

STUDENT SAMPLE

SOFTWARE QA GUIDANCE

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1.0 Purpose

To provide guidance on development, implementation and management of Software Quality Assurance Programs (SQAP/SQAPs).

2.0 Scope

2.1 Applies to all computer-based data required to support the business processes dependent on software and used by or for facility operations or support.

2.2 Software Quality Assurance (SQA) is supplemental to existing programs, laws, and regulations.

3.0 Definitions

3.1 Development - Process used to write or modify computer programs, including source code.

3.2 Software - Includes computer programs, procedures, operating system(s), applications, firmware, rules, documentation and data.

3.3 Software Life Cycle – The process used to assure appropriate control and documentation of software and its operating system from initiation or revision through retirement.

4.0 SQA Policy

Established by management to provide SQA program implementation expectations and authority and to define the following:

4.1 Scope and applicability of the SQA program with provisions for exemptions.

4.2 Implementation and SQA Program management responsibilities.

4.3 Relationship between disaster prevention, recovery operations and emergency planning.

4.4 Level of effectiveness evaluations and independent oversight required.

5.0 SQA Program

The SQA program should be developed, documented and implemented to address the full range of software and data processes and controls. As a minimum, the SQA Program addresses responsibilities, quality level classification, planning, procurement, implementation and software life cycle, administration, and management.

5.1 Responsibilities

Responsibilities should be assigned to the appropriate personnel or groups:

5.1.1 SQA Program level responsibilities include:

- SQA Program development and maintenance.
- Extent of SQA program interface with existing programs.
- Establishing software life cycle(s).
- SQA Program monitoring, guidance and administration.
- Training requirements and implementation.
- Catalogue development and maintenance (sometimes referred to as software index, list, master list, etc.).

- Disaster prevention definition and recovery process requirements.

5.1.2 Software and data ownership responsibilities for assuring:

- Compliance with software and data SQA Program requirements.
- Appropriate SQA classification of software and data.
- Identification of appropriate control, input, and use of data.
- Selection of software life cycle.
- Software and data integrity.
- Administration of documentation and records.
- Disposition of error notices, nonconformance controls, & corrective actions.
- Configuration management and control of changes and modifications.
- Security and access control.
- Establishment of handling, storage and shipping methods for media and products.
- Disaster prevention and recovery implementation requirements.
- Control of purchased goods and services including:
 - SQA requirements in applicable procurement documents.
 - Appropriate use and implementation of commercial grade products.
 - Inclusion of error notification process in procurement documents.

5.1.3 User level responsibilities for assuring:

- Use of properly classified and catalogued software and data.
- Appropriate control, input and use of software and data.
- Error notifications and problem reporting.
- Training or qualifications commensurate with the quality level of software and data.
- Compliance with computer security practices and procedures.
- Implementation of disaster prevention and recovery requirements, when assigned.

5.1.4 Functional support responsibilities for assuring:

- Maintenance and configuration control of operating system(s).
- Communication and coordination of operating system changes affecting software and data.
- Development support, as requested.
- Support and/or implementation of disaster prevention and recovery.
- Problem resolution or resolution support.
- Implementation of security measures.
- Appropriate handling, storage and shipping of media and products.

5.1.5 Independent oversight responsibilities for assuring:

- Periodic monitoring of the SQA Program implementation.
- Periodic audits and/or assessments.

5.2 Software and Data Classification (see Attachment 1)

SQA classification controls should establish or provide:

- 5.2.1 Methods for evaluating software and data impact business processes prior to development, procurement or use.
- 5.2.2 Clearly defined graded approach to software and data quality levels to assure compliance with existing requirements, policy, programs, procedures, and commitments.
- 5.2.3 A hierarchy of implementation of requirements based upon actual use and risk to business processes. The hierarchy should establish clear software and data quality levels with consideration of the following:
 - Highest level(s) including significant, and usually immediate risks, to business.
 - Intermediate level(s) including regulatory compliance and issues that could ultimately lead to significant risks to business.
 - Lowest level(s) including elements representing no significant risk to business, but that ultimately require resolution.
- 5.2.4 The actual quality level classifications with consideration of:
 - Safety significance.
 - Regulatory requirements and commitments.
 - Degree of business risk
 - Reliance on human intervention.
 - Otherwise unverified implementation, control or decisions using software or data as the primary basis.
 - Scope and use of the software and data.
 - Products developed from standard or generic software, such as spreadsheets, databases or calculations.
- 5.2.5 The extent to which reclassification of software and data is necessary, due to proposed changes in software or data usage and/or changes in functionality.
- 5.2.6 SQA Program exemption methodology for software or data that requires documented rationale for the exemption.

5.3 Software Quality Assurance Planning (see Attachment 2)

SQA planning should include:

- 5.3.1 Appropriate control of all software and data that may be accomplished in one or more of the following ways:
 - Specific SQA plans for each software or data development, procurement or redevelopment effort.
 - Generic SQA plans for development or procurement of equivalent or similar software or data.
 - SQA planning procedures or instructions.

