NRC INSPECTION MANUAL

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INSPECTION MANUAL CHAPTER 1245 APPENDIX C5

RESEARCH AND TEST REACTOR INSPECTOR
TECHNICAL PROFICIENCY
TRAINING AND QUALIFICATION JOURNAL

Effective Date: 06/26/2020

Table of Contents

Introduction

You may begin the activities or complete the courses in this qualification journal while completing the Basic Inspector Certification Journal. You may complete the General Proficiency requirements contained in Appendix B together with the Technical Proficiency requirements outlined in this journal.

Required Research and Test Reactor Inspector Training Courses**:**

R-106,	Research and Test Reactor Technology: Introduction
R-206,	Research and Test Reactor Technology: Regulatory Oversight
R-306,	Research and Test Reactor Technology: Nuclear Theory
R-406,	Research and Test Reactor Technology: Operation
H-111,	Environmental Monitoring for Radioactivity
H-122S,	Fundamental Health Physics Course
H-201,	Advanced Health Physics
H-308,	Transportation of Radioactive Materials
S-301,	Security Fundamental Course
S-201,	NRC Materials Control, Security Systems & Principles

Research and Test Reactor Inspector

Individual Study Activities

Research and Test Reactor Individual Study Activity

TOPIC: (ISA-RT-1) Research and Test Reactor Standards and Regulatory Guides

PURPOSE: The purpose of this activity is to familiarize you with research and test reactor standards and regulatory guides and to acquaint you with the information available. For some licensees, some standards provide the bases for requirements, and the inspector must be familiar with these standards. Further, inspectors must routinely evaluate and review a variety of facilities and documents to support their inspection activities. Often, the inspector will find situations where research reactor Standards and Regulatory Guides can provide useful guidance to successfully perform your assigned responsibilities. This individual study activity will acquaint you with the most common research reactor standards and regulatory guides and will help you learn the different ways NRC regulations and requirements are implemented by licensees.

COMPETENCY AREA: REGULATORY FRAMEWORK

LEVEL OF EFFORT: 16 Hours

REFERENCES: See list at the end of this activity

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

1. Locate the referenced Research Reactor Standards and Regulatory Guides.

2. Find and explain significant features of specific guidance in following areas:

   - Organization and staffing in ANSI/ANS 15.1
   - Staff qualifications in ANSI/ANS 15.4
   - Experiment Technical Specifications and Review in ANSI/ANS 15.1, and in Regulatory Guides 2.2 and 2.4
   - Radiological Controls in ANSI/ANS 15.11
   - Administrative Controls in ANSI/ANS 15.1
   - Quality Assurance for Research Reactors in ANSI/ANS 15.8

3. Describe the process used to issue research reactor Standards.

TASKS:

1. Locate the referenced active ANSI/ANS Research Reactor Standards and NRC Regulatory Guides.
2. Review the table of contents of each referenced active standard.
3. Review the main topic areas of each referenced Regulatory Guide.
4. Read the areas of specific guidance reference above in item 2 of evaluation criteria.
5. Discuss these areas with a qualified inspector or your supervisor.
6. Discuss with an ANSI/ANS 15 Subcommittee member the methods to develop these standards.
7. Meet with your supervisor, or the person designated to be your resource for this activity and discuss the answers to the questions listed under Evaluation Criteria.

DOCUMENTATION: Research and Test Reactor Individual Study Guide Signature Card Item ISA-RT-1

REFERENCES FOR ISA-RT-1:

ANSI/ANS 15 Standards.

Some of the following standards may be referenced in the licensing basis for many RTRs. Inspectors may find references to earlier versions of these standards. Additionally, certain standards may no longer be maintained or have even been withdrawn.

- ANSI/ANS-15.1, "The Development of Technical Specifications for Research Reactors."
- ANSI/ANS-15.2, "Quality Control for Plate-Type Uranium-Aluminum Fuel Elements."
- ANSI/ANS-15.4, "Selection and Training of Personnel for Research Reactors."
- ANSI/ANS-15.8, "Quality Assurance Program Requirements for Research Reactors."
- ANSI/ANS-15.10, "Decommissioning of Research Reactors."
- ANSI/ANS-15.11, "Radiological Controls at Research Reactors."
- ANSI/ANS-15.16, "Emergency Planning for Research Reactors."

