

Appendix C
Construction Inspector
Technical Proficiency-Level
Training and Qualification Journal

Prerequisite

Do not begin the activities or complete the courses in this qualification journal until you have completed the Basic Inspector Certification Journal. You may complete the General Proficiency requirements contained in Appendix B to MC 1252 concurrent with the Technical Proficiency requirements outlined in this journal.

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Introduction

Note: Some of the Construction Inspection Program Inspection Manual Chapters (IMCs) and other guidance may still be in draft. Use the latest draft IMCs and guidance documents while fully discussing with your supervisor

The purpose of this qualification journal is to ensure that inspectors are qualified to perform inspections in accordance with the NRC's Construction Inspection Program. The minimum qualification standards provide the technical competencies required for successfully completing the Construction Inspection Program.

The requirements of this standard are applicable to all NRC personnel conducting inspections and assessments used to verify acceptability of construction activities and ITAAC determinations. Satisfactory and documented attainment of the requirements contained in this qualification standard will ensure that personnel possess the requisite competence to fulfill functional area duties and responsibilities.

This qualification standard is intended to identify the minimum technical competency requirements in four broad functional areas: civil/structural, mechanical, electrical/I&C and construction/start-up testing. Qualification as a construction inspector may be obtained in one or all functional areas. Inspectors not qualified in a particular functional area are not to perform independent implementation of inspection procedures applicable to that functional area. Initial qualification may be obtained in only one functional area. Other functional areas may be pursued after full qualification is completed via the Individual Development Plan, with supervisor approval. The expected knowledge and/or skill that an individual must meet in order to perform inspections and assessments in each functional area must be reviewed and approved by the management responsible for implementing the construction inspection program.

Technical competency can be achieved through successful completion of the required training or through demonstration of equivalency by evidence of formal classroom training, college education or previous experience. The basis for acceptance of equivalency must be documented and requires approval from both the inspector's Branch Chief and Division Director. Any training course substituted for a required course must be reviewed and approved by the NRC Training program office.

Satisfaction of the minimum standards in this document is not intended to result in an expert level of knowledge. Additional training or education beyond the requirements of this standard would be required to achieve the specialist expertise level necessary to perform detailed disciplinary reviews or assessments within any specific area. In all cases, responsible management shall determine whether an inspector is qualified to inspect specific areas. The qualification journal must provide traceable documentation to show that minimum requirements have been met for each individual functional area.

Construction Inspector Technical Proficiency Formal Training Activities

Required Construction Inspector Technical Proficiency-Level Training Courses (Note 1)

All Functional Areas

- Construction Inspection Program
- Reactor Technology

Civil/Structural Functional Area

- Civil/Structural Codes and Inspection Course (with Focus on ITAAC)

Mechanical Functional Area

- Mechanical Codes and Inspection Course (with Focus on ITAAC)

Electrical Functional Area

- Electrical Codes and Inspection Course (with Focus on ITAAC, Including Digital I&C and fiber optics)

Preoperational/Start-up Testing Functional Area

- Preoperational and Startup Testing Inspection Course (with Focus on ITAAC)

Post Qualification Construction Inspector Training Courses

- Reactor Technology Courses (other designs)
- Welding/NonDestructive Examination (NDE) Inspection
- Geotechnical Inspection
- Concrete Inspection
- Structural Steel Inspection

Required Refresher Training

- None identified

(Note 1): Courses listed are under development. Until those courses are available, other equivalent courses may be substituted for certification. However, their equivalency and use for certification must first be reviewed and approved by the NRC Region II Deputy Regional Administrator for Construction. Any course submitted for equivalency review should contain elements covering technical fundamentals, regulatory and code requirements, and techniques for inspection applicable to the subject matter being taught.

**Construction Inspector Technical Proficiency
Individual Study Activities**

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Construction Inspector Individual Study Activity

TOPIC: (ISA-CI-1) Construction QA and Defect Reporting Requirements

PURPOSE: The purpose of this activity is to familiarize inspectors with the regulatory provisions that require licensees to have a quality assurance program and to report deficiencies. In addition to inspections that support the determination that ITAAC have been met, additional inspections will be needed to provide assurance that the licensee's processes for oversight of construction activities are effective. The successful implementation of a comprehensive QA program by the licensee will be an important indicator of the licensee's ability to manage the various activities associated with a large construction project. This activity will highlight the relationship between Part 52 and the requirements in Part 50 that relate to quality assurance and defect reporting.

COMPETENCY

AREAS: INSPECTION

LEVEL OF

EFFORT: 24 hours

- REFERENCES:**
1. 10 CFR Part 50, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants."
 2. Inspection Procedure 35100, "Review of QA Manual."
 3. 10 CFR 50.55, "Conditions of Construction Permits." (note: the applicable provisions of 10 CFR 50 have been incorporated into Part 52 by reference and not all the requirements of part 50.55 pertaining to construction permits will apply to Part 52)
 4. 10 CFR Part 21, "Reporting of Defects and Noncompliance."
 5. Regulatory Guide 1.28, "Quality Assurance Program Requirements (Design and Construction)."
 6. ASME NQA-1, "Quality Assurance Requirements for Nuclear Facility Application."
 7. NUREG 1055, "Improving Quality and the Assurance of Quality in the Design and Construction of Nuclear Power Plants, (A Report to Congress), March, 1987." (a hard copy of this report is available in each region)

