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ASME
As a Help to Export!

Our Topic today:

Nuclear Quality Assurance
ASME NQA-1

Karte: Wikipedia

CIS GmbH

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Experts in
ASME Code

ASME
SETTING THE STANDARD

Consulting

CIS GmbH
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3rd Party
Inspection

Training
Design
Audits

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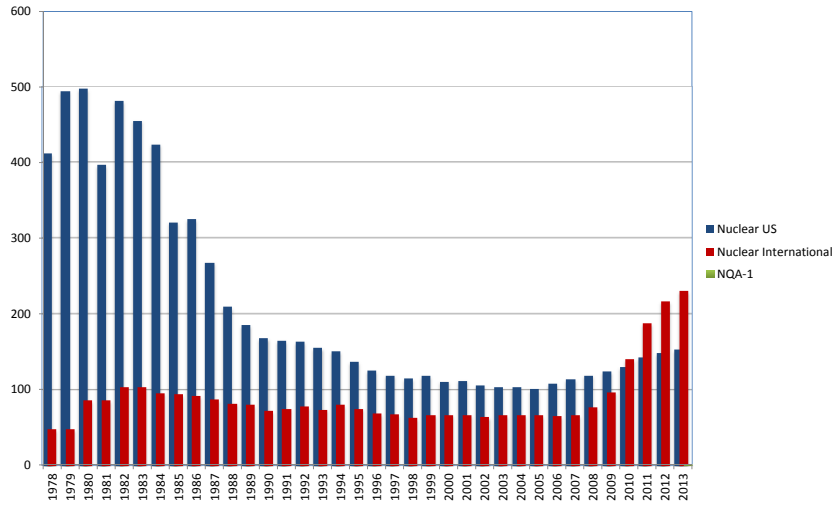
ASME Nuclear Accredited Companies



Hierarchy Structure

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Regulatory Authorities: Nuclear Regulatory Commission [NRC]

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

Code of Federal Regulations [CFR]
Regulatory Guides [Reg]
http://www.nrc.gov/

Jurisdictional Authorities: US-States and Canadian Provinces

IEEE Standards
IEEE 323
IEEE 334
IEEE 572

Referenced Codes and Standards

NQA-1: Quality Assurance Requirements for Nuclear Facility Applications
QAI-1: Qualifications for Authorized Inspection
ASME Code Sections II [Material] ; V [NDE] ; IX [Welding] ; XI [Inservice]
ASME ; ANSI ; ASNT

Jurisdictional Regulations

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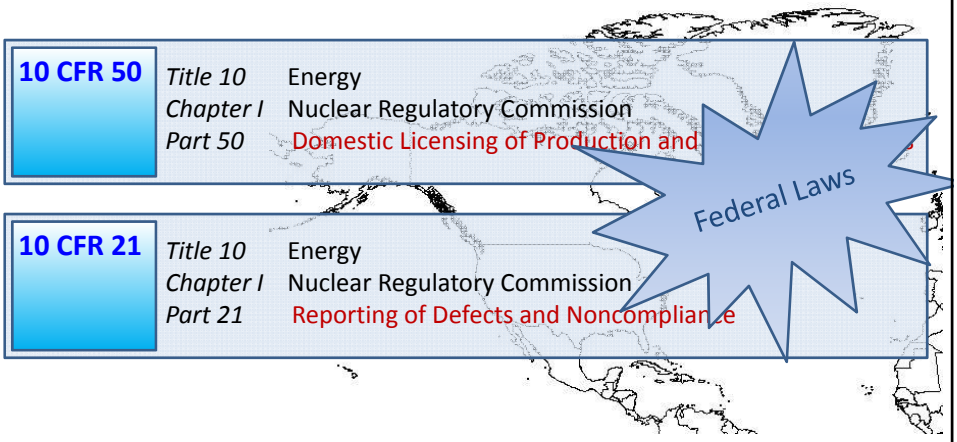
Code of Federal Regulations [CFR]

http://www.gpo.gov/fdsys/browse/collectionCfr.action?collectionCode=CFR



10 CFR 50

Title 10 Energy
Chapter I Nuclear Regulatory Commission
Part 50 Domestic Licensing of Production and

10 CFR 21

Title 10 Energy
Chapter I Nuclear Regulatory Commission
Part 21 Reporting of Defects and Noncompliance

10 CFR 50.49

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§ 50.49 Environmental qualification of electric equipment important to safety for nuclear power plants.