- ANSI/ANS-15.17, "Fire Protection Program Criteria for Research Reactors."
- ANSI/ANS-15.21, "Format and Content for Safety Analysis Reports for Research Reactors."
- ANSI/ANS-15.7, "Research Reactor Site Evaluation"
- ANSI/ANS-15.12, "Design Objectives for and Monitoring of Systems Controlling Research Reactor Effluents"
- ANSI/ANS-15.15, "Criteria for Reactor Safety Systems of Research Reactors"
- ANSI/ANS-15.19, "Shipment and Receipt of Special Nuclear Material (SNM) by Research Reactors"
- ANSI/ANS-15.20, "Criteria for the Reactor Control and Safety Systems of Research Reactors"

Division 2 Regulatory Guides

- Regulatory Guide 2.1, "Shield Test Program for Evaluation of Installed Biological Shielding in Research and Training Reactors," (Withdrawn)
- Regulatory Guide 2.2, "Development of Technical Specifications for Experiments in Research Reactors,"
- Regulatory Guide 2.3, "Quality Verification for Plate-Type Uranium-Aluminum Fuel Elements for Use in Research Reactors,"
- Regulatory Guide 2.4, "Review of Experiments for Research Reactors," (Withdrawn)
- Regulatory Guide 2.5, "Quality Assurance Program Requirement for Research Reactors,"
- Regulatory Guide 2.6, "Emergency Planning for Research Reactors."

Supplementary Regulatory Guides

- Regulatory Guide 1.159 "Assuring the Availability of Funds for Decommissioning Nuclear Reactors,"
- Regulatory Guide 4.13, "Performance, Testing, and Procedural Specifications for Thermo-luminescence Dosimetry: Environmental Applications"

- Regulatory Guide 4.15, “Quality Assurance for Radiological Monitoring Programs - (Inception through Normal Operations to License Termination) - Effluent Streams and the Environment,”
- Regulatory Guide 4.20, “Constraint on Releases of Airborne Radioactive Materials to the Environment for Licensees other than Power Reactors,”
- Regulatory Guide 5.7, “Entry/Exit Control for Protected Areas, Vital Areas, and Material Access Areas,”
- Regulatory Guide 5.12, “General Use of Locks in the Protection and Control of Facilities and Special Nuclear Materials, Classified Matter, and Safeguards Information,”
- Regulatory Guide 5.13, “Conduct of Nuclear Material Physical Inventories,”
- Regulatory Guide 5.38, “Nondestructive Assay of High-Enrichment Uranium Fuel Plates by Gamma Ray Spectrometry,”
- Regulatory Guide 5.44, “Perimeter Intrusion Alarm Systems,”
- Regulatory Guide 5.51, “Management Review of Nuclear Material Control and Accounting Systems (for Comment),”
- Regulatory Guide 5.52, “Standard Format and Content of a Licensee Physical Protection Plan for Strategic Special Nuclear Material at Fixed Sites (Other than Nuclear Power Plants),”
- Regulatory Guide 5.56, “Standard Format and Content of Safeguards Contingency Plans for Transportation,” (Withdrawn)
- Regulatory Guide 5.57, “Shipping and Receiving Control of Strategic Special Nuclear Material,”
- Regulatory Guide 5.59, “Standard Format and Content for a Licensee Physical Security Plan for the Protection of Special Nuclear Material of Moderate or Low Strategic Significance,”
- Regulatory Guide 5.60, “Standard Format and Content of a Licensee Physical Protection Plan for Strategic Special Nuclear Material in Transit”
- Regulatory Guide 5.62, “Reporting of Safeguards Events,”
- Regulatory Guide 7.1, “Administrative Guide for Packaging and Transporting Radioactive Material,"
- Regulatory Guide 7.1, “Administrative Guide for Packaging and Transporting Radioactive Material,"

- Regulatory Guide 7.1, “Administrative Guide for Packaging and Transporting Radioactive Material,"
- Regulatory Guide 7.2, “Packaging and Transportation of Radioactively Contaminated Biological Materials,"
- Regulatory Guide 7.3, “Procedures for Picking Up and Receiving Packages of Radioactive Material,"
- Regulatory Guide 7.4, “Leakage Tests on Packages for Shipment of Radioactive Materials,"
- Regulatory Guide 7.5. “Administrative Guide for Obtaining Exemptions from Certain NRC Requirements over Radioactive Material Shipment,"
- Regulatory Guide 7.6, “Design Criteria for the Structural Analysis of Shipping Cask Containment Vessels,"
- Regulatory Guide 7.7, “Administrative Guide for Verifying Compliance with Packaging Requirements for Shipments of Radioactive Materials,”
- Regulatory Guide 7.8, “Load Combinations for the Structural Analysis of Shipping Casks for Radioactive Material,”
- Regulatory Guide 7.9. “Standard Format and Content of Part 71 Applications for Approval of Packaging of Type B, Large Quantity, and Fissile Radioactive Material,”
- Regulatory Guide 7.10, “Establishing Quality Assurance Programs for Packaging Used in the Transport of Radioactive Material,”
- Regulatory Guide 8.1, “Radiation Symbol,”
- Regulatory Guide 8.2, “Administrative Practices in Radiation Monitoring,”
- Regulatory Guide 8.4, “Personnel Monitoring Device – Direct-Reading Pocket Dosimeters,”
- Regulatory Guide 8.5, “Criticality and Other Interior Evacuation Signals,”
- Regulatory Guide 8.6, “Standard Test Procedure for Geiger-Muller Counters,”

