

**Appendix C-5**

**Research and Test Reactor Inspector  
Technical Proficiency  
Training and Qualification Journal**

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## 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  
H-111, Environmental Monitoring for Radioactivity  
H-117, Introduction to Health Physics  
H-303, Radiological Emergency Response and Operations  
H-308, Transportation of Radioactive Materials  
S-118S, Introduction to Physical Security Systems

### Required Post-Qualification Training:

This section has been moved to Appendix D-1.

**Research and Test Reactor Inspector**  
**Individual Study Activity**

## 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 how individual facilities may implement differently NRC regulations and requirements.

**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

- ANSI/ANS-15.1, "Development of Technical Specifications for Research Reactors," 1990 (R1999).
- ANSI/ANS-15.2, "Quality Control for Plate-Type Uranium-Aluminum Fuel Elements," 1999.
- ANSI/ANS-15.4, "Selection and Training of Personnel for Research Reactors," 1988 (R1999).
- ANSI/ANS-15.8, "Quality Assurance Program Requirements for Research Reactors," 1995 (R2005).

- ANSI/ANS-15.10, "Decommissioning of Research Reactors," 1994.
- ANSI/ANS-15.11, "Radiological Controls at Research Reactors," 1993 (R2004).
- ANSI/ANS-15.16, "Emergency Planning for Research Reactors," 1982 (R2000).
- ANSI/ANS-15.17, "Fire Protection Program Criteria for Research Reactors," 1981 (R2000).
- ANSI/ANS-15.21, "Format and Content for Safety Analysis Reports for Research Reactors," 1996

In addition to the above standards that are maintained, the following standards that are no longer maintained and have been withdrawn, as well as earlier versions of many of the above standards, may be referenced in the licensing basis for many RTRs:

1. 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," May 1973.
- Regulatory Guide 2.2, "Development of Technical Specifications for Experiments in Research Reactors," November 1973.
- Regulatory Guide 2.3, "Quality Verification for Plate-Type Uranium-Aluminum Fuel Elements for Use in Research Reactors," July 1976.
- Regulatory Guide 2.4, "Review of Experiments for Research Reactors," May 1977.

- Regulatory Guide 2.5, "Quality Assurance Program Requirement for Research Reactors," October 1977.
- Regulatory Guide 2.6, "Emergency Planning for Research Reactors," March 1983.

### Supplementary Regulatory Guides

- Regulatory Guide 1.159 "Assuring the Availability of Funds for Decommissioning Nuclear Reactors" (Draft DG-1003 published 5/1989, Draft DG-1106 published 5/2001)
- 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 (Normal Operations) -- 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" (Draft DG-8016 published 12/1995)
- Draft Regulatory Guide 4006, "Demonstrating Compliance with the Radiological Criteria for License Termination"
- Regulatory Guide 5.7, "Entry/Exit Control for Protected Areas, Vital Areas, and Material Access Areas" (Draft SG 909-4, Proposed Revision 1, published 5/1979)
- Regulatory Guide 5.12, "General Use of Locks in the Protection and Control of Facilities and Special Nuclear Materials"
- 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" (Draft SG 048-4, Proposed Revision 1, published 8/1982)
- Regulatory Guide 5.44, "Perimeter Intrusion Alarm Systems" (Draft SG 479-4, Proposed Revision 2, published 5/1979)(Draft DG-5007, Proposed Revision 3, published 4/1996)
- Regulatory Guide 5.51, "Management Review of Nuclear Material Control and Accounting Systems (for Comment)"



- Regulatory Guide 5.56, "Standard Format and Content of Safeguards Contingency Plans for Transportation" (for Comment)
- Regulatory Guide 5.57, "Shipping and Receiving Control of Strategic Special Nuclear Material" (Draft SG 908-4, Proposed Revision 1, published 5/1979)
- 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" (Draft MP 711-4 published 7/1979) (Draft SG 229-4, Proposed Revision 1, published 9/1982)
- 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" (Draft SG 901-4 published 10/1979) (Draft SG 901-4, Proposed Revision 1, published 10/1985) (Draft DG-5008, Prop. Rev. 2, published 12/1997)
- 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" (for Comment)
- Regulatory Guide 7.8, "Load Combinations for the Structural Analysis of Shipping Casks for Radioactive Material" (Draft MS 527-4, Proposed Revision 1, published 7/1987) (Draft MS 804-4, Second Proposed Revision 1, published 9/1988)