EVALUATION

CRITERIA:

At the completion of this activity, and as determined by the supervisor, inspectors should be able to:

1. Explain how 10 CFR Parts 50 and 21 requirements are invoked by 10 CFR Part 52.
2. Identify the Appendix B criteria and describe how an inspection would verify that they are correctly implemented during construction activities.
3. Discuss the basis for the applicability Part 21, "Reporting of Defects and Noncompliance" to vendors and suppliers. Define a defect in the context of Part 21.
4. Describe the notification requirements of § 50.55(e) and explain the relationship of this part to 10 CFR Part 50 and Part 21.
5. Discuss the American National Standards (ANSI) and American Society of Engineers (ASME) guidance that is endorsed by Reg Guide 1.28 and explain the exceptions to the guidance (contained in Reg Guide 1.28) which are required to be met in order for a licensee or vendor to use the endorsement.
6. Describe the applicability of ASME NQA-1 and explain the content of the various parts.

TASKS:

1. Read § 52.83.
2. Review Appendix B and Inspection Procedure 35100, "Review of QA Manual." Compare the criteria with the inspection attributes in the IP and pay particular attention to the IP guidance.
3. Review Part 21 with particular focus on the § 21.21 requirements for evaluating defects and for reporting them.
4. Read 50.55(e) and determine what actions must be completed by licensees to satisfy these requirements.
5. Review Reg Guide 1.28 and focus on the additions and modifications to ANSI/ASME NQA-1 identified in Section C, "Regulatory Position."
6. Review ASME NQA-1.
7. Read NUREG 1055 and note the root causes for past construction problems.
8. Meet with your supervisor, mentor, or a qualified construction

inspector to discuss any questions you may have as a result of this activity. Discuss the answers to the questions listed under the Evaluation Criteria section of this study guide with your supervisor.

DOCUMENTATION: Qualification Signature Card, Item ISA-CI-1.

Construction Inspector Individual Study Activity

TOPIC: (ISA-CI-2) 10 CFR Part 52

PURPOSE: The purpose of this activity is to familiarize inspectors with the documents which form the bases and guidance required to support construction inspection activities. The Code of Federal Regulations (CFR) sets out the requirements for applying for a license to build and operate a nuclear power plant. In the past, the requirements, contained in 10 CFR Part 50, supported a two-phased licensing process. Under Part 50, the applicant first applied for and received a construction permit. Then, when plant construction was nearing completion, an application was submitted for a license to operate the plant. Under 10 CFR Part 52, which was first adopted in 1989, the licensing process was modified to one step, where an applicant can be granted a combined construction permit and operating license or a combined license (COL). This activity will provide you with knowledge of Part 52 and the licensing processes which will be used in the licensing of new reactors.

COMPETENCY AREAS: REGULATORY FRAMEWORK

LEVEL OF EFFORT: 16 hours

REFERENCES:

1. 10 CFR Part 52, "Early Site Permits; Standard Design Certifications; And Combined Licenses For Nuclear Power Plants."
2. NUREG/BR-0298, "Nuclear Power Plant Licensing Process," Rev.2

EVALUATION CRITERIA: At the completion of this activity, and as determined by the supervisor, inspectors should be able to:

1. Explain the basis and criteria for the licensing of nuclear plants.
2. Recognize and locate specific topics presented in 10 CFR Part 52.
3. Discuss the definitions of following terms used in 10 CFR Part 52:
 - a. early site permit
 - b. standard design
 - c. standard design certification
 - d. combined license

4. Discuss the importance of the inspections, tests, and analyses discussed in 10 CFR 52.47(b)(2) to the overall licensing of a new nuclear power plant. Explain why there are no inspections associated with standard design certification.

TASKS:

NOTE: 10 CFR Part 52 is undergoing a significant revision where some topics are being moved to different sections. The revisions to the rule will not be finalized and become effective until early 2007, and will likely undergo some additional changes in response to public comment. However, the relocation of topics is not likely to be affected. As a result, this activity uses the proposed rule for study rather than the current version of Part 52 to allow inspectors to become familiar with the new location of information. The proposed rule can be found in ADAMS at Accession Number ML061320560. If the rule has been finalized, the current information from the CFR should be used.

1. Read NUREG/BR-0298, "Nuclear Power Plant Licensing Process," Rev.2. This document is available on the NRC's external website and may be available in hard copy from each region's Office of Public Affairs. Compare the topics covered in the NUREG to the topics covered in Part 52.
2. Locate the section in Part 52 where Early Site Permits are discussed. Read all paragraphs related to Early Site Permits including § 52.17 which addresses the technical information that must be submitted by the applicant and is reviewed by the NRC. Then, review Inspection Manual Chapter 2501, Construction Inspection Program: Early Site Permits. Compare the inspections conducted under IMC-2501 to the ESP topics being evaluated by the NRC.
3. Review Subpart B on standard design certification. Pay particular attention to §52.47(b)(2), which discusses the inspections, tests, analyses and acceptance criteria of the design.
4. Review Subpart C on combined licenses. Pay particular attention to the title of § 52.79. Scan the technical information that must be in the application for a COL.
5. Meet with your supervisor, mentor, or a qualified construction inspector to discuss any questions you may have as a result of this activity. Discuss the answers to the questions listed under the Evaluation Criteria section of this study guide with your supervisor.

DOCUMENTATION: Qualification Signature Card, Item ISA-CI-2.

