



SETTING THE STANDARD

ASME Code and Quality assurance for construction of nuclear facilities

Mark N. Mitchell

**Principal Engineer at Bufo Technology and
Member BPV Committee on Construction
of Nuclear Facility Components (BPV III)**

Introduction

- Introduction to ASME Codes and Standards.
 - The inclusiveness of the ASME standards development process
 - World Trade Organization Technical Barriers to Trade (TBT) criteria regarding standards development.
- The ASME Code, QA and Certification.
 - Introduction to the ASME Section III Rules for Construction of Nuclear Facility Components of the B&PV Code as they apply to quality assurance for construction of nuclear facilities
 - Introduction to the ASME Conformity assessment process.
- Overview of major international Nuclear Quality Assurance Standards and how they relate and interact.
 - Introduction to ASME NQA-1 Nuclear Quality Assurance Standard (comparison to ISO 9001 and IAEA GS-R-3).

INTRODUCTION TO ASME CODES AND STANDARDS

ASME: A Standards Development Organization

- First standard issued in 1884
- 50 Consensus Committees
- 700 Total Committees
- About 30 technical staff
- Between 75-100 Standards Issued Annually
- Approximately 500 published codes and standards; used in more than 100 countries
- Administer Over 40 US Technical Advisory Groups to ISO

The ASME Consensus Process

- People
 - there were 4705 volunteers working in ASME standards development of which
 - 585 were from outside the U.S.
 - representing 47 countries.
- Process
 - Complies with WTO Principles for International Standards Development; e.g., transparency, openness, impartiality and consensus, effectiveness and relevance
 - Agreement on Technical Barriers to Trade tries to ensure that regulations, standards, testing and certification procedures do not create unnecessary obstacles to international trade.
 - Procedural due process
- Product
 - High quality technical standards
 - Continuous maintenance; incorporation of new technologies

2011 – How do we look?



- Recognized and accepted in over 100 nations
 - Leading standards across an array of industries throughout the world
 - Current translations by others in Japanese, Korean, French and Chinese
 - ASME Spanish version of BPV Section I, Power Boilers
-
- Recent references in national regulations of:
India - Nigeria - South Africa - Colombia
 - Volunteers from over 40 nations

