a part of this standard to the extent specified herein. Unless otherwise indicated the issue in effect on the date of invitation for bids or request for proposal shall apply.

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| IEEE STD 729 | A Glossary of Software Engineering Terminology |

(Information on obtaining copies of IEEE documents may be obtained from the Institute of Electrical Engineers, 445 Hoes Lane, Piscataway, New Jersey 08854.)

3. REQUIREMENTS

3.1 Computer software qualitY program and plan. The contractor shall develop, implement, and maintain a computer software quality program which complies with the requirements of this standard. The program shall provide quality assurance controls throughout all phases of the software acquisition, including the requirements definition, design, implementation, test, installation and checkout, and operations and maintenance portions of the software life cycle. The computer software quality program shall be described in a documented Computer Software Quality Program Plan (CSQPP). The CSQPP shall describe the contractor's procedures, controls, methodologies and organization necessary to meet the requirements of each of the elements described in paragraphs 3.1.1 through 3.1.18. It shall also contain a cross-reference index, listing each of the paragraph requirements together with its location in the CSQPP in which the related description is provided.

3.1.1 Organization. Describe the relationship, position and authority of the software quality organization to other activities (e.g., Configuration Management, Software Engineering, Program Management) within the management organization. The Contractor shall also describe, in chart form or by other suitable means, the structure, responsibility and authority of those organizations participating in or accomplishing the quality function. The organizational structure shall assure that personnel performing software quality functions are given sufficient well-defined responsibility, authority, organizational freedom and independence to identify and evaluate quality problems, and to initiate, recommend or provide solutions.

3.1.2 Personnel. State the minimum ratio of software quality assurance personnel to development personnel for each phase of the software development. The personnel shall be described by title and minimum qualifications for each quality management and supervisory position.

3.1.3 Resources. Describe the resources that will be used to support the Computer Software Quality Program. The description of each resource shall reference the applicable paragraphs of this standard describing the operation which requires the resource (e.g., a data base management system to store data for corrective action, an organization or a support contractor used to verify documentation, processes or activities).

3.1.4 Development process flow. Describe (in flow chart and narrative form) the quality assurance operations from contract award through final delivery which are utilized to assure the quality of the computer software and related documentation. The description shall include organizational responsibilities and planned inspection and test operations and shall be keyed or related to the major milestones or activities within each phase of the development process. The description shall indicate the relationship and frequency of quality assurance activities to events such as; formal reviews (SRR, SDR, SSR, PDR, CDR, TRR), audits (PCA, FCA) and inspection and test activities (walkthroughs, code inspections, unit & integration tests, documentation reviews, acceptance tests, and field operations).

3.1.5 Audits. Describe the software quality procedures, methods, and responsibilities for the conduct of recurring audit activities which will verify compliance of contractor operations with all aspects of the contract. The description shall include audits of all operations involved in the design, development, code, test, inspection, and installation of the software and documentation, including in-process and supplier operations. The contractor shall establish and describe initial audit schedules and frequencies. Frequencies shall be sufficient to detect change in the level of performance in operations audited. The basis for change in the audit frequencies shall be described. Provisions shall be included to verify the effectiveness of actions taken.

3.1.6 Standards and procedures. Describe the contractor's standards and procedures (e.g., documentation, work, coding, test) which will be used to support the software development and associated documentation. The standards and procedures shall specify criteria for use, and shall have controlled conditions for release, and change. As a minimum, the CSQPP shall address those standards and procedures necessary for the requirements, design, implementation, test, and documentation activities.

3.1.7 In-process controls. Describe the in-process procedures and controls which will be utilized to verify the completeness and acceptability of events, products, tests, and media required of each phase of the software development. Include procedures and controls applicable to items such as: code inspections, development folders, unit tests, document reviews, and acceptance tests.

3.1.8 Configuration management. Describe the software quality procedures and controls to be used to assure compliance of all software and documentation requirements. Include the procedures and controls applicable to:

(a) Configuration identification, configuration control, configuration status accounting and reporting, and configuration audit procedures and processes.

(b) Configuration management and control of the following, if different from the above:

(1) Software and documentation provided by a supplier.

(2) Commercially available, reusable and Government furnished software and related documentation.

(3) Non-deliverable software and documentation used for development and test.

(4) The contractor's internal Developmental Configuration process.

3.1.9 Library controls. Describe the software quality procedures and controls to be used to assure compliance of all software and documentation with software library requirements. Include the procedures and controls applicable to:

(a) The content and operations of libraries such as: Programming Support, Master, and Software Repositories.

(b) The following if different from the above:

(1) Software and documentation provided by a supplier.

(2) Commercially available, reusable and Government furnished software and related documentation.

(3) Non-deliverable software and documentation used for development and test.