Construction Inspector Individual Study Activity

TOPIC: (ISA-CI-3) Construction Inspection Program

PURPOSE: The purpose of this activity is to introduce the requirements that form the basis of the Construction Inspection Program. This activity will provide you with knowledge of the Manual Chapter requirements that will be implemented to inspect all phases of new reactor construction.

COMPETENCY

AREAS: REGULATORY FRAMEWORK

LEVEL OF

EFFORT: 24 hours

REFERENCES:

1. MC 2501, "Early Site Permits"
2. MC 2502, "COL Application"
3. MC 2503, "Construction Inspection Program - ITAAC"
4. MC 2504, "Construction Inspection Program - Non ITAAC"
5. IP 65001, "Inspections, Tests, Analyses and Acceptance Criteria (ITAAC) Matrix Inspections"

EVALUATION

CRITERIA: At the completion of this activity, and as determined by the supervisor, inspectors should be able to:

1. Discuss the program requirements contained in the construction inspection program Manual Chapters and in IP 65001.
2. Relate the requirements of the CFR to the inspection objectives of the construction inspection program by comparing and contrasting the various aspects of the licensing process to the Inspection Manual Chapters 2501, 2502, 2503 and 2504 of the construction inspection program.
3. Discuss how inspection information will be used to support the Commission decision that the licensee can load fuel and operate the plant.

TASKS:

1. Review MC 2501, 2502, 2503 and 2504 and IP 65001.
2. Review § 52.97 on issuance of a combined license. Compare the inspections in IMC-2504 to the topical areas in § 52.97.

3. Read § 52.99 on inspections during construction. Pay particular attention to the requirements of § 52.99(2)(e).
4. Read § 52.103 on operation under a combined license. Pay particular attention to § 52.103(g).
5. Meet with your supervisor, mentor, or a qualified construction inspector to discuss any questions you may have as a result of this activity. Discuss the answers to the questions listed under the Evaluation Criteria section of this study guide with your supervisor.

DOCUMENTATION: Qualification Signature Card, Item ISA-CI-3.

Construction Inspector Individual Study Activity

TOPIC: (ISA-CI-4) Design Control Document

PURPOSE: The purpose of this activity is for you to learn about a key document related to the licensing and construction of a new plant under 10 CFR Part 52. A design control document (DCD) is a repository of information about a standard design certified under 10 CFR Part 52. Under Part 52, a reactor design can be submitted to the NRC for review and approval, even if there are no applicants to build the plant. The vendor submits sufficient design information such that the staff can make an overall determination of the design adequacy as it relates to safety and risk. Typically, the information needed to certify a design accounts includes the principal plant systems and components and their corresponding inspections, tests, analysis, and acceptance criteria (ITAACS). In addition to the detailed design information, the vendor also provides information about the site parameters (the postulated physical, environmental, and demographic features of an assumed site) for a plant and the other system interfaces that will be needed to support the safe operation of the reactor. Part 52 also requires the vendor to provide other types of information for use in the future when an applicant references an already certified design.

This ISA focuses on the AP1000 and ABWR DCDs with the intent of highlighting the differences in these documents. This approach will show how these and future DCDs may vary and should sensitize the inspector to the differences that can be encountered from various certified designs.

COMPETENCY

AREAS: REGULATORY FRAMEWORK

LEVEL OF

EFFORT: 8 Hours per design

REFERENCES: 1. 10 CFR Part 52

2. Design Control Documents

EVALUATION

CRITERIA: At the conclusion of this activity, and as determined by the supervisor, the inspector should be able to:

1. Define the following terms:
 - a. Design Control Document (DCD)
 - b. Tier 1
 - c. Tier 2
 - d. Tier 2*

- e. ITAAC
 - f. Design Acceptance Criteria (DAC)
2. Explain the relationship between Tier 1 and Tier 2 information.
 3. Describe the kind of information required to be provided by a COL applicant as described in the DCD.
 4. Compare and contrast the methods required to make changes to the information contained in Tiers 1, 2 and 2*.
 5. Locate the ITAAC information and tables in the DCD.
 6. Identify the kind of information available in the Tier 2 section of the DCD.
 7. Discuss in detail why DAC were used as part of design certification and demonstrate an understanding of the practical application of DAC.
 8. Discuss in detail the different definitions of “as built” in each design. Describe how these differences can affect inspection planning.

TASKS:

1. Locate the DCD for the AP1000 and the ABWR on the Construction Inspection Program webpage. This site can be accessed via ROP Digital City and the NRR websites.
2. Look at the organization of both DCDs.
3. Read the Introduction to the DCD section for each design.
4. Review Chapter 1 of Tier 1 for each design. Within the General Provisions sections take particular note of:
 - Treatment of individual items
 - Implementation of ITAAC
 - Verifications for Basic Configuration for Systems for ABWR

Consider how the differences between these sections may affect inspection planning.
5. In both DCDs review the content, format and presentation of the ITAAC .
6. Read the definitions for the terms listed in evaluation criterion 2 a-e, in both the AP1000 and the ABWR.
7. Review the content and format of Tier 2 for AP1000 and ABWR.

8. Go to NUREG-0800, the Standard Review Plan. Locate chapter 14.3. Read the description of Design Acceptance Criteria (DAC).
9. Review the ITAAC for Human Factors Engineering for both designs as related to DAC.
10. Meet with your supervisor, mentor, or a qualified construction inspector to discuss any questions you may have as a result of this activity. Discuss the answers to the questions listed under the Evaluation Criteria section of this study guide with your supervisor.