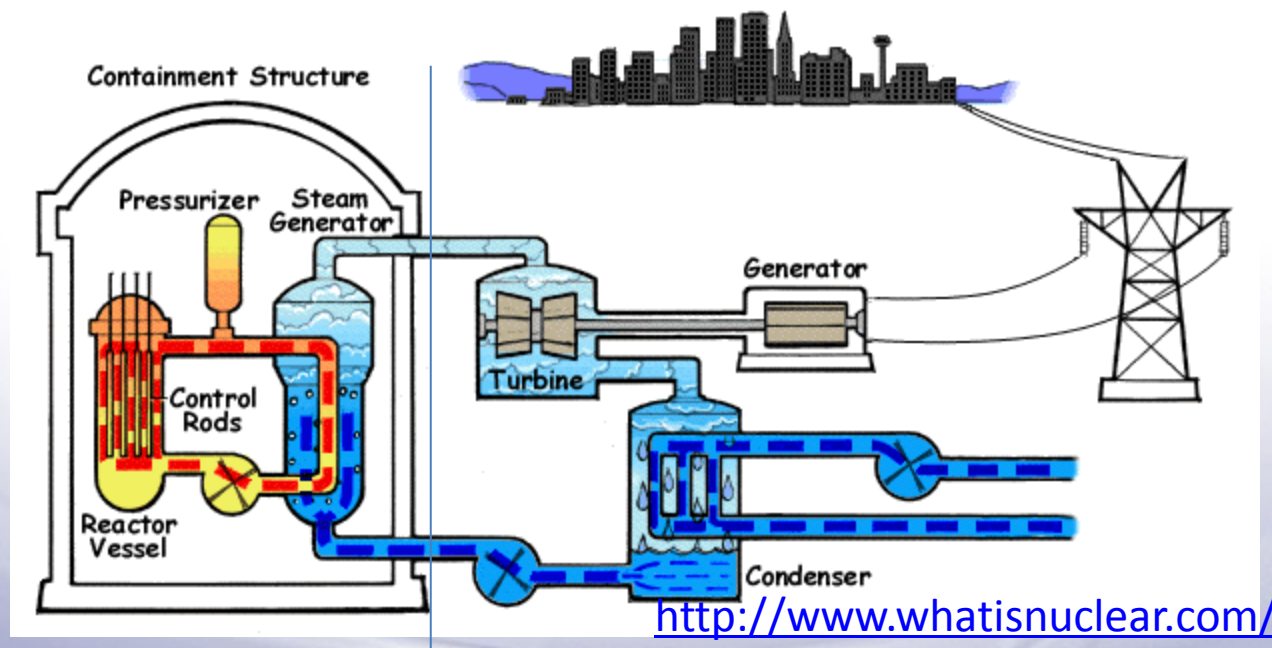
ASME CODE, QA AND CERTIFICATION

Supply to ASME Code

- Focus on Nuclear Construction
- Technical and Administrative Requirements in the Boiler and Pressure Vessel Code BPV III:
 - Design and construct to code requirements
 - Authorization / Accreditation by the Society
 - Construction oversight – Authorized Nuclear Inspector
- References NQA-1 for Quality management System

What is addressed

- NCA-General Requirements Division 1 & 2
- Subsection NB-Class 1 Components
- Subsection NC-Class 2 Components
- Subsection ND-Class 3 Components
- Subsection NE-Class MC Components
- Subsection NF-Supports
- Subsection NG-Core Support Structures
- Subsection NH Class 1 Components in Elevated Temperature Service
- Division 2-Code for Concrete Containments



<http://www.whatisnuclear.com/>

What is addressed

- **Division 3 Containments for Transportation & Storage of Spent Nuclear Fuel & High Level Radioactive Material & Waste**
 - Subsection WA General Requirements
 - Subsection WB Class TP (Type B) Containment Systems for Transport Packaging
 - Subsection WC Class WC Storage Containments for Spent Nuclear Fuel and High Level Radioactive Waste and Materials
- **Division 5 Rules for Construction of Nuclear Facility Components High Temperature Reactors**

Types of Certification

- Accreditation
 - Approval of QA Program - No Stamping
 - Quality System – Supplier of Material – No Stamping
- Authorization (to apply the stamp)
 - Implementation (survey) – Stamping N, NA, NPT, NV, and N3
 - NS – Supplier of nuclear supports – No Stamping

Conformity Assessment

- Why Conformity Assessment?
 - Conformity Assessment, when properly applied, provides regulators and purchasers of products confidence that the products were manufactured in accordance with the applicable standard, regardless of where in the world they were manufactured
 - ASME's Nuclear Conformity Assessment Program is recognized in over 100 countries

Nuclear Certificates

- Data as of 3/31/2011, furnished by Conformity Assessment Department, ASME

	U.S.	Canada	Int'l	TOTAL
Certificate Holders				
Nuclear Comp.	109	8	129	246
Nuclear Materials	31	-	36	67
Certificates				
Nuclear Comp.	328	25	384	737
Nuclear Materials	36	-	43	79

- Today SA has 5 certificate holders today, none nuclear.

<https://caconnect.asme.org/CertificateHolderSearch.aspx>

New Conformity Assessment Programs

- Nuclear Quality Assurance (NQA-1) Certification
- Development in Progress:
 - ASME Non-Destructive Examination personnel certification (ANDE)
 - Nuclear Auditor personnel certification

Global Nuclear Construction

World Wide Construction Activity

- First- and second-generation nuclear power plants built by integrated suppliers, required little from external suppliers
- Today new plants come from international suppliers, and vendor companies focused on design, engineering and project management.
- Demand for maximum local supply, which means a high level of technology transfer.
- Reactor vendors prefer large forgings and the very heavy forging capacities are found today in Japan, China, South Korea, France and Russia.
- Very few nations can go it alone.