(a) Each holder of or an applicant for an operating license issued under this part,…, shall establish a **program for qualifying the electric equipment** defined in paragraph (b) of this section. …

Federal Law

(b) Electric equipment important to safety covered by this section is:

(1) Safety-related electric equipment. [3]

[3] **Safety-related electric equipment is referred to as "Class 1E" equipment in IEEE 323-1974. …**

(2) Nonsafety-related electric equipment whose failure under postulated environmental conditions could prevent satisfactory accomplishment of safety functions specified in subparagraphs (b)(1)(i)(A) through (C) of this section by the safety-related equipment.

(3) Certain post-accident monitoring equipment. [4]

[4] **See Reg Guide 1.96**

10 CFR 50.49

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§ 50.49 Environmental qualification of electric equipment important to safety for nuclear power plants.

(c) Requirements for (1) dynamic and seismic qualification of electric equipment important to safety, (2) protection of electric equipment important to safety against other natural phenomena and external events, and (3) environmental qualification of electric equipment important to safety located in a mild environment are not included within the scope of this section. A mild environment is an environment that would at no time be significantly more severe than the environment that would occur during normal plant operation, including anticipated operational occurrences.

Federal Law

(d) **The applicant or licensee shall prepare a list of electric equipment important to safety covered by this section**. In addition, the applicant or licensee shall include the information in paragraphs (d)(1), (2), and (3) of this section for this electric equipment important to safety in a **qualification file**. The applicant or licensee shall keep the list and information in the file current and retain the file in auditable form for the entire period during which the covered item is installed in the nuclear power plant or is stored for future use to permit verification that each item of electric equipment is important to safely meet the requirements of paragraph (j) of this section.

10 CFR 50.49

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§ 50.49

(d)

(1) The **performance specifications under conditions existing during and following design basis accidents.**
(2) The voltage, frequency, load, and other electrical characteristics for which the performance specified in accordance with paragraph (d)(1) of this section can be ensured.
(3) The environmental conditions, including **temperature, pressure, humidity, radiation, chemicals, and submergence at the location** where the equipment must perform as specified in accordance with paragraphs (d) (1) and (2) of this section.

Federal Law

10 CFR 50.49

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(e) The electric equipment qualification program must include and be based on the following:

(1) *Temperature and pressure.* The time-dependent temperature and pressure at the location of the electric equipment important to safety must be established for the most severe design basis accident during or following which this equipment is required to remain functional.

(2) *Humidity.* Humidity during design basis accidents must be considered.

(3) *Chemical effects.* The composition of chemicals used must be at least as severe as that resulting from the most limiting mode of plant operation (e.g., containment spray, emergency core cooling, or recirculation from containment sump). …

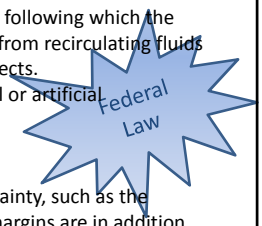
(4) *Radiation.* The radiation environment must be based on the type of radiation, the total dose expected during normal operation over the installed life of the equipment, and the radiation environment associated with the most severe design basis accident during or following which the equipment is required to remain functional, including the radiation resulting from recirculating fluids for equipment located near the recirculating lines and including dose-rate effects.

(5) *Aging.* Equipment qualified by test must be preconditioned by natural or artificial (accelerated) aging to its end-of-installed life condition. …

(6) *Submergence* (if subject to being submerged).

(7) *Synergistic effects.* Synergistic effects must be considered …

(8) *Margins.* Margins must be applied to account for unquantified uncertainty, such as the effects of production variations and inaccuracies in test instruments. These margins are in addition to any conservatisms applied during the derivation of local environmental conditions of the equipment unless these conservatisms can be quantified and shown to contain appropriate margins.