- 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” (Draft FC 416-4, Proposed Revision 2, published 5/1986)
- Regulatory Guide 7.10, “Establishing Quality Assurance Programs for Packaging Used in the Transport of Radioactive Material” (Combined Draft TP 019-4, published 6/1981, and Draft TP 020-4, published 3/1981)
- Regulatory Guide 8.1, “Radiation Symbol”
- Regulatory Guide 8.2, “Guide for Administrative Practices in Radiation Monitoring”
- Regulatory Guide 8.4, “Direct-Reading and Indirect-Reading Pocket Dosimeters Regulatory”
- 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” (Draft DG-8007, Proposed Revision 1, published 11/1991)
- Regulatory Guide 8.9, “Acceptable Concepts, Models, Equations, and Assumptions for a Bioassay Program” (Draft DG-8009, Proposed Revision 1, published 12/1991)
- 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” (Draft OP 031-4 Proposed Revision 2, published 8/1981) (Draft DG-8014, Proposed Revision 3, published 10/1994)
- Regulatory Guide 8.15, “Acceptable Programs for Respiratory Protection” (Draft DG-8022, Proposed Revision 1, issued 7/1998)
- Regulatory Guide 8.25, “Air Sampling in the Workplace” (Draft OH 905-4 published 10/1979) (Draft DG-8003, Proposed Revision 1, published 9/1991)
- Regulatory Guide 8.26, “Applications of Bioassay for Fission and Activation Products” (Draft OH 714-4 published 8/1979)

- Regulatory Guide 8.28, “Audible-Alarm Dosimeters” (Draft OH 804-4 published 8/1979)
- Regulatory Guide 8.29, “Instruction Concerning Risks from Occupational Radiation Exposure” (Draft OH 902-4 published 5/1980) (Draft DG-8012, Proposed Revision 1, published 12/1994)
- Regulatory Guide 8.32, “Criteria for Establishing a Tritium Bioassay Program” (Draft OP 713-4 published 6/1983) 07/1988
- Regulatory Guide 8.33. “Quality Management Program” (Draft DG-8001 published 1/1990)
- Regulatory Guide 8.34, “Monitoring Criteria and Methods To Calculate Occupational Radiation Doses” (Draft DG-8010 published 2/1992)
- Regulatory Guide 8.35, “Planned Special Exposures” (Draft DG-8008 published 12/1991)
- Regulatory Guide 8.36, “Radiation Dose to the Embryo/Fetus” (Draft DG-8011 published 2/1992)
- Regulatory Guide 8.38, “Control of Access to High and Very High Radiation Areas of Nuclear Plants” (Draft DG-8006 published 10/1991)
- Draft Regulatory Guide OP 032-5, “Test and Calibration of Radiation Protection Instrumentation”
- Regulatory Guide 10.1, “Compilation of Reporting Requirements for Persons Subject to NRC Regulations NUREG-1460”
- Regulatory Guide 10.2, “Guidance to Academic Institutions Applying for Specific Byproduct Material Licenses of Limited Scope” (Errata published 7/1984)
- 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” (Errata published 7/1984) (Draft FC 409-4, Proposed Revision 2, published 4/1985)
- Regulatory Guide 10.5, “Applications for Type A Licenses of Broad Scope” (Errata published 7/1984) (Draft FC 408-4, Proposed Revision 2, published 2/1985) (Draft DG-0005, Second Proposed Revision 2, published 10/1994)

- Regulatory Guide 10.6, “Guide for the Preparation of Applications for Use of Sealed Sources and Devices for Performing Industrial Radiography” (Draft TP 602-4, Proposed Revision 1, published 6/1980) (Errata published 7/1984) (Draft FC 401-4, Proposed Revision 2, published 10/1984)
- Regulatory Guide 10.7, “Guide for the Preparation of Applications for Licenses for Laboratory and Industrial Use of Small Quantities of Byproduct Material” (Errata published 7/1984)
- Regulatory Guide 10.8, “Guide for the Preparation of Applications for Medical Use Programs” (Draft FC 415-4, Proposed Revision 2, published 8/1985) (Draft DG-0002, Proposed Appendix X to Regulatory Guide 10.8, published 12/1991) (Appendix X published June 1992) (DG-0009, Proposed Supplement, published 3/1997)
- Regulatory Guide 10.12, “Preparation of Petitions for Rulemaking Under 10 CFR 2.802 and Preparation and Submission of Proposals for Regulatory Guidance Documents” (Draft DG-0010 published 8/1996)

## Research and Test Reactor Individual Study Activity

**TOPIC:** (ISA-RT-2) Overview of 10 CFR Parts 30, 50, 70, 73, 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, 50, 70, 73, 170 and 171 and how to locate the specific requirements for any subject.