- Regulatory Guide 8.7, “Instructions for Recording and Reporting Occupational Radiation Exposure Data,”
- Regulatory Guide 8.9, “Acceptable Concepts, Models, Equations, and Assumptions for a Bioassay Program,”
- Regulatory Guide 8.10, “Operating Philosophy for Maintaining Occupational Radiation Exposures As Low As Is Reasonably Achievable,”
- Regulatory Guide 8.13, “Instruction Concerning Prenatal Radiation Exposure,”
- Regulatory Guide 8.15, “Acceptable Programs for Respiratory Protection,”
- Regulatory Guide 8.25, “Air Sampling in the Workplace,”
- Regulatory Guide 8.26, “Applications of Bioassay for Fission and Activation Products,”
- Regulatory Guide 8.28, “Audible-Alarm Dosimeters,”
- Regulatory Guide 8.29, “Instruction Concerning Risks from Occupational Radiation Exposure,”
- Regulatory Guide 8.32, “Criteria for Establishing a Tritium Bioassay Program,”
- Regulatory Guide 8.33. “Quality Management Program,”
- Regulatory Guide 8.34, “Monitoring Criteria and Methods To Calculate Occupational Radiation Doses,”
- Regulatory Guide 8.35, “Planned Special Exposures,”
- Regulatory Guide 8.36, “Radiation Dose to the Embryo/Fetus,”
- Regulatory Guide 8.38, “Control of Access to High and Very High Radiation Areas of Nuclear Plants,”
- Regulatory Guide 10.1, “Compilation of Reporting Requirements for Persons Subject to NRC Regulations,"
- Regulatory Guide 10.2, “Guidance to Academic Institutions Applying for Specific Byproduct Material Licenses of Limited Scope,”
- Regulatory Guide 10.3, “Guide for the Preparation of Applications for Special Nuclear Material Licenses of Less than Critical Mass Quantities “

- Regulatory Guide 10.4, “Guide for the Preparation of Applications for Licenses to Process Source Material,”
- Regulatory Guide 10.5, “Applications for Type A Licenses of Broad Scope,”
- Regulatory Guide 10.6, “Guide for the Preparation of Applications for Use of Sealed Sources and Devices for Performing Industrial Radiography,”
- Regulatory Guide 10.7, “Guide for the Preparation of Applications for Licenses for Laboratory and Industrial Use of Small Quantities of Byproduct Material,”
- Regulatory Guide 10.8, “Guide for the Preparation of Applications for Medical Use Programs,”
- Regulatory Guide 10.12, “Preparation of Petitions for Rulemaking Under 10 CFR 2.802 and Preparation and Submission of Proposals for Regulatory Guidance Documents.”

Research and Test Reactor Individual Study Activity

TOPIC: (ISA-RT-2) Overview of 10 CFR Parts 30, 37, 50, 55, 70, 73, 74, 100, 170 and 171 for Research and Test Reactors

PURPOSE: The purpose of this activity is to acquaint you with the regulations that specify the requirements on the construction, licensing and operation of research and test reactors. This individual study activity will help you to understand the content of 10 CFR Parts 30, 37, 50, 55, 70, 73, 74, 100, 170 and 171 and how to locate the specific requirements for any subject.

COMPETENCY AREA: REGULATORY FRAMEWORK

LEVEL OF EFFORT: 12 Hours

REFERENCES: 10 CFR Parts 30, 50, 70, 73, 170 and 171
NUREG-1537, "Guidelines for Preparing and Reviewing Applications for the Licensing of Non-Power Reactors"

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

1. State the purpose of each Part of 10 CFR studied.
2. Use the search feature of the NRC website to find information on a specific topic in 10 CFR.
3. Identify what portions of the subject regulations apply to research and test reactors and which do not apply.
4. Become familiar with the content of regulations that apply to research and test reactors.

TASKS:

1. Become familiar with the NRC website search feature to locate a specific topic in the regulations. To find this, go to nrc.gov, electronic reading room, document collection, regulations (10 CFR).
2. Review Appendix A of NUREG-1537 which identifies the significant sections of the subject regulations and which applies to research and test reactors.
3. Read those sections of the regulations which apply to research and test reactor inspectors.