10 CFR 50.49

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(f) Each item of electric equipment important to safety must be qualified by one of the following methods:

(1) Testing an identical item of equipment under identical conditions or under similar conditions with a supporting analysis to show that the equipment to be qualified is acceptable.

(2) Testing a similar item of equipment with a supporting analysis to show that the equipment to be qualified is acceptable.

(3) Experience with identical or similar equipment under similar conditions with a supporting analysis to show that the equipment to be qualified is acceptable.

(4) Analysis in combination with partial type test data that supports the analytical assumptions and conclusions.

U.S.NRC United States Nuclear Regulatory Commission Protecting People and the Environment

Appendix B to Part 50—

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Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants

Introduction. Every applicant for a construction permit is required by the provisions of § 50.34 to include in its **preliminary safety analysis report** a description of **the quality assurance program** to be applied to the design, fabrication, construction, and testing of the structures, systems, and components of the facility. …

Every applicant for a combined license under part 52 of this chapter is required by the provisions of § 52.79 of this chapter to include in its final safety analysis report a description of the quality assurance applied to the design, and to be applied to the fabrication, construction, and testing of the structures, systems, and components of the facility and to the managerial and administrative controls to be used to assure safe operation. For applicati… September 27, … …ter is required by the prov… …f § 5… to include in its … …m applied to site activities relate… construction, an… …cilities that may be constructed… for a design app… …y the provisions of 10 CFR 52.… include in its fin… …applied to the design of the stru… components of t… …f this chapter is required by the provisi… …CFR …2.157 to include in its … …am applied to the design, and to be applied to the manufacture of, the structu… …components of the reactor. Nuclear power plants and fuel reprocessing plants include structures, syste… …mponents that prevent or mitigate the consequences of postulated accidents that could cause undue risk t… …health and safety of the public. This appendix establishes quality assurance requirements for … design, manufacture, construction, and operation of those structures, systems, and **components**. The pertinent requirements of this appendix apply to **all activities affecting the safety-related functions of those structures, systems, and components**; these activities include designing, purchasing, fabricating, handling, shipping, storing, cleaning, erecting, installing, inspecting, testing, operating, maintaining, repairing, refueling, and modifying.

QA is required for all Safety Related Components!
To be classified and specified by the Owner / Contractor

Federal Law

U.S.NRC United States Nuclear Regulatory Commission Protecting People and the Environment

Appendix B to Part 50—

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I. Organization
II. Quality Assurance Program
III. Design Control
IV. Procurement Document Control
V. Instructions, Procedures, and Drawings
VI. Document Control
VII. Control of Purchased Items and Services
VIII. Identification and Control of Items
IX. Control of Processes
X. Inspection
XI. Test Control
XII. Control of Measuring and Test Equipment
XIII. Handling, Storage, and Shipping
XIV. Inspection, Test, and Operating Status
XV. Nonconforming Materials, Parts, or Components
XVI. Corrective Action
XVII. Quality Assurance Records
XVIII. Audits

Federal Law

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United States Nuclear Regulatory Commission
Protecting People and the Environment

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Appendix B to Part 50—

IV. Procurement Document Control

QA required for SUBContractors

Measures shall be established to assur[illegible], design bases, and other requirements which are nec[illegible]ssure adequate quality are suitably included or referenced in the documer[illegible]rocurement of material, equipment, and services, whether purchased by [illegible]applicant or by its contractors or subcontractors. To the extent necessary, **procurement documents shall require contractors or subcontractors to provide a quality assurance program consistent with the pertinent provisions of this appendix.**

Federal Law

VII. Control of Purchased Material, Equipment, and Services

Measures shall be established to assure that purchased material, equipment, and services, whether purchased directly or through contractors and subcontractors, conform to the procurement documents. **These measures shall include provisions, as appropriate, for source evalu[illegible]f quality furnished by the contractor or su[illegible] or subcontractor source, and examination of produc[illegible]elivery.** Documentary evidence that material and equipment conform to th[illegible]urement requirements shall be available at the nuclear powerplant or fuel reproc[illegible]g plant site prior to installation or use of such material and equipment. …**The effectiveness of the control of quality by contractors and subcontractors shall be assessed by the applicant or designee at intervals consistent with the importance, complexity, and quantity of the product or services**.