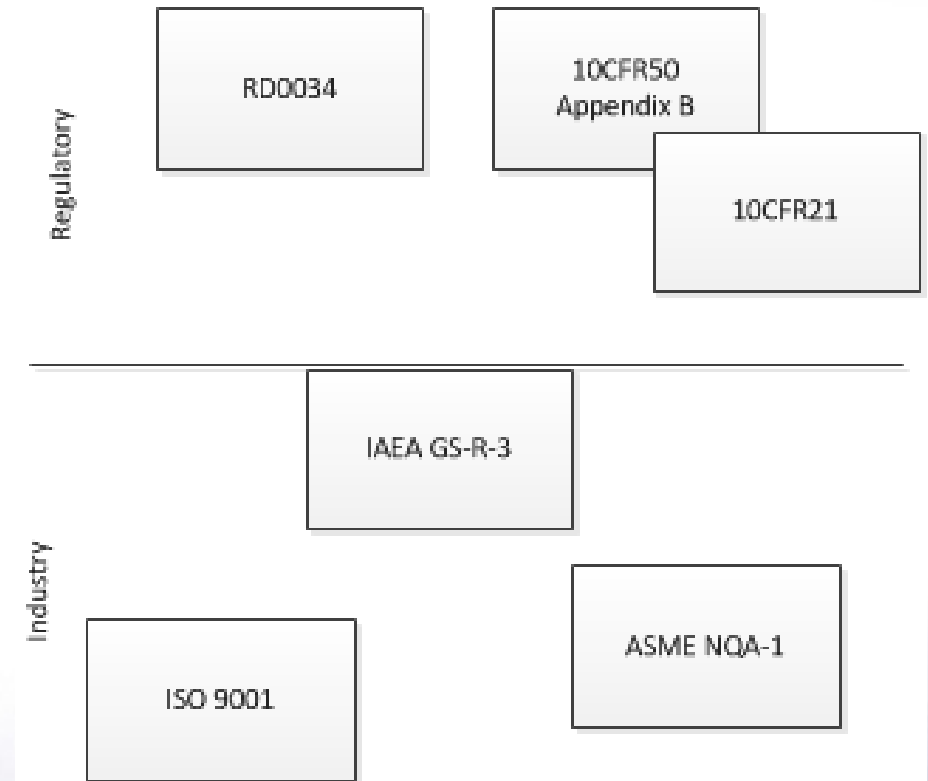
Introduction to Global Nuclear Construction

- Current Global Procurement Codes & Standards New Nuclear Plant Construction
 - ASME Section III “Committee on Construction of Nuclear Facility Components”
 - RCC-M “Design and Construction Rules for Mechanical Components of PWR Nuclear Islands”
 - CSA N286-05 “Management System Requirements for Nuclear Power Plants”
 - IAEA Safety Requirement GS-R-3 “The Management System for Facilities and Activities”
 - ASME NQA-1 “Quality Assurance Requirements for Nuclear Facility Applications”
 - ISO 9001 Quality Management Systems-Requirements”
 - JEAC 4111-2003 “Quality Assurance Code for Nuclear Power Plants”-Japan Utility Standard

ASME QUALITY ASSURANCE REQUIREMENTS

Regulatory Requirements

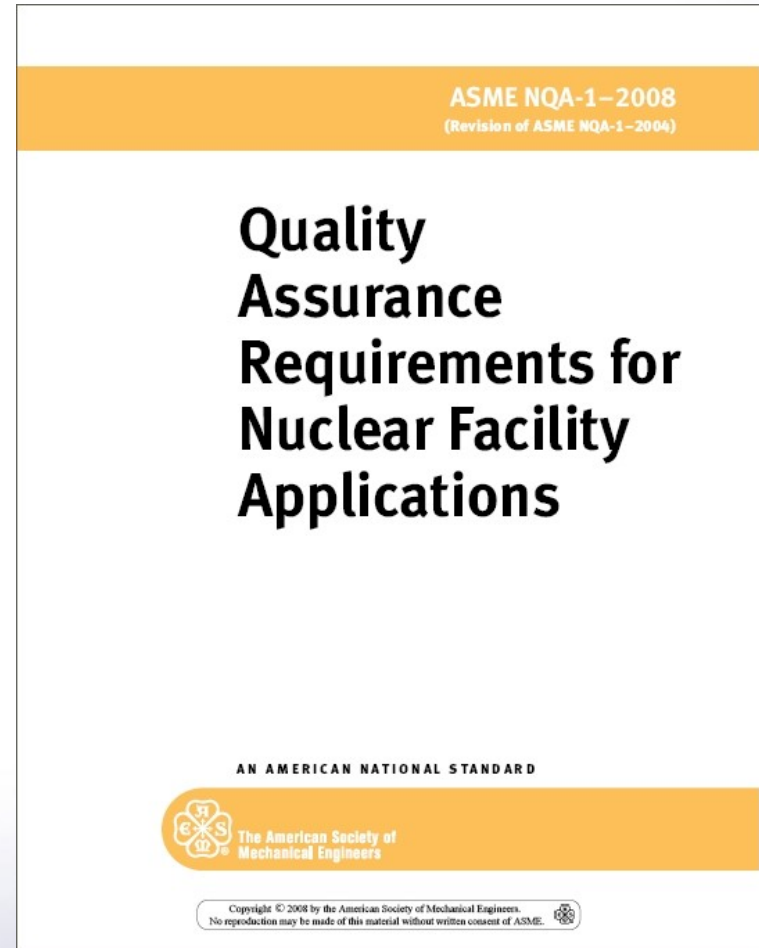
- Good quality assurance is fundamental to nuclear construction.
- Nuclear regulators impose requirements for Quality Assurance Requirements for the Construction of Nuclear Facilities. Such as:
 - US NRC- 10 CFR 50 Appendix B, Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants
 - NNR - RD0034 Quality and Safety Management Requirements for Nuclear Installations
- Many equivalent or partially equivalent options.
- Often very difficult to demonstrate equivalence



