

# NRC INSPECTION MANUAL

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INSPECTION MANUAL CHAPTER 1245, APPENDIX D2

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INSERVICE INSPECTION ADVANCED-LEVEL TRAINING

Effective Date: 04/11/2023

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## Introduction

Completion of the Reactor Engineering Inspector Technical Proficiency Qualification journal is strongly recommended before beginning activities or courses in this advanced-level training. You may complete the General Proficiency requirements contained in Appendix B and the Technical Proficiency requirements in C-2 together with requirements in this training standard.

Completion of Inservice Inspection (ISI) Advanced-Level Training is recommended for inspectors leading **Inservice** inspections and for other inspectors conducting ISI inspection activities. Inspectors with demonstrated experience may **receive credit for completing portions of** this journal, as determined by the appropriate branch chief.

## Objectives of Advanced-Level Training

Inservice inspection (ISI) programs are designed to identify service-induced degradation that might lead to leakage or result in the loss of integrity of a **structure, system or component (SSC)**. Since a variety of inspection techniques can be used to assess the structural and leakage integrity of a SSC, an NRC inspector should have a general knowledge of the various techniques that can be used.

The objectives of this advanced voluntary training are:

- To ensure the inspector is knowledgeable of the requirements **regarding** the ISI of nuclear power plant structures, systems and components (SSCs).

- To ensure the inspector is knowledgeable about ISI techniques such that he/she can determine whether the techniques used are adequate to detect potential degradation that may be affecting that SSC.

- To ensure the inspector is knowledgeable of staff positions and industry guidance related to ISI.

After completion of this training, the inspector should be capable of:

- Developing informed questions such that he/she can perform effective and efficient inspections.

- Communicating the finding of their inspections effectively and efficiently with management and with headquarters staff.

- Reliably identifying ISI issues that should be brought to the attention of more senior regional inspectors or technical experts in Headquarters.

It is not the intent of this training standard to make the inspector an expert in assessing the structural and leakage integrity of each SSC in the plant.

## Required Training Courses

1. Nondestructive Examination (NDE) Technology and Codes (NRC Course E-306)

2. ASME Code **Section XI**—Inservice Inspection
3. **ASME Code Section IX—Welding, Brazing and Fusing Qualifications and ASME Practical Welding Technology Course (both preferred)**

Or

4. **Welding and NDE Overview (NRC Course E-901)**

Additional training recommended to be completed following qualification:

1. An advanced corrosion course.
2. A fracture mechanics course.
3. A quality assurance course.
4. An advanced course(s) in ultrasonic examination that would count toward the training hours and course materials of the ASNT Recommended Practice SNT-TC-1 **A** and/or ANSI/ASNT CP-189 guidelines for certification as a Level II ultrasonic examiner. Training course(s) should focus on ultrasound for nuclear weld examinations and substantially cover application of phased array ultrasound techniques and Section XI Appendix VIII qualified techniques.
5. An advanced course(s) in eddy current testing that would count toward the training hours and course materials of the ASNT Recommended Practice ASNT SNT-TC-1A and/or ANSI/ASNT CP-189 guidelines for certification as a Level II eddy current examiner. Training course(s) should focus on steam generator and heat exchanger tubing and include interpretation of data to meet the standards for a Qualified Data Analyst (QDA) in accordance with the EPRI S/G Examination Guidelines, Appendix G, for certification as a Level IIA QDA.
6. An advanced course(s) in radiographic examination that would count toward the training hours and course materials of the ASNT Recommended Practice SNT-TC-1A and/or ANSI/ASNT CP-189 guidelines for certification as a Level II in radiography. Training should focus on radiographic film interpretation for pipe and vessel welds.
7. A stress analysis course.

#### ISI Guidance Documents

The following include current and historical guidance documents applicable to **Inservice** inspection activities. As such, many of these documents can be used as further reference and guidance for implementing the most up to date inspection procedures and regulatory requirements.