Auditing of Subcontractors required

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U.S. NUCLEAR REGULATORY COMMISSION

July 2011
Revision 1

REGULATORY GUIDE

OFFICE OF NUCLEAR REGULATORY RESEARCH

REGULATORY GUIDE 1.156
(Draft was issued as DG-1254, dated January 2011)

QUALIFICATION OF CONNECTION ASSEMBLIES FOR NUCLEAR POWER PLANTS

U.S.NRC

Reg Guide 1.156

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B. DISCUSSION

Institute of Electrical and Electronics Engineers (IEEE) Standard (Std.) 572-2006, "Qualification of Class 1E Connection Assemblies for Nuclear Power Generating Stations," issued June 2007 (Ref. 2), was prepared by Subcommittee 2 (Qualification) of the IEEE Nuclear Power Engineering Committee and was approved by the IEEE Standards Board on December 6, 2006. **This standard describes basic procedures for qualifying connection assemblies (e.g., connectors, terminations, and environmental seals in combination with related cables or wires as assemblies). The qualification requirements in this standard, when followed, demonstrate and document the ability of the equipment to perform safety functions under applicable service conditions, including design-basis events.**

C. REGULATORY POSITION

Th**2006**, when used in co…tion of Certain Electric Eq…, as **an acceptable me…ns** pertaining to the environmental qualification of connectors, terminations, and environmental seals in combination with cables or wires as assemblies for service in nuclear power plants to ensure that the connection assemblies can perform their safety functions

Other Methods may be used as well!

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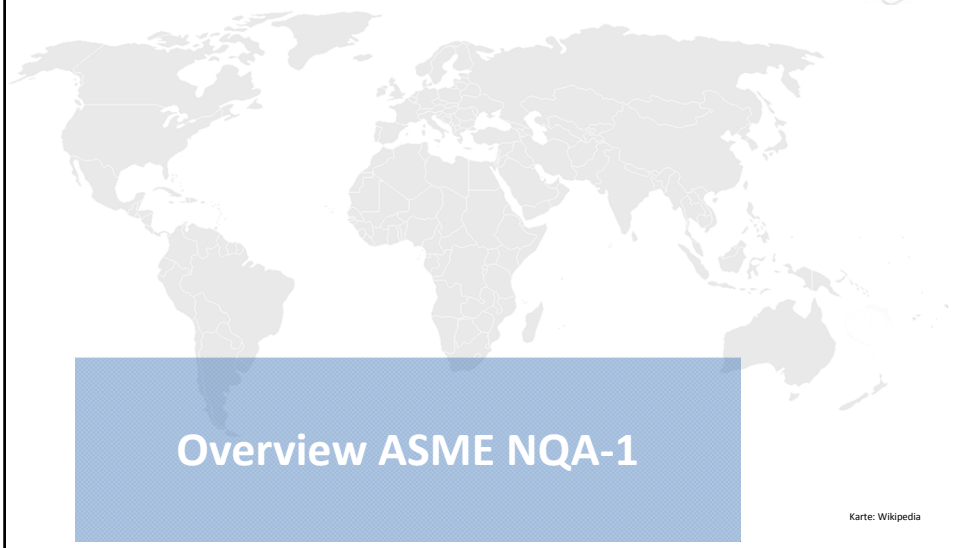

Overview ASME NQA-1

Karte: Wikipedia

NQA-1 History

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ANSI/ASME NQA-1-1979 Quality Assurance Program Requirements for Nuclear Power Plants
intended to meet and implement the 18 criteria of
10 CFR 50 Appendix B, Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants.