(4) Automated Tools and documentation.

3.1.10 Corrective action, reporting and control. Describe the corrective action process used to assure the prompt reporting, tracking, analysis, and correction of problems and defects for all software and related documentation placed under the contractor's internal Developmental Configuration process or Government required configuration control. Include those procedures and controls which shall assure that deficiencies are promptly documented and corrected and that appropriate action is taken to prevent repetition. Include in the description the procedures and controls:

(a) For initiating and reporting problems or defects including reports which describe the deficiencies and the conditions involved.

(b) To identify problems or defects; by severity (critical, major, minor), by development phase (requirements, design, implementation), and by function (test, coding, documentation).

(c) To determine extent, cause and frequency of each problem or defect.

(d) To identify and analyze trends in the problem or defects reported.

(e) Which provide for the determination, authorization, and acceptance of corrective action.

3.1.11 Tools. Describe the software quality procedures and controls used to assure the periodic verification, certification, and update of all tools (e.g., code auditors, decision path monitors, file comparators, structure analyzers, test drivers, simulators, compilers), used in or required to support the development process.

3.1.12 Supplier control. Describe the software quality procedures and controls used to assure that all software supplies and services procured from suppliers conform to contract requirements. Include the procedures and controls for: specifying the level of the suppliers software quality requirements (based on factors such as, complexity, size, critical application), the selection of suppliers, control of purchase documents, surveillance of suppliers operations, determination of acceptability of the software quality plans and procedures, and determination of conformance and acceptability of supplies and services. Describe the procedures and controls used to assure that purchase order criteria include:

(a) Applicable software and software quality requirements.

(b) Software development methods and documentation appropriate to the procurement.

(c) Formal reviews, audits, and milestones.

(d) Rights of the Government to audit the quality system and to inspect at source supplies and services produced at the suppliers facility.

3.1.13 Test controls. Describe the software quality procedures and controls used to assure compliance of software and documentation with applicable test requirements (both formal and informal). The procedures shall assure that all tests and data are complete, correct, traceable, and repeatable. Include the controls over the process, forms, equipment, personnel, operations, and records.

3.1.14 Software independent verification and validation (IV&V) interface. Describe the interface between the software quality organization and an independent verification and validation (IV&V) contractor tasked by the Government (if required by the contract). The description shall include the software quality activities which will be used to assure feedback and correction on deficiencies reported by the IV&V.

3.1.15 Records. Describe the procedures and controls used to assure that records are maintained to provide objective evidence and traceability of operations performed in all phases of the software development. Include the procedures and controls which assure the records provide evidence to substantiate that:

(a) The software and documentation meet contractual requirements.

(b) All quality requirements have been satisfied.

(c) Tests have been performed in accordance with applicable test requirements.

3.1.16 Reports. Describe the quality related reports which document the status, and results of the software development. Include the format, content, distribution and frequency of each report. The reports shall describe all relevant quality information (e.g., inspection activities and results, inspection and test schedules, audit schedules and results, trend data, test requirements and completion matrix, change control activity, program errors, open items, deviation status, and supplier surveys and results). Copies of the reports shall be provided to the QRO upon request.

3.1.17 Installation and checkout. Describe the software quality procedures and controls to be used during the contractor's installation and checkout operations (if required by the contract). Describe the quality operations which assure the following:

(a) Compliance with contract requirements and this standard.

(b) Compliance with internal contractor requirements.

3.1.18 Storage, handling, and shipping. Describe the quality procedures and controls used to assure acceptable storage, handling, packaging, and shipping of in-process and completed software, including source and object code, physical media, and documentation. Include the procedures and controls which will verify compliance with contract requirements and adherence to configuration requirements.

3.2 Preparation instructions. The CSQPP shall comply with the requirements listed in Paragraphs 3.2.1 through 3.2.6.

3.2.1 Format. Unless otherwise specified in the solicitation the CSQPP shall be prepared on 8 1/2 by 11 inch bond paper and bound in a separate volume. Each page prior to Section 1 shall be numbered in lower-case roman numerals beginning with page ii for the table of contents. Each page starting with Section 1 to the end of the document shall be consecutively numbered in arabic numerals. The document may be printed on one or both sides of each page. The plan as a minimum shall consist of the following:

a. Cover Page

b. Table of Contents

c. Scope

d. Referenced Documents

e. Requirements

f. Notes

g. Appendixes

3.2.2 Cover page. The plan shall contain a cover page in the following format.

Computer Software Quality Program Plan

For The

( System/Equipment Name )

Contract No. (contract #)

Date of Document (day/month/year)

Prepared for:

Contracting Agency and address

Prepared by:

( Contractor name and address )

3.2.3 Table of contents. The plan shall contain a table of contents listing the paragraph number, title and page number of all paragraphs and subparagraph. The table of contents shall then list the title and page number of all figures, tables, and appendixes, in that order.