#### Inspection Procedures

- |       |  |
|-------|--|
| 49001 | Inspection of Erosion-Corrosion/Flow Accelerated Corrosion Monitoring Programs |
| 50001 | Steam Generator Replacement Inspection   |
| 50002 | Steam Generators   |

50003	Pressurizer Replacement Inspection
55050	Nuclear Welding General Inspection Procedure
55100	Structural Welding General Inspection Procedure
55150	Weld Verification Checklist
57050	Nondestructive Examination Procedure Visual Examination
57060	Nondestructive Examination Procedure Liquid Penetrant
57070	Nondestructive Examination Procedure Magnetic Particle
57080	Nondestructive Examination Procedure Ultrasonic Examination
57090	Nondestructive Examination Procedure Radiographic Examination
61715	Verification of Containment Integrity
61720	Containment Local Leak Rate Testing
62002	Inspection of Structures, Passive Components, and Civil Engineering Features at Nuclear Power Plants
62003	Inspection of Steel and Concrete Containments at Nuclear Power Plants
70307	Containment Integrated Leak Rate Test - Procedure Review
70313	Containment Integrated Leak Rate Test
70323	Containment Leak Rate Test Results Evaluation
71111.08	Inservice Inspection Activities
71111.24	Testing and Maintenance of Equipment Important to Safety
73051	Inservice Inspection - Review of Program
73052	Inservice Inspection - Review of Procedures
73754	Preservice Inspection - Nondestructive Examination
73753	Inservice Inspection
73755	Inservice Inspection - Data Review and Evaluation
73756	Inservice Testing of Pumps and Valves

#### Temporary Instructions (TIs)

2515/150, Revision 3: Reactor Pressure Vessel Head and Vessel Head Penetration Nozzles  
(NRC Order EA-03-009)

2515/172: Reactor Coolant System Dissimilar Metal Butt Welds

#### Inspection Manual Part 9900 Technical Guidance

SGTUBELK:	Steam Generator Tube Primary-to-Secondary Leakage
ASME III & XI:	Code Interpretations, Use of Engineering Judgment, Flaw Evaluation
ASME XIA:	System Pressure Tests
SGTUBE:	Steam Generator Plugs and Sleeving Repairs

#### Inspection Manual Chapter 0326, "Operability Determinations"

#### Industry Guidance

- NEI 03-08 "The Material Initiative"
- Code Case N-770-x
- MRP 117 "Materials Reliability Program Inspection Plan for Reactor Vessel Closure Head Penetrations in U.S. PWR Plants"
- MRP 146 "Management of Thermal Fatigue in Normal Stagnant Non-Isolable Reactor Coolant Lines"
- MRP 192 "Assessment of Residual Heat Removal Mixing Tee Thermal Fatigue in PWR Plants"
- MRP 227 "PWR Internals and Evaluation Guidelines"

MRP 228 "Inspection Standard for PWR Internals"

BWRVIP-03: TR-105696-R9 Revision 19: BWR EPRI Vessel and Internals Project, Reactor Pressure Vessel and Internals Examination Guidelines

BWRVIP-160: "BWR Vessel and Internals Project, BWRVIP Inspection Trends," 2016 Update

EPRI "Steam Generator Management Program: Pressurized Water Reactor Steam Generator Examination Guidelines," most recent revision

EPRI "Steam Generator Integrity Assessment Guidelines," most recent revision

## ISI Requirements

10 CFR 50.55a

10 CFR 50.69

ASME Code (Section II, III, V, and XI)

Standard Technical Specifications 3.0 incorporated with TSTF-449 Vol 1, B 3.4.20, and Section 5.5.9 (Steam Generator Program)

Standard Technical Specifications 3.0 incorporated with TSTP-449 Vol 2, B 3.4.20

10 CFR 50 Appendix A (GDC: 14, 30, 32) and B

## Regulatory Guides

1.14 Reactor Coolant Pump Flywheel Integrity

1.26 Quality Group Classifications and Standards for Water-, Steam-, and Radioactive-Waste-Containing Components of Nuclear Power Plants

1.31 Control of Ferrite Content in Stainless Steel Weld Metal

1.34 Control of Electroslag Weld Properties

1.35 Inservice Inspection of UngROUTED Tendons in Prestressed Concrete Containments

1.35.1 Determining Prestressing Forces for Inspection of Prestressed Concrete Containments

1.43 Control of Stainless Steel Weld Cladding of Low-Alloy Steel Components

1.44 Control of the Use of Sensitized Stainless Steel

1.45 Reactor Coolant Pressure Boundary Leakage Detection Systems

1.50 Control of Preheat Temperature for Welding of Low-Alloy Steel

1.65 Materials and Inspections for Reactor Vessel Closure Studs

1.71 Welder Qualification for Areas of Limited Accessibility

1.83 Inservice Inspection of Pressurized Water Reactor Steam Generator Tubes

1.84 Design, Fabrication, and Materials Code Case Acceptability, ASME Section III

1.85 Materials Code Case Acceptability

1.90 Inservice Inspection of Prestressed Concrete Containment Structures with Grouted Tendons

1.94 Quality Assurance Requirements for Installation, Inspection, and Testing of Structural Concrete and Structural Steel During the Construction Phase of Nuclear Power Plants