NQA-1 Quality Assurance Requirements for Nuclear Facility Applications

NQA-1 Establishes:

- Approved Quality Assurance Program
- Controls such as Procedures, Documents and Processes to provide consistent quality results
- Qualification of Personnel
 - Inspectors and Testing Personnel
 - Welders
 - NDE Examiners
 - Auditors
- Alternative or complimentary to ISO9001 or IAEA GS-R-3



Review of International Organization for Standardization (ISO) 9001:2008

This standard

- Is often used by Nuclear activities and facilities as the interface between the nuclear facility owner/operator and suppliers.
- Allows an organization to demonstrate its ability to meet customer and applicable regulatory requirements, in addition to its own organizational requirements.

ASME NQA-1a-2009 SUBPART 4.3

- Use of the ISO 9001:2008 Quality Management Systems Standard for Compliance with ASME NQA-1
 - This application appendix provides guidance to the ISO 9001:2008 Standard users and interested organizations who may elect to use the ISO 9001:2008 Quality Management System Standard as the basis for establishing a Quality Assurance Program that meets the requirements of ASME NQA-1 Standard
 - The purposes of this guidance is to:
 - Compare requirements of ISO 9001:2008 and ASME NQA-1-2008 Part I with the NQA-1a-2009 addenda (NQA-1);
 - Identify the similarities and differences; and,
 - Identify where actions may be needed to address the differences. The guidance is intended for all parties involved in the nuclear industry that are currently applying/implementing either NQA-1 or ISO 9001:2008 requirements and are required to comply with both standards.

Review of IAEA Safety Standard GS-R-3

- The International Atomic Energy Agency (IAEA) has defined requirements for establishing, implementing, assessing and continually improving an integrated management system that reflect advances in safety management approaches, concepts and Member State experience.
- IAEA GS-R-3 can be used by Member States to set management system requirements for nuclear facilities and activities to provide assurance of adequate safety.

ASME NQA-1a-2009 SUBPART 4.7

- Compares NQA-1 and IAEA Safety Standard GS-R-3,
- The purposes of this Application Guide are to:
 - Identify the similarities and differences; and,
 - Identify where actions may be needed to address the differences.
 - The comparisons are illustrated from two perspectives:
 - How IAEA GS-R-3 requirements address NQA-1 requirements; and
 - How NQA-1 requirements address IAEA GS-R-3 requirements.
 - Two tables are included providing a detailed line-by-line comparison from each perspective.
- Provides guidance on how a NQA-1 based management system can be integrated with a GS-R-3 system to allow a user to comply with both systems.

Comparison of Quality Standards

NQA-1 Requirement	Comparable requirement in IAEA GS-R-3	Comparable requirement in ISO 9001
1 Organization	2 Management System, 3 Management Responsibilities, 5 Process Implementation, 6 Measurement, Assessment and Improvement	4 Quality Management System / 5 Management Responsibility
2 Quality Assurance Program	2 Management System, 3 Management Responsibilities, 6 Measurement, Assessment and Improvement	4 Quality Management System/ 5 Management Responsibility/ 6 Resource Management/ 7 Product Realization / 8 Measurement, analysis and improvement
3 Design Control	No corresponding section	7 Product Realization
4 Procurement Document Control	5 Process Implementation	7 Product Realization
5 Instructions, Procedures, and Drawings	2 Management System, 5 Process Implementation, 6 Measurement, Assessment and Improvement	No corresponding section
6 Document Control	5 Process Implementation	4 Quality Management System
7 Control of Purchased Items and Services	5 Process Implementation, 6 Measurement, Assessment and Improvement	7 Product Realization
8 Identification and Control of Items	5 Process Implementation	7 Product Realization
9 Control of Special Processes	No corresponding section	7 Product Realization

Comparison of Quality Standards (2)