DOCUMENTATION: Qualification Signature Card, Item ISA-CI-4.

Construction Inspector Individual Study Activity

TOPIC: (ISA-CI-5) Report Writing and Construction Inspection Program Information Management System (CIPIMS)

PURPOSE: The purpose of this activity is to familiarize inspectors with the program requirements required to document construction inspection activities.

COMPETENCY

AREAS: INSPECTION

LEVEL OF

EFFORT: 16 hours

REFERENCES: 1. Manual Chapter 0613, "Construction Inspection Reports."

2. CIPIMS User's Guide.

EVALUATION

CRITERIA: At the completion of this activity, and as determined by the supervisor, inspectors should be able to:

1. Describe how inspection results will be documented and what a construction inspection report will look like.
2. Explain how inspection findings are characterized what the different types of findings are.
3. Explain how CIPIMS is used in documenting inspection findings and in developing inspection reports. Describe the specific inputs into CIPIMS.

TASKS:

1. Read MC 0613 and understand the requirements for characterizing and documenting inspection findings.
2. Review the CIPIMS User's Guide and understand the requirements for documenting results in CIPIMS.
3. Meet with your supervisor, mentor, or a qualified construction inspector to discuss any questions you may have as a result of this activity. Discuss the answers to the questions listed under the Evaluation Criteria section of this study guide with your supervisor.

DOCUMENTATION: Qualification Signature Card, Item ISA-CI-5.

Construction Inspector Individual Study Activity

TOPIC: (ISA-CI-6) Industry Codes & Standards - General

PURPOSE: The purpose of this activity is to introduce you to some of the basic Codes, NRC Regulatory Guides (RG) and associated industry standards commonly used during construction activities. The list is not inclusive but it does contain the major documents that will be utilized during construction and fabrication.

COMPETENCY

AREAS: INSPECTION

LEVEL OF

EFFORT: 40 hours

REFERENCES: See the attached list of References for ISA-CI-6.

EVALUATION

CRITERIA: At the completion of this activity, and as determined by the supervisor, inspectors should be able to :

1. Identify the general codes commonly used by construction inspectors and discuss the topics included in these codes.
2. Discuss the relationship between RG (guidelines) and industry standards (accepted methodologies).
3. Identify the RG and associated industry standards that address the 10CFR50, Appendix B, QA Criteria.
4. Discuss the topics included in the RG and industry standards associated with each

TASKS:

1. For the appropriate technical area, review each of the documents listed in the attached list of references.
2. Meet with your supervisor, mentor, or a qualified construction inspector to discuss any questions you may have as a result of this activity. Discuss the answers to the questions listed under the Evaluation Criteria section of this study guide with your supervisor.

DOCUMENTATION: Qualification Signature Card, Item ISA-CI-6.

REFERENCES for ISA-CI-6

General

10 CFR Part 50 Appendix A, General Design Criteria for Nuclear Power Plants

10 CFR 50.46 Acceptance Criteria for Emergency Core Cooling Systems for Light-Water Nuclear Power Reactors

10 CFR 50.49 Environmental Qualification of Electric Equipment Important to Safety for Nuclear Power Plants

10 CFR 50.55a Codes and Standards

The American Society for Mechanical Engineers (ASME)

Section II - Materials

Section III - Nuclear

Section V - Nondestructive Examination

Section VIII - Pressure Vessels

Section IX - Welding and Brazing Qualifications

Section XI - Inservice inspection

Civil/Structural

American Concrete Institute (ACI)

ACI 117 Tolerances for Concrete Construction and Materials

ACI 214 Recommended Practice for Evaluation of Strength Test Results of Concrete

ACI 301 Specifications for Structural Concrete

ACI 304 Measuring, Mixing, Transporting and Placing Concrete

ACI 305 Hot Weather Concreting

ACI 306 Cold Weather Concreting

ACI 304 Guide for Measuring, Mixing, Transporting and Placing Concrete

ACI 308 Curing Concrete

ACI 309 Consolidation of Concrete

ACI 311 Recommended Practice for Concrete Inspection

ACI 318 Building Code Requirements for Reinforced Concrete

ACI 349-01 Code Requirements for Nuclear Safety Related Concrete Structures

ACI SP-2 Manual of Concrete Inspection

American Institute of Steel Construction (AISC)

M011 Manual of Steel Construction

S326 Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings

S329 Specification for Structural Joints Using ASTM A325 or A490 Bolts

American National Standards Institute (ANSI)

N45.2.5 Supplemental QA Requirements for Installation, Inspection, and Testing of Structural Concrete and Structural Steel

American Society for Testing and Materials (ASTM)

A 36 Specification for Structural Steel
A 325 Specification for High-Strength Bolts for Structural Steel Joints
A 490 Specification for Heat Treated, Steel Structural Bolts, 150 ksi Tensile Strength
C 29 Unit Weight and Voids in Aggregates
C 94 Specification for Ready-Mixed Concrete
C 172 Method of Sampling Freshly Mixed Concrete
C 1077 Practice for Laboratories Testing concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation
D 422 Method for Particle-Size Analysis of Soils
D 1556 Test Method for Density of Soil in Place by the Sand-Cone Method
D 2167 Test Method for Density and Unit Weight of Soil In-Place by the Rubber Balloon Method
D 2922 Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods
D 3017 Moisture Content of Soil and soil Aggregate in Place by Nuclear Methods
D 3740 Practice for Evaluation of Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction
E 329 Evaluation of Testing and Inspection Agencies