1.116 Quality Assurance Requirements for Installation, Inspection, and Testing of Mechanical Equipment and Systems

1.121 Bases for Plugging Degraded PWR Steam Generator Tubes

1.147 Inservice Inspection Code Case Acceptability □ ASME Section XI, Division 1

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

1.163 Performance-Based Containment Leak-Test Program

- 1.178 An Approach for Plant-Specific Risk-Informed Decisionmaking: Inservice Inspection of Piping
- 1.193 ASME Code Cases Not Approved for Use

Staff positions/observations – Refer to the References Section of Inspection Procedure 71111.08, “Inservice Inspection Activities”

ISI Inspector Individual Study Activities  
Advanced ISI Training



## (ISA-ISI-1) ASME Code Sections and Code Cases

### PURPOSE:

The purpose of this ISA is to acquaint you with the organization and requirements pertaining to the ISI program contained in the ASME Code, applicable code cases, and 10 CFR 50.55a.

COMPETENCY AREA: INSPECTION AREA TECHNICAL EXPERTISE  
REGULATORY FRAMEWORK

LEVEL OF EFFORT: 50 Hours

### REFERENCES:

1. ASME Section II, III, V, IX, XI
2. Regulatory Guide 1.147
3. Regulatory Guide 1.84
4. Regulatory Guide 1.193
5. Regulatory Guide 1.26
6. 10 CFR 50.55a
7. 10 CFR 50.69
8. Section XI Code Case N-513-x
9. Generic Letter 90-05
10. Inspection Manual Chapter 0326, "Operability Determinations"

### EVALUATION CRITERIA

Upon completion of the tasks in this activity, you will be asked to demonstrate your understanding of Section XI of the ASME Code, 10 CFR 50.55a, 10 CFR 50.69 and other pertinent references as they pertain to the following:

1. The scope of 10 CFR 50.55a and 10 CFR 50.69.
2. The process for licensees to obtain approval for relief from ISI requirements and the use of code cases.
3. Submission of a licensee's ISI program to NRR.
4. The role of the Authorized Nuclear Inspector/Authorized Nuclear Inservice Inspector.
5. The four types of non-destructive examinations used during ISI and the specific techniques that fall under each of these categories.
6. The differences between a Level I, Level II, and Level III examiner.
7. The repair and replacement requirements contained in ASME Section XI article IWA-4000 (or IWA-7000 as applicable).

8. The various types of system pressure tests and the general requirements associated with them including the examinations performed during these tests and their limitations.
9. The records and reports that must be submitted in accordance with ASME Section XI article IWA-6000 and 10 CFR 50.55a.
10. The Quality Group Classifications identified in Regulatory Guide 1.26 and the nuclear class 1, 2, and 3 classifications identified in ASME Section XI.
11. Describe the general organization of ASME Section XI Subsection IWB, IWC, IWD, IWE, IWF, and IWL and the materials/components to which these requirements apply.
12. The use of Section XI Appendix VIII qualified UT techniques, the relationship between Appendix VIII and the Performance Demonstration Initiative (PDI), and how to determine when Appendix VIII requirements are applicable.
13. Temporary non-Code repairs.
14. The difference between a code of record and a code of construction.
15. Inspection Manual Chapter 0326, "Operability Determinations"

#### TASKS:

1. Review the Table of Contents and Introduction for each ASME section II, III, V, IX, and XI.
2. Review ASME Section XI Glossary (Article IW-9000), particularly definitions of indication, imperfection, flaw, discontinuity, defect, relevant condition, Authorized Nuclear Inservice Inspector.
3. Review Regulatory Guides 1.147, 1.84, 1.193, and 1.26 (quality group classifications).
4. Review Section XI Appendix VIII and 10 CFR 50.55a requirements pertaining to the use of Appendix VIII.
5. Review the 10 CFR 50.69 ISI and IST requirements for systems that have been classified as Risk Informed Safety Classification one through four.
6. After reviewing the references in sufficient detail to perform adequately in accordance with the requirements of the Evaluation Criteria, meet with your supervisor, or the person designated to be your resource for this activity to discuss the material/subjects listed in the Evaluation Criteria.