ANSI/ASME NQA-2-1979 Quality Assurance Requirements for Nuclear Power Plants
based upon ANSI/ASME N45.2-1977, Quality Assurance Program Requirements for Nuclear Facilities;
ANSI N46.2, Revision 1, Quality Assurance Program Requirements for Post Reactor Nuclear Fuel Cycle Facilities;
N45.2.6-1978 Qualifications of Inspection, Examination, and Testing Personnel for Nuclear Power Plants
N45.2.9-1979 Requirements for Collection, Storage, and Maintenance of Quality Assurance Records for Nuclear Power Plants
N45.2.10-1973 Quality Assurance Terms and Definitions
N45.2.11-1974 Quality Assurance Requirements for the Design of Nuclear Power Plants
N45.2.12-1977 Requirements for Auditing of Quality Assurance Programs for Nuclear Power Plants
N45.2.13-1976 Quality Assurance Requirements for Control of Procurement of Items and Services for Nuclear Power Plants
N45.2.23-1978 Qualification of Quality Assurance Program Audit Personnel for Nuclear Power Plants

ANSI/ASME NQA-1-1979, 1983, 1986, 1989
ASME NQA-1-1994, 1997, 2000, 2004, 2008, 2012 (March 2013).

NQA-1 Part 1 Requirements

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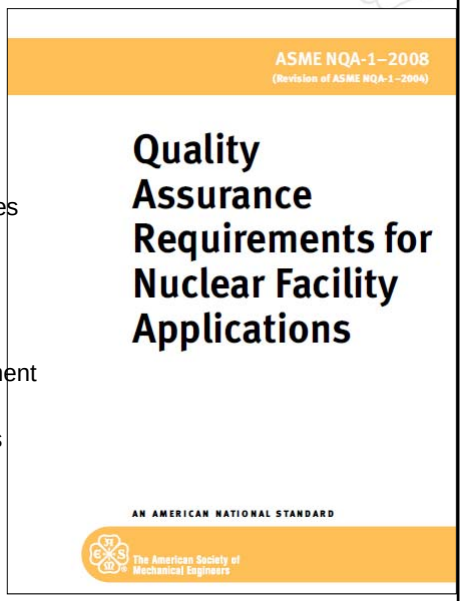
1 Organization
2 Quality Assurance Program
3 Design Control
4 Procurement Document Control
5 Instructions, Procedures, and Drawings
6 Document Control
7 Control of Purchased Items and Services
8 Identification and Control of Items
9 Control of Processes
10 Inspection
11 Test Control
12 Control of Measuring and Test Equipment
13 Handling, Storage, and Shipping
14 Inspection, Test, and Operating Status
15 Control of Nonconforming Items
16 Corrective Action
17 Quality Assurance Records
18 Audits



NQA-1 Requirement 1

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REQUIREMENT 1
Organization

100 GENERAL

Responsibilities for the establishment and implementation of the quality assurance program shall be defined. The organizational structure, functional responsibilities, levels of authority, and lines of communications for activities affecting quality shall be documented.

200 STRUCTURE AND RESPONSIBILITY

201 General

The organizational structure and responsibility assignments shall be such that

(a) senior management establishes objectives for effective implementation of the quality assurance program and is responsible for the desired end result

(b) quality is achieved and maintained by those assigned responsibility for performing the work

(c) quality achievement is verified by those not directly responsible for performing the work

(d) those responsible for assuring that an appropriate quality assurance program has been established and those verifying activities affecting quality have sufficient authority, direct access to responsible levels of management, organizational freedom, and access to work to

from cost and schedule when opposed to safety function considerations. These verification functions include the following:

(1) identifying quality problems

(2) initiating, recommending, or providing solutions to quality problems through designated channels

(3) verification of implementation of solutions

(4) assuring that further processing, delivery, installation, or use is controlled until proper disposition of a nonconforming item, deficiency, or unsatisfactory condition has occurred

300 PROGRAM CONTROL

Where more than one organization is involved in the execution of activities, the responsibilities, interfaces, and authority of each organization shall be clearly defined and documented.