American Welding Society (AWS)

AWS D1.1 Structural Welding Code - Steel
AWS B2.1 Specification for Welding Procedure and Performance Qualification

The International Organization for Standardization (ISO)

ISO 14731 - Welding Coordination - Tasks and Responsibilities

Nuclear Regulatory Commission Regulatory Guides (RG)

RG 1.107 Qualifications for Cement Grouting for Prestressing Tendons in Containment Structures
RG 1.127 Inspection of Water-Control Structures Associated with Nuclear Power Plants
RG 1.132 Site Investigations for Foundations of Nuclear Power Plants

- RG 1.136 Materials, Construction, and Testing of Concrete Containments (Articles CC-1000, -2000, and -4000 through -6000 of the Code for Concrete Reactor Vessels and Containments)
- RG 1.138 Laboratory Investigations of Soils for Engineering Analysis and Design of Nuclear Power Plants
- RG 1.142 Safety Related Concrete Structures for Nuclear Power Plants

Concrete Reinforcing Steel Institute (CRSI)

- MSP-1 Manual of Standard Practice

Portland Cement Association (PCA)

- EB001 Design and Control of Concrete Mixtures

Mechanical

American Society of Mechanical Engineers (ASME)

- B&PV Code
- Section III, Division 1 Nuclear Power Plant Components
- B&PV Code
- Section III, Division 2 Concrete Reactor Vessels and Containments

Nuclear Regulatory Commission Regulatory Guides (RG)

- RG 1.27 Ultimate Heat Sink for Nuclear Power Plants
- RG 1.31 Control of Ferrite Content in Stainless Steel Weld Metal
- RG 1.43 Control of Stainless Steel Weld Cladding of Low-Alloy Steel Components
- RG 1.44 Control of the Use of Sensitized Stainless Steel
- RG 1.50 Control of Preheat Temperature for Welding of Low-Alloy Steel
- RG 1.54 Service Level I, II, and III Protective Coatings Applied to Nuclear Power Plants
- RG 1.71 Welder Qualification for Areas of Limited Accessibility
- RG 1.84 ASME Code Case Applicability
- RG 1.87 Guidance for Construction of Class 1 Components in Elevated-Temperature Reactors (Supplement to ASME Section III Code Cases 1592, 1593, 1594, 1595, and 1596)
- RG 1.96 Design of Main Steam Isolation Valve Leakage Control Systems for Boiling Water Reactor Nuclear Power Plants
- RG 1.100 Seismic Qualification of Electrical and Mechanical Equipment for Nuclear Power Plants
- RG 1.116 QA Requirements for Installation, Inspection and Testing of Mechanical Equipment and Systems

RG 1.150 Ultrasonic Testing of Reactor Vessel Welds During Preservice and Inservice Examinations

Electrical

Institute of Electrical and Electronics Engineers

315 Graphic Symbols for Electrical and Electronics Diagrams
336 Installation, Inspection, and Testing Requirements for Power, Instrumentation, and Control Equipment at Nuclear Facilities
338 IEEE Standard Criteria for Periodic Testing of Nuclear Power Generating Station Class 1E Power and Protection Systems
1050 Guide for Instrument and Control Equipment Grounding in Generating Stations

Nuclear Regulatory Commission Regulatory Guides (RG)

RG 1.6 Independence Between Redundant Standby (Onsite) Power Sources and Between Their Distribution Systems
RG 1.11 Instrument Lines Penetrating Primary Containment
RG 1.30 Quality Assurance Requirements for the Installation, Inspection, and Testing of Instrumentation and Electric Equipment (ANSI N45.2.4/IEEE 336)
RG 1.32 Criteria for Safety-Related Electric Power Systems for Nuclear Power Plants (IEEE 308)
RG 1.40 Qualification Tests of Continuous-Duty Motors Installed Inside the Containment of Water-Cooled Nuclear Power Plants (IEEE 334)
RG 1.47 Bypassed and Inoperable Status Indication for Nuclear Power Plant Safety Systems
RG 1.53 Application of the Single-Failure Criterion to Nuclear Power Plant Protection Systems (IEEE 279 and IEEE 379)
RG 1.63 Electric Penetration Assemblies in Containment Structures for Light-Water-Cooled Nuclear Power Plants (IEEE 317)
RG 1.73 Qualification Tests of Electric Valve Operators Installed Inside the Containment of Nuclear Power Plants
RG 1.75 Physical Independence of Electric Systems (IEEE 384)
RG 1.81 Shared Emergency and Shutdown Electric Systems for Multi-Unit Nuclear Power Plants
RG 1.89 Qualification of Class 1E Equipment for Nuclear Power Plants (IEEE 323)
RG 1.97 Instrumentation for Light -Water-Cooled Nuclear Power Plants to Assess Plant and Environs Conditions During and Following an Accident
RG 1.100 Seismic Qualification of Electrical and Mechanical Equipment for Nuclear Power Plants
RG 1.105 Instrument Set points (ISA S67.04)
RG 1.106 Thermal Overload Protection for Electric Motors on Motor-Operated Valves
RG 1.128 Installation Design and Installation of Large Lead Storage Batteries for Nuclear Power Plants (IEEE 484)