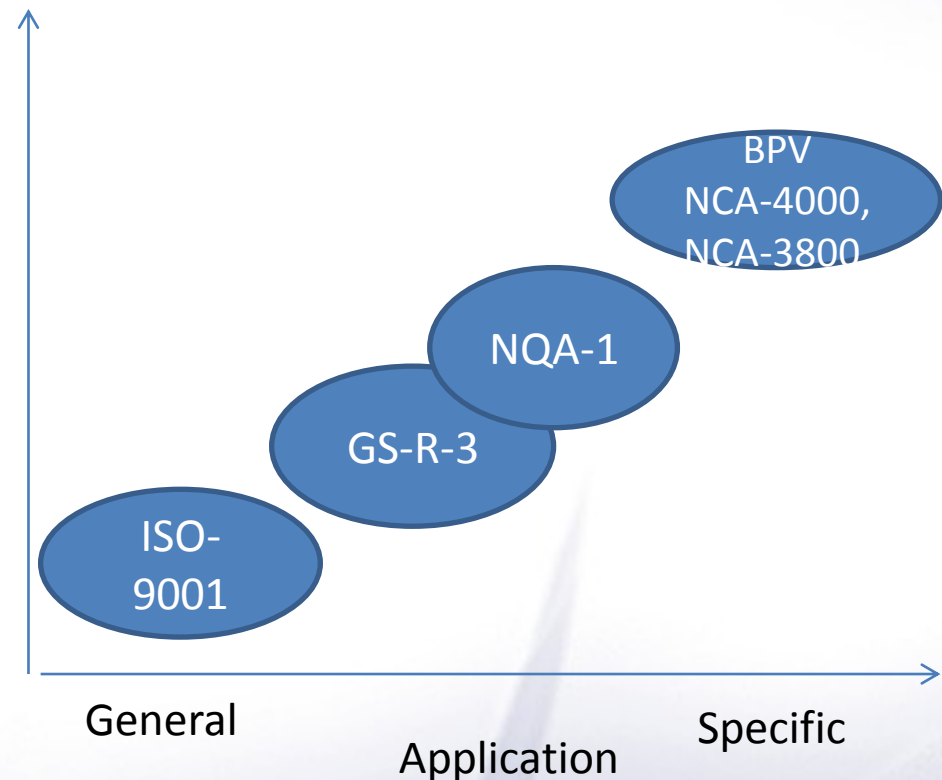
NQA-1 Requirement	Comparable requirement in IAEA GS-R-3	Comparable requirement in ISO 9001
10 Inspection	5 Process Implementation	No corresponding section
11 Test Control	5 Process Implementation	No corresponding section
12 Control of Measuring and Test Equipment	5 Process Implementation	7 Product Realization
13 Handling, Storage, and Shipping	5 Process Implementation	No corresponding section
14 Inspection, Test, and Operating Status	5 Process Implementation	No corresponding section
15 Control of Nonconforming Items	6 Measurement, Assessment and Improvement	8 Measurement, analysis and improvement
16 Corrective Action	6 Measurement, Assessment and Improvement	Measurement, analysis and improvement
17 Quality Assurance Records	5 Process Implementation	4 Quality Management System
18 Audits	6 Measurement, Assessment and Improvement	Measurement, analysis and improvement

Regulatory Position

- Only NRC has offered a position:
 - The staff (NRC) reviewed ISO 9001-2000, "Quality Management System (QMS) - Requirements," and performed a comparison to (10 CFR 50) Appendix B quality requirements. (SECY-03-0117)
 - Based on this review, the staff concluded that supplemental quality requirements would need to be applied when implementing ISO 9001 within the existing regulatory framework.

Comparison

- For BPV construction, NQA-1 Tailored and specific requirements added in NCA.
- NQA-1: Prescriptive (Who, What, Where and When?)
- GS-R-3, more general with a strong nuclear focus.
 - Includes safety culture
 - Includes a graded approach
- ISO-9001. General.
 - Will need to add some specific details in the implementation for regulatory acceptance.



Conclusion

- The ASME code system offers a framework for international construction of Nuclear Components
- Many options are available for implementing a QA programme
- Where can you get more information: ASME Training courses:
 - QA Considerations for New Nuclear Facility Construction
 - Course No. 3 days (PD635) or online (ZI370)
 - Comparison of Global Quality Assurance & Management System Standards used for Nuclear Applications
 - Course No. 3 days (PD634) or online (ZI360)

Thank you

Feel free to contact:

- **Christian Sanna** of ASME by email at sannac@asme.org or by phone at +1-212-591-8513.
- **Mark Mitchell**, Bufo Technology by email mark.mitchell@bufo.co.za or by phone at +27-12-667-1212.





SETTING THE STANDARD