The external interfaces between organizations and the internal interfaces between organizational units, and

Summary:

- Organization Chart Required
- Senior Management shall establish and verify requirements for the QAProgram
- Responsibility and Authority in case of Problems
- No shipment with open NCRs.
- Interface Controls required

NQA-1 2 – QA Program

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100 GENERAL ~~BASIC~~

(a) A documented quality assurance program shall be planned, implemented, and maintained in accordance with this Part (Part I), or portions thereof. The program shall identify the activities and items to which it applies. The program shall provide control over activities affecting quality to an extent consistent with their importance. The program shall include monitoring activities against acceptance criteria in a manner sufficient to provide assurance that the activities affecting quality are performed satisfactorily. The program shall be established at the earliest time consistent with the schedule for accomplishing the activities.

The program shall provide for the planning and accomplishment of activities affecting quality under suitably controlled conditions. Controlled conditions include the use of appropriate equipment, suitable environmental conditions for accomplishing the activity, and assurance that prerequisites for the given activity have been satisfied. The program shall provide for any special controls, processes, test equipment, tools, and skills to attain the required quality of activities and items and for verification of that quality. The organization shall establish and implement processes to detect and correct quality problems.

(b) The program shall provide for indoctrination, training, and qualification as necessary of personnel performing or managing activities affecting quality to ensure that suit able proficiency is achieved and maintained.

Summary:

- Description needed
- Scope shall be identified
- Indoctrination and Training required
- System for Detection of Quality Problems

NQA-1 3– Design Control

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100 GENERAL BASIC
The design shall be
- defined,
- controlled, and
- verified.

Design inputs shall be specified on a timely basis and translated into design documents. Design interfaces shall be identified and controlled. Design adequacy shall be verified by individuals other than those who designed the item or computer program. Design changes shall be governed by control measures commensurate with those applied to the original design.

200 DESIGN INPUT
Applicable design inputs shall be identified and documented, and their selection reviewed and approved. The design input shall be specified to the level of detail necessary to permit the design activities to be carried out in a correct manner and to provide a consistent basis for making design decisions, accomplishing design verification measures, and evaluating design changes.

NQA-1 3– Design Control

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400 DESIGN ANALYSES
Design analyses shall be sufficiently detailed such that a person technically qualified in the subject can review and understand the analyses and verify the adequacy of the results without recourse to the originator.

401 Use of Computer Programs
To the extent required in paras. 401(a) and (b) of this Requirement, computer program acceptability shall be preverified or the results verified with the design analysis for each application.

Preverified computer p
Standard.
(a) The computer pro
encoded mathematic
(b) The encoded mat
problem associated w

402 Documentation of Design Analyses
Documentation of design analyses shall include the following:
(a) the objective of the analyses
(b) design inputs and their sources
(c) results of literature searches or other applicable background data
(d) assumptions and indication of those assumptions that must be verified as the design proceeds
(e) identification of any computer calculation, including identification of

900 DOCUMENTATION AND RECORDS
Design documentation and records shall include not only final design documents, such as drawings and specifications, and revisions to those documents, but also documentation that identifies the important steps in the design process, including sources of design inputs that support the final design.

NQA-1 4– Procurement

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200 CONTENT OF THE PROCUREMENT DOCUMENTS
Procurement documents issued at all tiers of procurement shall include provisions for the following, as deemed necessary by the Purchaser.
201 Scope of Work
202 Technical Requirements
203 Quality Assurance Program Requirements
204 Right of Access
205 Documentation Requirements
206 Nonconformances
207 Spare and Replacement Parts

300 PROCUREMENT DOCUMENT REVIEW
A review of the procurement documents, and changes thereto, shall be made and documented prior to award to assure that documents transmitted to prospective Supplier(s) include appropriate provisions to assure that items or services will meet specified requirements.

400 PROCUREMENT DOCUMENT CHANGES

Summary:

- Procurement process shall be documented
- QA shall be extended to subtier suppliers
- PO shall be reviewed for approval prior to procurement
- Changes shall be controlled in the same way.