- RG 1.129 Maintenance, Testing, and Replacement of Large Lead Storage Batteries for Nuclear Power Plants (IEEE 450)
- RG 1.131 Qualification Tests of Electric Cables, Field Splices, and Connections for Light-Water-Cooled Nuclear Power Plants (IEEE 383)
- RG 1.151 Instrument Sensing Lines (ISA S67.02)
- RG 1.180 Guidelines for Evaluating Electromagnetic and Radio-Frequency Interference in Safety-Related Instrumentation and Control Systems

Testing

Nuclear Regulatory Commission Regulatory Guides (RG)

- RG 1.68 Initial Test Programs for Water-Cooled Nuclear Power Plants
- RG 1.79 Preoperational Testing of Emergency Core Cooling Systems for Pressurized Water Reactors

Construction Inspector Individual Study Activity

TOPIC: (ISA-ASME-1) Regulatory Basis for the Requirements Specified in the American Society of Mechanical Engineers (ASME) Boiler & Pressure Vessel Code (Code).

PURPOSE: The purpose of this activity is to familiarize you with the federal regulations which incorporate by reference the requirements of the ASME Code for design, fabrication, erection, testing, and inspection of the reactor coolant system and associated auxiliary, control, and protection systems.

COMPETENCY AREA: REGULATORY FRAMEWORK

LEVEL OF EFFORT: 40 Hours

REFERENCES:

1. 10 CFR 50.55a
2. 10 CFR 50, Appendix A, General Design Criteria (GDC)
3. Proposed Rule for 10 CFR Part 52 (71 FR 12885)

EVALUATION CRITERIA: At the completion of this activity the inspector should be able to:

1. Identify the sections in the Code of Federal Regulations (CFR) which mandate the use of the ASME Code for construction of the reactor coolant pressure boundary and associated auxiliary, control, and protection systems.
2. Identify the Code editions and addenda that have been endorsed by the NRC staff relative to the following ASME Code Sections:
 - a. ASME III, Rules for Construction of Nuclear Facility Components
 - b. ASME XI, Rules for In-Service Inspection of Nuclear Plant Components
 - c. ASME OM Code, ASME Code for Operation and Maintenance of Nuclear Power Plants
3. Identify the locations of the listing of limitations and modifications which the NRC has imposed on the use of the Code editions currently endorsed by the staff.
4. Describe the requirements a licensee must follow before using proposed alternatives to the requirements of the ASME Code editions currently endorsed by the NRC.
5. Identify the ASME Code Class requirements specified in the

CFR for construction of components classified as NRC Quality Groups A, B, and C.

6. Explain how the ASME Code requirements are incorporated in the regulations for combined license applications and new reactor construction in accordance with 10 CFR Part 52.

TASKS:

1. Read the 10 CFR 50 Appendix A GDC, especially GDC 1, 14, 15, 30, 31, and 32, to become familiar with the minimum requirements established for the principal design criteria for the reactor coolant system for water-cooled nuclear power plants.
2. Read 10 CFR 50.55a(b) to understand how the ASME Code has become approved for incorporation by reference into the CFR.
3. Read 10 CFR 50.55a(b)(1), b(2), and b(3) to understand which editions and addenda of the ASME Code have been reviewed and endorsed by the NRC staff, including identification of any limitations imposed by the staff on their usage.
4. Read 10 CFR 50.55a(c), (d), and (e) to recognize the Code design requirements established for components categorized by the NRC as Quality Groups A, B, and C components.
5. Become familiar with the proposed rule for 10 CFR Part 52 published in the Federal Register (71 FR 12885). Specifically, read the proposed new rule in 10 CFR 52.79(a)(11), and note the incorporation of 10 CFR 50.55a into the Part 52 regulations for new construction.
6. Meet with your supervisor, mentor, or a qualified construction inspector to discuss any questions you may have as a result of this activity. Discuss the answers to the questions listed under the Evaluation Criteria section of this study guide with your supervisor.

DOCUMENTATION:

Qualification Signature Card, Item ISA-ASME-1

Construction Inspector Individual Study Activity

TOPIC: (ISA-ASME-2) American Society of Mechanical Engineers Boiler & Pressure Vessel Code, Section III (ASME Code, or Section III) Overview

PURPOSE: The ASME Code, Section III has been incorporated by reference into the Code of Federal Regulations (CFR). 10 CFR 50.55a effectively mandates use of the ASME Code, Section III for design, construction, nondestructive examination, testing, code certification stamping, and overpressure protection of new components used in nuclear power plants. For this reason, it is necessary that inspectors have a general understanding of the scope of Section III, and the applicability and limitations of its rules. This general understanding will provide the foundation for more detailed understanding of selected Articles of Section III directly related to the inspector's duties. These insights will also facilitate the inspection of certain Part 52 COL ITAAC which requires some knowledge of ASME Code reports and documentation.