**COMPETENCY AREA:** REGULATORY FRAMEWORK

**LEVEL OF EFFORT:** 12 Hours

**REFERENCES:** 10 C FR 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.

**T asks:**

1. Become familiar with the NRC website search feature to locate a specific topic in the regulations. To find this, go to [nrc.gov](http://nrc.gov), electronic reading room, document collection, regulations (10 C FR).
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 to your supervisor and the assigned NRC project manager, and to licensee management under the supervision of a qualified research and test reactor inspector.
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  $\geq$  2 megawatts:

- IP 69003, Class I Research and Test Reactor Operator Licenses, Qualification, 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

- 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 Security

- IP 81401, Plans, Procedures, and Reviews (45 hours)
- IP 81402, Reports of Safeguards Events (72 hours)
- IP 81411, Physical Protection for Reactors with Formula Quantities of Special Nuclear Material (108 hours)

- IP 81421, Fixed Site Physical Protection of Special Nuclear Material of Moderate Strategic Significance (90 hours)
- IP 81431, Fixed Site Physical Protection of Special Nuclear Material of Low Strategic Significance (72 hours)
- IP 81810, Protection of Safeguards Information (27 hours)
- IP 85102, Material Control and Accounting - Reactors (36 hours)

Inspection Procedures on Transportation

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

# Research and Test Reactor Technical Proficiency Level Signature Card and Certification

| <i>Inspector Name:</i> _____   | <i>Employee Initials/ Date</i> | <i>Supervisor's Signature/Date</i> |
|--|--------------------------------|------------------------------------|
| <i>Training Courses Required for RTR Inspector Qualification</i>                             |                                |                                    |
| R-106, Research and Test Reactor Technology  |                                |                                    |
| H-111, Environmental Monitoring for Radioactivity  |                                |                                    |
| H-117, Introduction to Health Physics  |                                |                                    |
| H-303, Radiological Emergency Response and Operations  |                                |                                    |
| H-308, Transportation of Radioactive Materials   |                                |                                    |
| S-118S, Introduction to Physical Security Systems  |                                |                                    |
|  |                                |                                    |
| <i>Individual Study Activities</i>   |                                |                                    |
| ISA-RT-1 Research and Test Reactor Standards and Regulatory Guides                           |                                |                                    |
| ISA-RT-2 Overview of 10 CFR Parts 30, 50, 70, 73, 170 and 171 for Research and Test Reactors |                                |                                    |
| <i>On-the-Job Training Activity</i>  |                                |                                    |
| 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

|  |  |
|--|--|
| <i>Inspector Name:</i> _____   | <i>Identify equivalent training and experience for which the inspector is to be given credit</i> |
| <i>Training Courses Required for RTR Inspector Qualification</i>                             |  |
| R-106, Research and Test Reactor Technology  |  |
| H-111, Environmental Monitoring for Radioactivity  |  |
| H-117, Introduction to Health Physics  |  |
| H-303, Radiological Emergency Response and Operations  |  |
| H-308, Transportation of Radioactive Materials   |  |
| S-118S, Introduction to Physical Security Systems  |  |
| <i>Individual Study Activities</i>   | <i>Identify equivalent training and experience for which the inspector is to be given credit</i> |
| ISA-RT-1 Research and Test Reactor Standards and Regulatory Guides                           |  |
| ISA-RT-2 Overview of 10 CFR Parts 30, 50, 70, 73, 170 and 171 for Research and Test Reactors |  |
| <i>On-the-Job Training Activity</i>  |  |
| 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 C-5

| Commitment Tracking Number | Issue Date            | Description of Change  | Training Needed | Training Completion Date | Comment Resolution Accession Number |
|----------------------------|-----------------------|--|-----------------|--------------------------|-------------------------------------|
| N/A                        | 10/31/06<br>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                                 |
| N/A                        | 07/08/09<br>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                                 |
|                            |                       |  |                 |                          |                                     |
|                            |                       |  |                 |                          |                                     |
|                            |                       |  |                 |                          |                                     |
|                            |                       |  |                 |                          |                                     |