- 5.3.2 Selection of an appropriate software life cycle. The extent of applicability of the software life cycle will depend upon the SQA classification and management discretion.

Life cycle requirements and considerations may be included in generic SQA plans, procedures or instructions.

- 5.3.3 Technical reviews, including independent reviews, depending upon the classification of the software or data and the complexity of the development effort. Reviews may be imposed upon any or all of the documents developed through the software life cycle. Additional reviews also should be considered including:

- Management or project management reviews to monitor progress, status and effectiveness of implementation.
- Inspections conducted by peers to provide additional assurance of conformance. Independent reviews/inspections should be considered for higher risk software and data (e.g., environmental controls).
- Walk-through or tabletop discussions during early stages of development to identify any potential problems or user issues.
- Audits/assessments.

These reviews are particularly useful for monitoring or assessing software or data development by contractors or vendors.

- 5.3.4 Assignment and scope of specific responsibilities for implementation and control of:

- Software life cycle and configuration management.
- Project management or reference to project planning documents, as applicable.
- Procurement:
 - Including controls for contracted services.
 - Instructions for procurement of commercial grade software and data, if applicable.

- 5.3.5 Establishment of required documentation.

5.4 Procurement

SQA procurement controls should include:

- 5.4.1 Provisions for assuring procured software or data meets SQA program requirements.
- 5.4.2 Appropriate qualification of vendors or contractors.
- 5.4.3 Establishment and implementation of error notifications by vendors, contractors and other companies, when appropriate.

5.4.4 Provisions to assure SQA requirements are included in procurement documents (e.g., maintenance upgrades or QA support for higher risk software).

5.5 Implementation

Based upon the level of business risk, SQA implementation should include:

5.5.1 Establishment of software and data requirements, such as:

- Regulatory requirements and commitments (e.g., environmental)
- Functionality and external interfaces
- Performance and attributes
- Design assumptions, constraints and considerations
- Security and access restraints

5.5.2 Software and data design controls, based upon established requirements, such as:

- Development of the software or data
- Details of the control logic
- Data operations performed.

5.5.3 Verification and validation (V&V) planning and implementation, such as:

- Establishment of acceptance criteria
- Schedule or frequency
- Verifying and validating requirements

5.5.4 Software construction, such as:

- Construction and integration of the software components.
- Correction of compilation and assembly errors.
- Verifications of operational compatibility of individual software components.
- Programming standards.

5.5.5 Test planning and implementation, such as:

- Establishment of acceptance criteria
- Schedule, including re-testing.
- Exercising the design of software against the requirements, as implemented by the construction.
- Installation acceptance testing
- User testing

5.5.6 Controls for installation and checkout, such as:

- Movement of software and data from the development region to production.
- Updates of disaster prevention and recovery plans prior to the movement, as necessary.
- Completion of additional testing to assure that the software and data was transported and installed without affecting performance or requirements.
- Conduct of user testing to assure final readiness checks and to assure adequacy of implementation.
- Maintenance of configuration, documentation, distribution media, and operating environments.

- Data validation using special procedures, work instructions or engineering processes.

5.5.7 Controls for operations and maintenance, such as:

- Notifications to management when changes may affect or impact plant operations.
- Configuration and infrastructure control to minimize losses and to maintain software and data availability.
- Development and control of a “Master Software Catalog” (listing of classified software).
- Permanent, emergency and temporary changes and modifications.
- Conduct of impact analysis or testing to assure continued reliable operation of software and data after operating environment changes.
- Conduct of impact analysis to assure continued reliable operation of production systems after introduction of a change including their impact on:
 - The operating environment.
 - Other software which share the same data and/or documentation.
 - Users.
- Error reporting, non-conformances, and corrective actions.
- Ongoing use and configuration of software and data.

5.5.8 Controls for retirement, such as:

- Removal of software from the production region, including notification to affected users.
- Retrieval or migration of data affected by the retirement.
- Plans for error reporting and resolution for previous use of the software and data.

5.6 Administration and management

SQA administration and management controls should be established to assure:

5.6.1 Administrative program interfaces, such as:

- Corrective action
- Design change process
- Document control and records
- Procurement
- Support processes, as applicable

5.6.2 Security of software and data, such as:

- Authorized access or use.
- Protection of security information.

5.6.3 Disaster prevention and recovery, such as:

- Differentiation of Disaster Recovery and data retention.
- Establishment of electronic or manual backup systems.
- Software and data backups and recovery processes.
- Incremental implementation that allows personnel to implement disaster recovery processes to eliminate or minimize the occurrence before an actual disaster.

- Periodically testing the adequacy of disaster recovery processes and procedures.

5.6.4 Training, such as:

- SQA program requirements and implementation, commensurate with level of responsibility.
- Online help for users to the extent necessary or possible.
- Providing user maintenance or help documentation or manuals.