DOCUMENTATION: ISI Inspector Advanced-Level Signature Card Item ISA-ISI-1

## (ISA-ISI-2) Industry Initiatives for Material Degradation

### PURPOSE:

The purpose of this ISA is to acquaint you with various industry initiatives that address material degradation mechanisms, inspection programs and techniques that evaluate degradation and techniques for mitigating the effects of material degradation.

COMPETENCY AREA: INSPECTION AREA TECHNICAL EXPERTISE

LEVEL OF EFFORT: 50 Hours

### REFERENCES:

1. Code Cases N-770-x, N-729-x and N-722-x
2. BWR Vessel and Internal Program (BWR VIP) listed in the ISI Guidance Documents Section
3. NEI 03-08 "The Material Initiative"
4. MRP 146 "Management of Thermal Fatigue in Normal Stagnant Non-Isolable Reactor Coolant Lines"
5. MRP 192 "Assessment of Residual Heat Removal Mixing Tee Thermal Fatigue in PWR Plants"
6. MRP 227 "PWR Internals and Evaluation Guidelines"
7. MRP 228 "Inspection Standard for PWR Internals"

### EVALUATION CRITERIA:

Review the references in sufficient detail to demonstrate:

1. Understanding of industry initiatives regarding the study and mitigation of material degradation mechanisms.
2. Understanding of examination guidelines for reactor pressure vessels and internals.
3. Describe industry operating experience with PWSCC, IGSCC and erosion/corrosion and flow accelerated corrosion.

### TASKS:

1. Review Code Cases N-770-x, N-729-x and N-722-x
2. Review BWR VIPs listed in the reference listing.

3. Review NEI 03-08.
4. Review MRP 146, MRP 192, MRP 227 and MRP 228.
5. Meet with your supervisor, or the person designated to be your resource for this activity to discuss any questions you may have as a result of this activity and to demonstrate that you can meet the evaluation criteria for this activity.

DOCUMENTATION:      ISI Inspector Advanced-Level Signature Card Item ISA-ISI-2

(ISA-ISI-3) Reactor Pressure Vessel Head Penetrations (RPVH)

PURPOSE:

The purpose of this ISA is to acquaint you with the history of reactor pressure vessel head penetration degradation, regulatory requirements for inspection, and inspection techniques employed during reactor pressure vessel head inspections.

COMPETENCY AREA: INSPECTION AREA TECHNICAL EXPERTISE  
ASSESSMENT AND ENFORCEMENT

LEVEL OF EFFORT: 50 Hours

REFERENCES:

All the documents listed in the ISI Guidance Documents Section are appropriate for this activity as well as those specifically listed below in the "Tasks" Section.

EVALUATION CRITERIA:

Review the references in sufficient detail to demonstrate:

1. Knowledge of the requirements for inspection of Reactor Pressure Vessel Heads for PWRs.
2. Capabilities and limitations of ultrasonic inspections systems.
3. Basic understanding of various inspection techniques used by licensee's in inspection of Reactor Pressure Vessel Heads for PWRs.

TASKS:

1. Review NRC Order EA-03-009 Revision 1.
2. Review Section XI code case N-729-x and 10 CFR 50.55a(g)(6)(ii)(d).
3. Obtain and review RPVH Penetration information from the ISI Best Practices website <https://usnrc.sharepoint.com/teams/ISlandMaterialsEngineeringResource>
4. Review and discuss with an ISI inspector NUREG/CR-5985/PNL-8919, "Evaluation of Computer-Based Ultrasonic Inservice Inspection Systems."
5. Review MRP-117: "Materials Reliability Program Inspection Plan for Reactor Vessel Closure Head Penetrations in U.S. PWR Plants."
6. Meet with your supervisor, or the person designated to be your resource for this activity to discuss any questions you may have as a result of this activity and to demonstrate that you can meet the evaluation criteria for this activity.

DOCUMENTATION: ISI Inspector Advanced-Level Signature Card Item ISA-ISI-3

## (ISA-ISI-4) Boric Acid Corrosion Control

### PURPOSE:

The purpose of this ISA is to acquaint you with the inspection activities contained in Inspection Procedure 57050, "Visual Testing Examination," and with the NRC staff and industry positions related to the boric acid corrosion control program.

COMPETENCY AREA: INSPECTION AREA TECHNICAL EXPERTISE  
ASSESSMENT AND ENFORCEMENT

LEVEL OF EFFORT: 50 Hours

### REFERENCES:

1. Inspection Procedure 57050, "Visual Testing Examination"
2. EPRI Boric Acid Corrosion Guideline
3. As listed in the Tasks Section below.