COMPETENCY AREA: TECHNICAL AREA EXPERTISE
REGULATORY FRAMEWORK

LEVEL OF EFFORT: 40 Hours

REFERENCES:

1. ASME Code, Section III, Subsection NCA, General Requirements for Division 1 and Division 2
2. "Companion Guide to the ASME Boiler & Pressure Vessel Code; Criteria and Commentary on Select Aspects of the Boiler & Pressure Vessel and Piping Codes," Volumes 1, 2, and 3, edited by K.R. Rao, ASME Press, New York, 2006.
3. 10 CFR 50.55a, Codes and standards

EVALUATION CRITERIA:

At the completion of this activity the inspector should be able to:

1. Identify and explain the differences in the various Divisions of the ASME Code, Section III.
2. Identify and discuss the limits of the ASME Code, Section III rules, including use of Code editions, Addenda, and Code Cases.
3. Identify the location of the ASME Code Glossary which defines selected terms commonly used throughout ASME III.

4. Identify the principal ASME Code-specified documents requiring certification, by either a Registered Professional Engineer or by the Authorized Nuclear Inspector, that a component has been constructed in accordance with Code requirements. Discuss the importance of these documents to inspections and closure of ASME Code-related ITAAC.
5. Identify the ASME Code-specified document which establishes the design basis for a component, including loadings and load combinations, and defines appropriate Design, Service, and Test Limits for construction of ASME classified components.
6. Compare and contrast the ASME Code Service Limit A, B, C, and D provisions for damage allowed to a component while still satisfying the Code Service Limits A through D.
7. Identify the general duties of the Authorized Nuclear Inspector (ANI), and discuss some of the principal functions of the ANI in the certification process for Code component construction.
8. Explain how to access the electronic version of the ASME Boiler & Pressure Vessel Code from the NRC website.

TASKS:

1. Access the ASME Boiler & Pressure Vessel Code on the NRC website by the following steps:
 - a. From the NRC home page select 'Information Resources'
 - b. Scroll down to the Codes & Standards section and select 'IHS Codes & Standards'
 - c. Follow the access directions by again selecting 'IHS Codes & Standards'
 - d. From the IHS menu select 'Specs & Standards'
 - e. From the 'Quick Searches' pull-down menu select 'Table of Contents'
 - f. Select the ASME Code edition desired
 - g. Select the ASME Code Section desired, e.g., ASME III
2. Read ASME III, Articles NCA-1110 and NCA-1130 to understand the differences in types of items addressed by the rules of the various Divisions of the ASME Code, and to become aware of the basic limitations on applicability of these ASME Code rules.
3. Read ASME III, Article NCA-9000 to become aware of specific definitions of terms commonly used within the ASME III Code.
4. Read ASME III, Article NCA-1140 to understand the basis for

use of Code editions, Addenda, and Code Cases, and to understand the impact that 10 CFR 50.55a has on their usage.

5. Read the following ASME III Articles to identify the ASME Code reports, and their basic provisions, required for certification that components have been constructed in accordance with Code requirements:
 - a. NCA-3250, Provision of Design Specifications
 - b. NCA-3260, Review of Design Report
 - c. NCA-3555, Certification of Design Report
 - d. NCA-3270, Overpressure Protection Report
 - e. NCA-3280, Owner's Data Report and Filing
 - f. NCA-3340, Design Drawings and Construction Specification Division 2)
 - g. NCA-3350, Design Report (Division 2)
 - h. NCA-3360, Certification of the Construction Specification, Design Drawings, and Design Report (Division 2)
 - i. NCA-3380, Certification of Construction Report (Division 2)
 - j. NCA-3454, Contents of the Construction Report (Division 2)
 - k. NCA-5290, Data Reports and Construction Reports (Divisions 1 and 2)
6. Read ASME III, Article NCA-2140 to identify the principal document, and its major provisions, for establishment of the design basis for ASME components.
7. Read ASME III, Article NCA-2142.4 to understand the differences between the various ASME Service Limits, and to be able to discuss the service-related component damage implications of each Service Limit.
8. Read ASME III, Article NCA-5200 to understand the requirements for ASME Code authorized inspections implemented by the Authorized Nuclear Inspector.
9. Read Chapter 5 of Reference 2 for a concise introduction to the general requirements of ASME Section III, Divisions 1 and 2. Other chapters of Reference 2 provide outline summaries for all other provisions of the ASME Code, and offer a usable source of Code-related information which can be used as a roadmap to the more detailed requirements contained in the various ASME Code Sections.

10. Meet with your supervisor, mentor, or a qualified construction inspector to discuss any questions you may have as a result of this activity. Discuss the answers to the questions listed under the Evaluation Criteria section of this study guide with your supervisor.

DOCUMENTATION: Qualification Signature Card, Item ISA-ASME-2

**Construction Inspector Technical Proficiency
On-the-Job Activities**

Construction Inspector On-the-Job Activity

TOPIC:	(OJT-CI-1) Inspection Accompaniment
PURPOSE:	The purpose of this activity is to familiarize an inspector with a typical construction inspection for a nuclear facility.
COMPETENCY AREA:	INSPECTION
LEVEL OF EFFORT:	24 hours
REFERENCES:	<ol style="list-style-type: none">1. Applicable Final Safety Analysis Report Sections2. Applicable Inspection Procedures and Manual Chapters3. ITAAC (as applicable)
EVALUATION CRITERIA:	<p>Upon completion of the tasks, the inspector should be able to:</p> <ol style="list-style-type: none">1. Generally describe the construction requirements in the area being inspected.2. Discuss the results of the inspection both in technical and regulatory contexts.
TASKS:	<ol style="list-style-type: none">1. Review the references listed above to develop an understanding of the construction requirements and discuss them with the inspector to be accompanied.2. Accompany a qualified inspector during implementation of the inspection procedures and witness the conduct of inspection activities in progress.3. Meet with your supervisor or a qualified inspector designated by your supervisor and discuss the result of your activities.
DOCUMENTATION:	Construction Inspection Proficiency Level Qualification Signature Card Item OJT-CI-1