4. Meet with your supervisor, or the person designated to be your resource for this activity, and discuss the items listed under Evaluation Criteria.

DOCUMENTATION: Research and Test Reactor Individual Study Guide Signature Card Item ISA-RT-2

Research and Test Reactor Inspector

On-the-Job Activity

Research and Test Reactor On-the-Job Activity

TOPIC: (OJT-RT-1) Research and Test Reactor Inspection Accompaniments

PURPOSE: The purpose of this activity is to acquaint you with the general conduct of research and test reactor inspections

COMPETENCY AREAS:
INSPECTION
COMMUNICATION
FUNDAMENTAL FACILITY DESIGN AND OPERATION

Note: completion of this guide may take five or more inspections.

LEVEL OF EFFORT: See the times listed with the referenced inspection procedure.

REFERENCES: See list at the end of this activity

EVALUATION CRITERIA: Upon completion of the tasks, you will be asked to demonstrate your understanding of these tasks by successfully discussing the preparation, conduct, communication and documentation of the various inspection procedures. You will also be asked to discuss the methods used by licensees to implement safety programs and regulatory requirements. You will be asked to explain the facilities, equipment, processes, and activities of the areas you inspect, as well as the criteria, techniques, and mechanics of inspection. You will be asked to demonstrate a level of technical knowledge needed to adequately perform inspection activities on research and test reactors.

Some inspection procedures may not be conducted regularly, e.g., inspection procedures related to decommissioning. On completion of the tasks for any one inspection procedure, the inspector should be considered qualified to independently complete that inspection procedure.

TASKS:

1. Prepare and conduct inspection for each of the referenced inspection procedures at least twice under the supervision of a qualified research and test reactor inspector.

2. During the inspection, describe your observations and associated safety significance and/or compliance to regulatory requirements with licensee management under the supervision of a qualified

research and test reactor inspector. Following the inspection, discuss your observations with your supervisor and the assigned NRC project manager.

3. Prepare input to an inspection report for each of the referenced inspection procedures under the supervision of a qualified research and test reactor inspector.

4. With qualified inspectors, discuss and explore the different ways licensees implement safety programs and regulatory requirements applicable to each inspection procedure. Discuss the facilities and equipment, and the technical bases for their design. Discuss processes, and activities of the areas you inspect. Discuss the criteria, techniques, and mechanics of inspection at research and test reactors.

5. Witness a drill of the Emergency Plan at a research or test reactor.

6. Review and discuss evaluation criteria with your supervisor and/or designated resource for this training.

DOCUMENTATION: Non-Power Proficiency Level Qualification Signature Card Item OJT-RT-1

REFERENCES:

NOTE: The allowed time to complete the inspections is based on the resource estimate in each IP. The same amount of time was allowed to prepare and document the inspection. This time was doubled in consideration of the trainees' status. It was doubled again so that the inspection could be conducted twice for qualification.

Operational Inspection Procedures for Research and Test Reactors with power levels ≥ 2 megawatts:

- IP 69003, Class I Research and Test Reactor Operator Licenses, Requalification, and Medical Activities (27 hours)
- IP 69004, Class I Research and Test Reactor Effluent and Environmental Monitoring (90 hours)
- IP 69005, Class I Research and Test Reactor Experiments (27 hours)
- IP 69006, Class I Research and Test Reactors Organization and Operations and Maintenance Activities (45 hours)
- IP 69007, Class I Research and Test Reactor Review and Audit and Design Change Functions (45 hours)

- IP 69008, Class I Research and Test Reactor Procedures (45 hours)
- IP 69009, Class I Research and Test Reactor Fuel Movement (36 hours)
- IP 69010, Class I Research and Test Reactor Surveillance (72 hours)
- IP 69011, Class I Research and Test Reactor Emergency Preparedness (108 hours)
- IP 69012, Class I Research and Test Reactors Radiation Protection (162 hours)

Operational Inspection Procedures for Research and Test Reactors with power levels < 2 megawatts:

- IP 69001, Class II Research and Test Reactors (270 hours)

Inspection Procedures for Research and Test Reactor in Long-Term Shutdown Status

- IP 69002, Class III Research and Test Reactors (72 hours)

Inspection Procedures for Research and Test Reactors in Decommissioning Status

- Regulatory Guide 10.3, "Guide for the Preparation of Applications for Special Nuclear Material Licenses of Less than Critical Mass Quantities,"
- IP 69013, Research and Test Reactor Decommissioning (216 hours)
- IP 83801, Inspection and Final Surveys at Permanently Shutdown Reactors (216 hours)