### EVALUATION CRITERIA:

Review the references in sufficient detail to demonstrate:

1. Knowledge of inspection procedures and industry guidance concerning boric acid inspection programs.
2. Knowledge of effects of boric acid corrosion and susceptible penetrations on the reactor vessel head.
3. Describe industry operating experience with boric acid corrosion (including the Davis-Besse event).

### TASKS:

1. Review and discuss with an experienced ISI inspector, WCAP 15988-NP, "Generic Guidance for an Effective Boric Acid Inspection Program for Pressurized Water Reactors."
2. Review and discuss with an experienced ISI inspector, GL-88-05, "Boric Acid Corrosion of Carbon Steel Reactor Pressure Boundary Components in PWR Plants."
3. Meet with your supervisor, or the person designated to be your resource for this activity to discuss any questions you may have as a result of this activity and to demonstrate that you can meet the evaluation criteria for this activity.

DOCUMENTATION: ISI Inspector Advanced-Level Signature Card Item ISA-ISI-4

## (ISA-ISI-5) Steam Generator Examinations

### PURPOSE:

The purpose of this ISA is (1) to familiarize you with inspection activities in Inspection Procedure 71111.08, "Inservice Inspection Activities," and (2) to familiarize you with NRC staff and industry positions related to the inspection of steam generator tubes.

COMPETENCY AREA: INSPECTION AREA TECHNICAL EXPERTISE  
ASSESSMENT AND ENFORCEMENT

LEVEL OF EFFORT: 50 Hours

### REFERENCES:

As listed in the Tasks Section below.

### EVALUATION CRITERIA:

Review the references in sufficient detail to demonstrate:

1. Knowledge of inspection procedures and industry guidance concerning steam generator inspection programs.
2. Knowledge of the factors and conditions that cause degradation of steam generator tubes.
3. Guidelines and standards used to evaluate degraded steam generator tubes.
4. Acceptable repair techniques for steam generator tubes.

### TASKS:

1. Review and discuss with an experienced ISI inspector, EPRI "Pressurized Water Reactor Steam Generator Examination Guidelines."
2. Review and discuss with an experienced ISI Inspector, EPRI "Steam Generator Integrity Assessment Guidelines."
3. Review and discuss with an experienced ISI Inspector the Standard Technical Specifications applicable to steam generator tube inspections.
4. Review and discuss with an experienced ISI Inspector, IP 71111.08 sections associated with steam generator inspections.
5. Review and discuss Inspection Manual Chapter 0609, Appendix J, with an experienced inspector.

6. Meet with your supervisor, or the person designated to be your resource for this activity to discuss any questions you may have as a result of this activity and to demonstrate that you can meet the evaluation criteria for this activity.

DOCUMENTATION: ISI Inspector Advanced-Level Signature Card Item ISA-ISI-5



ISI Inspector On-the-Job Activities  
Advanced ISI Training

## (OJT-ISI-1) NDE and Welding Inspection

### PURPOSE:

The purpose of this OJT is to acquaint you with the organization and requirements pertaining to the ISI program contained in the ASME Code and applicable code cases.

COMPETENCY AREA:   INSPECTION AREA TECHNICAL EXPERTISE  
                                  PROBLEM ANALYSIS  
                                  ASSESSMENT AND ENFORCEMENT  
                                  COMMUNICATION  
                                  INSPECTION

LEVEL OF EFFORT:     50 hours

### REFERENCES:

All the references used in the ISAs and those listed in the ISI Guidance Documents Section are appropriate for this activity. Most of the efforts in this OJT will rely on licensee procedures and related regulatory documents (Technical Specifications, Orders, FSAR, etc.). Any references used other than licensee procedures will be used to determine the regulatory stance that has been historically applied by the NRC for a given situation. References selected should support the actual inspection efforts.

### EVALUATION CRITERIA:

1. Describe required elements of an ISI program and be able to identify what interval and period the licensee is in at the time of the OJT.
2. Identify the NDE samples required by IP 71111.08, and describe key elements of each type of NDE inspection identified in ASME Section XI.
3. Describe the capabilities and limitations of the NDE inspections you observed (specific technique limitations and/or limitations due to component design or location) and identify the advantages and disadvantages of each.
4. Describe the licensee's indication evaluation process and whether the indications were evaluated in accordance with the procedure requirements and industry and NRC guidance.
5. Describe the licensee's flaw acceptance criteria.
6. Describe the ASME Code requirements utilized by the licensee in its welding process:
  - a. The interaction between Sections II, III, IX, and XI where welding is concerned.
  - b. The difference between Essential, Supplementary Essential, and Non-Essential variables, and how to identify what each is for a welding process.