5.6.5 Development and maintenance of records to provide documented evidence of SQA program compliance.

6.0 Included Reference(s)

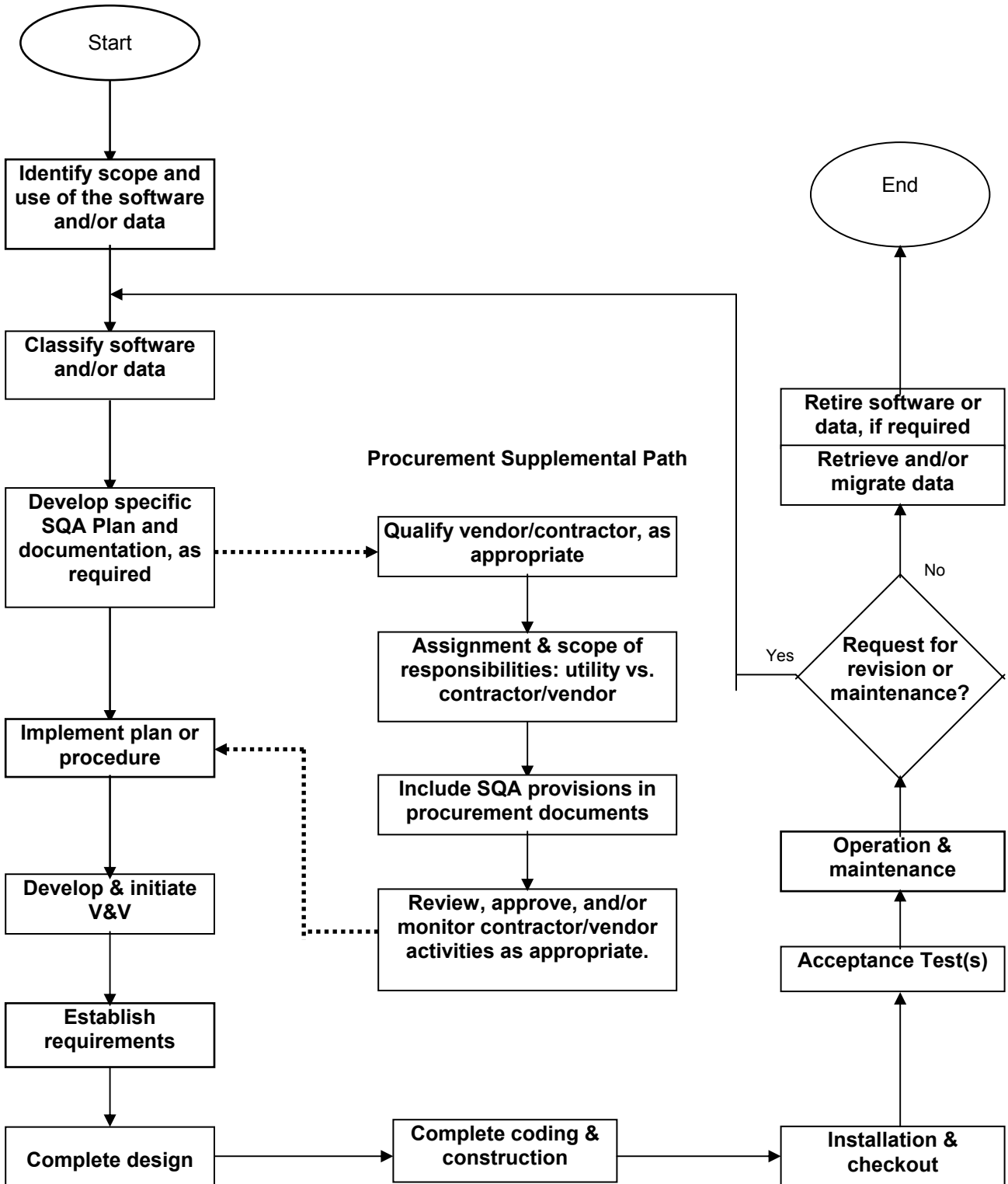
7.0 Development References

8.0 Attachments

8.1 Attachment 1 - Software QA Simplified Process Flow Chart

8.2 Attachment 2 - SQA Element Listing

Attachment 1 – Software QA Simplified Process Flow Chart



Attachment 2 – SQA Element Listing

The following is a list of the minimum SQA elements recommended for development of the highest designated quality level. The elements should be applied to all other high, intermediate and low (risk) quality level software and data as determined appropriate during quality level classification:

- Configuration control
- Error Reporting, Nonconformance control and corrective action
- Disaster recovery
- Document control
- Documentation of:
 - Requirements
 - Design
 - Classification and inclusion on software catalogue
 - Tests plans and reports
 - Instructions or instruction manuals
- Testing
 - Hardware/software integration tests
 - Production environment
 - User level
- Independent Review
- Procurement (for purchased products and services)
- User training - Training may be formal, on-the-job or job equivalent.
- Verification & Validation