Construction Inspector On-the-Job Activity

TOPIC:	(OJT-CI-2) Inspection Entrance/Exit Meetings
PURPOSE:	The purpose of this activity is to familiarize an inspector with entrance and exit meetings for a typical construction inspection.
COMPETENCY AREA:	INSPECTION
LEVEL OF EFFORT:	8 hours
REFERENCES:	<ol style="list-style-type: none">1. IP 30703, Entrance and Exit Meetings (previously deleted)2. Applicable Inspection Procedures
EVALUATION CRITERIA:	<p>Upon completion of the tasks, the inspector should be able to:</p> <ol style="list-style-type: none">1. Demonstrate proficiency in conducting entrance and exit meetings.
TASKS:	<ol style="list-style-type: none">1. Under the supervision of a qualified construction inspector or supervisor, conduct an entrance meeting.2. Under the supervision of a qualified construction inspector or supervisor, conduct an exit meeting.
DOCUMENTATION:	Construction Inspection Proficiency Level Qualification Signature Card Item OJT-CI-2

Construction Inspector On-the-Job Activity

TOPIC: (OJT-CI-3) Inspection Documentation

PURPOSE: The purpose of this activity is to familiarize an inspector with the requirements for construction inspection report documentation.

**COMPETENCY
AREA:** INSPECTION

**LEVEL
OF EFFORT:** 24 hours

REFERENCES:

1. Manual Chapter 0613, Construction Inspection Reports
2. CIPIMS User's Guide
3. Applicable Inspection Procedures
4. NRC Enforcement Manual Section for Construction Inspection

**EVALUATION
CRITERIA:** Upon completion of the tasks, the inspector should be able to:

1. Generally describe the requirements for documenting construction inspection reports.
2. Demonstrate the ability to properly document inspection findings in accordance with the applicable NRC Enforcement Manual sections.

TASKS:

1. Review the references listed above to develop an understanding of the documentation requirements for construction inspections.
2. Under the guidance of a qualified construction inspector, draft an inspection report input and develop CIPIMS inputs.
3. Organize and incorporate draft inspection report inputs from other inspectors, as applicable.

DOCUMENTATION: Construction Inspection Proficiency Level Qualification
Signature Card Item OJT-CI-3

Construction Inspector Technical Proficiency Level Signature Card and Certification

Inspector Name: _____	Inspector Initials/Date	Supervisor's Signature/Date
Required Training Courses		
All Functional Areas		
New Reactor Technology (one design only is required)		
Construction Inspection Program		
Completing a Codes and Inspection Course in only one discipline is required:		
Civil/Structural Functional Area		
Codes and Inspection Course (Civil/Structural)		
Mechanical Functional Area		
Codes and Inspection Course (Mechanical)		
Electrical Functional Area		
Codes and Inspection Course (Electrical)		
Construction/Start-up Testing Functional Area		
Preoperational and Startup Testing Inspection		
Individual Study Activities		
(ISA-CI-1) Construction Quality Assurance (QA) and Defect Reporting Requirements		
(ISA-CI-2) 10 CFR Part 52		
(ISA-CI-3) Construction Inspection Program		
(ISA-CI-4) Design Control Document		
(ISA-CI-5) Construction Inspection Program Information Management System (CIPIMS)		
(ISA-CI-6) Industry Codes and Standards - General		
(ISA-ASME-1) Regulatory Basis for the Requirements Specified in the American Society of Mechanical Engineers (ASME) Boiler & Pressure Vessel Code - (Mechanical Area Inspectors Only)		
(ISA-ASME-2) American Society of Mechanical Engineers Boiler & Pressure Vessel Code, Section III (ASME Code, or Section III) Overview - (Mechanical Area Inspectors Only)		
On-the-Job Activities		
(OJT-CI-1) Inspection Accompaniment		
(OJT-CI-2) Inspection Entrance/Exit Meetings		

Inspector Name: _____	Inspector Initials/Date	Supervisor's Signature/Date
(OJT-CI-3) Inspection Documentation		

Area for Certification:

- ☐ Civil/Structural
- ☐ Mechanical
- ☐ Electrical
- ☐ Preoperational/Startup Testing

Branch Chief's signature indicates successful completion of all required courses and activities listed in this journal for designated inspection area and readiness to appear before the Oral Board.

Branch Chief's Signature: _____ Date: _____

Form 1

Construction Inspector Technical Proficiency Level Equivalency Justification	
Inspector Name: _____	Identify equivalent training and experience for which the inspector is to be given credit
<i>Required Training Courses</i>	
<i>Individual Study Activities</i>	
<i>On-the-Job Activities</i>	

Branch Chief's Recommendation Signature / Date

Division Director's Approval Signature / Date

Copies to: Inspector
 HR Office
 Branch Chief

This form must accompany the Signature Card and Certification, if applicable.

Revision History Page

Commitment Tracking Number	Issue Date	Description of Change	Training needed	Training Completion Date	Comment Resolution Accession Number
	02/06/07 CN 07-005	Initial issuance of document	NO		