Inspection Procedures on Safeguards and Special Nuclear Material Security

- IP 81602, Fixed Site Physical Protection of Special Nuclear Material of Moderate Strategic Significance – Non-Power Reactors (144 hours)
- IP 81603, Fixed Site Physical Protection of Special Nuclear Material of Low Strategic Significance – Non-Power Reactors (96 hours)
- IP 81606, Material Control and Accounting – Non-Power Reactors (24 hours)
- IP 81607, Protection of Safeguards Information and Safeguards Information-Modified Handling – Non-Power Reactors (24 hours)
- IP 81608, Reporting of Safeguards Events – Non-Power Reactors (8 hours)

Inspection Procedures on Radioactive Material Security

- IP 81621, Fixed Site Physical Protection of Category 1 and Category 2 Quantities of Radioactive Material – Non-Power Reactors
- IP 81622, In Transit Physical Protection of Category 1 and Category 2 Quantities of Radioactive Material and 100 Grams or Less of Irradiated Reactor Fuel – Non-Power Reactors

Inspection Procedures on Transportation

- IP 86740, Inspection and Transportation Activities (45 hours)

Research and Test Reactor Technical Proficiency Level Signature Card and Certification

Inspector Name: _____	Employee Initials/ Date	Supervisor's Signature/Date
Training Courses Required for RTR Inspector Qualification		
R-106, Research and Test Reactor Technology: Introduction R-206, Research and Test Reactor Technology: Regulatory Oversight R-306, Research and Test Reactor Technology: Nuclear Theory R-406, Research and Test Reactor Technology: Operation		
H-111, Environmental Monitoring for Radioactivity		
H-122S, Fundamental Health Physics Course		
H-201, Advanced Health Physics		
H-308, Transportation of Radioactive Materials		
S-301, Security Fundamentals Course		
S-201, NRC Materials Control, Security Systems & Principles		
Individual Study Activities		
ISA-RT-1 Research and Test Reactor Standards and Regulatory Guides		
ISA-RT-2 Overview of 10 CFR Parts 30, 37, 50, 55, 70, 73, 74, 100, 170 and 171 for Research and Test Reactors		
On-the-Job Training Activity		
OJT-RT-1 Research and Test Reactor Inspection Accompaniments		

Supervisor's signature indicates successful completion of all required courses and activities listed in this journal and readiness to appear before the Oral Board.

Supervisor's Signature _____ Date: _____

Form 1: Research and Test Reactor Technical Proficiency Level Equivalency Justification	
Inspector Name: _____	Identify equivalent training and experience for which the inspector is to be given credit
Training Courses Required for RTR Inspector Qualification	
R-106, Research and Test Reactor Technology: Introduction R-206, Research and Test Reactor Technology: Regulatory Oversight R-306, Research and Test Reactor Technology: Nuclear Theory R-406, Research and Test Reactor Technology: Operation	
H-111, Environmental Monitoring for Radioactivity	
H-122S, Fundamental Health Physics Course	
H-201, Advanced Health Physics	
H-308, Transportation of Radioactive Materials	
S-301, Security Fundamentals Course	
S-201, NRC Materials Control, Security Systems & Principles	
Individual Study Activities	Identify equivalent training and experience for which the inspector is to be given credit
ISA-RT-1 Research and Test Reactor Standards and Regulatory Guides	
ISA-RT-2 Overview of 10 CFR Parts 30, 37, 50, 55, 70, 73, 74, 100, 170 and 171 for Research and Test Reactors	
On-the-Job Training Activity	
OJT-RT-1 Research and Test Reactor Inspection Accompaniments	

Supervisor's Recommendation: Signature / Date _____

Division Director's Approval: Signature / Date _____

Copies to: Inspector and official training file

Revision History Sheet for IMC 1245 Appendix C5

Commitment Tracking Number	Accession Number Issue Date Change Notice	Description of Change	Description of Training Required and Completion Date	Comment Resolution and Closed Feedback Form Accession Numbers (Pre-Decisional, Non-Public Information)
N/A	ML062400476 10/31/06 CN 06-032	To clarify signature requirements, update reference lists, and incorporate minor editorial changes. Completed 4 year historical CN search	None	N/A
N/A	ML090360468 07/08/09 CN-09-017	Updates a course number, replaces course H-201 with H-117, and moves post-qualification and refresher training requirements out of the appendix and into Appendix D-1.	None	N/A
N/A	ML20077L275 06/26/20 CN 20-026	This revision updated references to courses and corrected format items.	None	ML20079E417