NQA-1 7– Purchased Items and Services

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100 GENERAL BASIC
The procurement of items and services shall be controlled to ensure conformance with specified requirements. Such control shall provide for the following as appropriate: source evaluation and selection, evaluation of objective evidence of quality furnished by the Supplier, source inspection, audit, and examination of items or services upon delivery or completion.
200 SUPPLIER EVALUATION AND SELECTION
Prior to award of a contract, the Purchaser shall evaluate the Supplier's capability by:
(a) Supplier's history of providing an identical or similar product that performs satisfactorily in actual use. The Supplier's history shall reflect current capability.
(b) Supplier's current quality records supported by documented qualitative and quantitative information that can be objectively evaluated.
(c) Supplier's technical and quality capability shall be evaluated. Evaluation of the facilities, personnel, and the implementation of the Supplier's quality assurance program.
300 BID EVALUATION
400 CONTROL OF SUPPLIER-GENERATED DOCUMENTS
500 ACCEPTANCE OF ITEM OR SERVICE
503 Certificate of Conformance
504 Source Verification
505 Receiving Inspection
600 CONTROL OF SUPPLIER NONCONFORMANCES

Summary:

- Suppliers shall be audited
- Receiving inspection shall be performed
- Nonconformances shall be controlled
- Records shall be maintained
- Alternative:

UTILIZATION OF COMMERCIAL GRADE ITEMS

800 RECORDS
Records shall be established and maintained to indicate the performance of the following functions:
(a) supplier evaluation and selection
(b) acceptance of items or services
(c) supplier nonconformances to procurement document requirements, including their evaluation and disposition
(d) utilization and acceptance of commercial grade items

NQA-1 15– Nonconforming Items

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100 GENERAL BASIC
Items that do not conform to specified requirements shall be controlled to prevent inadvertent installation or use. Controls shall provide for identification, documentation, evaluation, segregation when practical, and disposition of nonconforming items, and for notification to affected organizations.
200 IDENTIFICATION
300 SEGREGATION
400 DISPOSITION
A disposition, such as use-as-is, reject, repair, or rework of nonconforming items shall be made and documented. Technical justification for the acceptability of a nonconforming item dispositioned repair or use-as-is shall be document ed. Nonconformances to design requirements dispositioned use-as-is or repair shall be subject to design control measures commensurate with those applied to the original design. Required as built records shall reflect the use-as-is or repair condition.
405 Reexamination
Reworked items shall be reexamined in accordance with applicable procedures and with the original acceptance criteria.
Repaired items shall be reexamined in accordance with applicable procedures and with the original acceptance criteria unless the disposition has established alternate acceptance criteria.

Summary:
- No Nonconforming Item may be supplied
- Structured Process to resolve
- Design / Engineering Concurrence
- Documentation for Lifetime
- 10CFR21: Applies even after supply!

NQA-1 17– QA Records

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REQUIREMENT 17
Quality Assurance Records

100 GENERAL

The control of quality assurance records shall be established consistently with the schedule for accomplishing work activities. Quality assurance records shall furnish documentary evidence that items or activities meet specified quality requirements. Quality assurance records shall be identified, generated, authenticated, and maintained, and their final disposition specified. Record control requirements and responsibilities for these activities shall be documented.

200 GENERATION OF RECORDS

(a) Records shall be legible.
(b) Records shall be traceable to associated items and activities and accurately reflect the work performed or information required.
(c) Records to be generated, supplied, or maintained shall be specified in applicable documents, such as design specifications, procurement documents, test procedures, and operational procedures.

401 Lifetime Records

401.1 Lifetime records are those that meet one or more of the following criteria:
(a) those that would be of significant value in demonstrating capability for safe operation
(b) those that would be of significant value in maintaining, reworking, repairing, replacing, or modifying an item
(c) those that would be of significant value in determining the cause of an accident or malfunction of an item
(d) those that provide required baseline data for inservice inspection
(e) those that show that the configuration of a particular item while it is installed in the plant or stored for future use.

402 Nonpermanent Records

Nonpermanent records are those required to show evidence that an activity was performed in accordance with the applicable requirements but need not be retained for the life of the item because they do not meet the criteria for lifetime records. Nonpermanent records

Summary:
- Owner shall keep Lifetime Records
- Nonpermanent Records by Manufacturer
- Storage Facility clearly defined (requirements!)
- Records shall be legible and protected
- Retention time
- Electronic records are difficult!

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Any questions?
We have answers!

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Karte: Wikipedia