3.2.4 Scope. This section shall be numbered 1 and identify the software and related documentation to which the plan applies. It shall also identify any support software necessary for the development of the government product. The paragraph shall begin

with the following sentence: "This document describes the Computer Software Quality Program to be used during the development of the computer software and related documentation for Contract XXXXX (insert title). The plan is also applicable to the following support software necessary for the design, development and delivery of the Government product."

3.2.5 Referenced documents. This section shall be numbered 2 and list all documents referenced in the plan by document number, title, revision, and date. All documents referenced in the plan shall be available for government review. If a resident QRO is assigned, copies of the documents will be provided for review and retention at his or her request.

3.2.6 Requirements. This section shall be numbered 3 and shall describe the procedures and controls required by paragraphs 3.1.1 through 3.1.18 of this standard.

4. QUALITY ASSURANCE

This section is not applicable to this standard.

5. PREPARATION FOR DELIVERY

This section is not applicable to this standard.

6. NOTES

6.1 Intended use. The contents of this section are for the information of the initiator of the procurement request and are not a part of the requirements of this standard. The Computer Software Quality Program Requirements described in this standard are intended to supplement FAA-STD-013 or FAA-STD-016, and other quality requirements of the contract or procurement specifications.

6.2 Ordering data. The following criteria should be considered when applying this standard to an invitation for bids, request for proposal, contract or other purchase document.

A. Requirements for submittal of the quality plan:

(1) When FAA-STD-018 and FAA-STD-016 are applicable, the quality plans shall be submitted with the technical proposals.

(2) When FAA-STD-018 and FAA-STD-013 are applicable, the quality plans shall be submitted after award in accordance with the contract. (See requirements in paragraph B.)

(3) When only FAA-STD-018 is applicable, the plan shall be submitted with the technical proposals.

B. Requirements for government review when the CSQPP is submitted after award:

(1) The number of copies of the quality plan required.

(2) The number of days (90 unless otherwise specified) after award for submission of the plan for review.

(3) The government review cycle time, including submission to the contractor (30 days unless otherwise specified).

(4) The number of days (14 unless otherwise specified) for the contractor to correct any deficiencies noted as a result of the government review or disapproval.

6.3 Computer software quality program plan changes. Any changes to the CSQPP must be authorized and approved by the Contracting Officer.

# APPENDIX A

## List of Definitions, Acronyms and Abbreviations

10.1 Purpose. In addition to the definitions listed herein this appendix provides a reference or source for definitions applicable to this standard. It also provides a list of all acronyms and abbreviations used in this standard.

10.2 Definitions.

10.2.1 Quality Assurance. A planned and systematic pattern of all actions which are necessary to provide adequate confidence that the item or product conforms to established technical requirements.

10.2.2 Quality Control. The operational techniques and the activities which sustain a quality of product or service that will satisfy given needs: also the use of such techniques and activities.

10.2.3 Verify. The act of reviewing, inspecting, testing, checking, auditing, or otherwise establishing whether or not items, processes, services, documents conform to specified requirements.

10.2.4 Independent verification and validation. Verification and validation of a software product by an organization that is both technically and managerially separate from the organization responsible for developing the product.

10.2.5 Developmental Configuration. The contractor's software and associated technical documentation that defines the evolving configuration of a computer software configuration item (CSCI) during development. It is under the development contractor's configuration control and describes the software configuration of the design, coding, and testing effort.

10.2.6 DOD-STD-2167. Definitions and acronyms used in DOD-STD-2167 are applicable unless conflicting with this standard.

10.2.7 MIL-STD-1521. Definitions and acronyms used in MIL-STD1521 are applicable unless conflicting with this standard or DOD-STD-2167.

10.2.8 IEEE STD 729. The terms and definitions listed in IEEE STD 729, unless conflicting with other applicable definitions noted herein, apply to this standard in their entirety.

10.3 Acronyms and Abbreviations.

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|---|---|
| CDR | Critical Design Review |
| CSQPP | Computer Software Quality Program Plan |

10.3 Acronyms and Abbreviations.

| | |
|---|---|
| DOD | Department of Defense |
| FAA | Federal Aviation Administration |
| FCA | Functional Configuration Audit |
| IEEE | Institute of Electronic and Electrical Engineers |
| IV&V | Independent Verification and Validation |
| PCA | Physical Configuration Audit |
| PDR | Preliminary Design Review |
| QRO | Quality and Reliability Officer |
| SDR | System Design Review |
| SRR | Systems Requirements Review |
| SSR | Software Specification Review |
| TRR | Test Readiness Review |