- c. Similarities and differences between qualification of a welder/weld operator and qualification of a weld procedure.
- 7. Discuss the use of ASME Section II and the licensee's quality assurance program as it pertains to control of material in the welding process.
- 8. Choose a relief request submitted by the licensee within the last year pertaining to welding activities and discuss the following:
  - a. Exceptions requested by the licensee
  - b. Use of code cases within the relief request
  - c. The NRC's Safety Evaluation Report

#### TASKS:

- 1. Review the licensee's ISI program (ASME Section XI program).
- 2. Review a sample of the licensee's NDE procedures for commonly used NDE techniques:
  - a. UT – PDI qualified
  - b. UT – other than PDI qualified
  - c. PT
  - d. MT
  - e. RT
  - f. VT-1
  - g. VT-2
  - h. VT-3
- 3. Observe the calibration of an UT system.
- 4. Review a copy of the licensee's Written Practice, and verify that qualifications for a sample of NDE Technicians are adequate for the following forms of NDE:
  - a. UT – PDI qualified
  - b. UT – non-PDI qualified
  - c. PT
  - d. MT
  - e. RT
  - f. VT-1
  - g. VT-2
  - h. VT-3
- 5. Observe the licensee's performance of several different NDE activities and compare the activities against licensee procedures.
- 6. Compare recordable indications to IWX-3000 or applicable acceptance criteria and verify if the licensee dispositioned the indications appropriately in accordance with ASME Code requirements.
- 7. Review welding packages for completeness. Verify the Welding Procedure Specifications (WPS) /Procedure Specification Record (PQR) against the ASME Code.

8. Review recent corrective action documents related to welding and NDE.
9. Meet with your supervisor, or the person designated to be your resource for this activity to discuss any questions you may have as a result of this activity and to demonstrate that you can meet the evaluation criteria for this activity.

DOCUMENTATION:      ISI Inspector Advanced-Level Signature Card OJT-ISI-1

(OJT-ISI-2) Reactor Pressure Vessel Head (RPVH) Penetration Inspection and  
Boric Acid Corrosion Control Program

PURPOSE:

The objective of this OJT is to prepare the inspector to review and evaluate a licensee's performance in assessing the condition of the vessel head penetrations. This OJT will familiarize the inspector with (1) inspection activities in Inspection Procedure 71111.08, "Inservice Inspection Activities," and (2) NRC staff and industry positions related to the inspection of vessel head penetrations.

COMPETENCY AREA:   INSPECTION AREA TECHNICAL EXPERTISE  
                              PROBLEM ANALYSIS  
                              ASSESSMENT AND ENFORCEMENT  
                              COMMUNICATION  
                              INSPECTION

LEVEL OF EFFORT:     50 hours

REFERENCES:

All the references used in the ISAs and those listed in the ISI Guidance Documents Section are appropriate for this activity. Most of the efforts in this OJT will rely on licensee procedures and related regulatory documents (Technical Specifications, Orders, FSAR, etc.). Any references used other than licensee procedures will be used to determine the regulatory stance that has been historically applied by the NRC for a given situation. References selected should support the actual inspection efforts.

EVALUATION CRITERIA:

Upon completion of this OJT, you should be able to:

1. Describe industry experience with reactor vessel head degradation.
2. Describe the scope and extent of the inspections including the inspections of the weld and nozzle base material.
3. Describe the requirements for performing examinations of the reactor vessel head penetrations including personnel and technique qualification.
4. Describe the capabilities and limitations of the inspections performed.
5. Describe the licensee's indication evaluation process and whether the indications were evaluated in accordance with the procedure requirements and industry and NRC guidance.
6. Describe the licensee's flaw acceptance criteria and repair process.

## TASKS

1. Read the references in sufficient detail to perform adequately in accordance with the requirements of the Evaluation Criteria.
2. Perform the tasks outlined in the RPVH section of IP 71111.08.
3. Observe an NDE technician perform data acquisition.
4. Review electronic data results with an NDE analyst.
5. Review the licensee's head susceptibility calculations (both effective degradation years and reinspection years).
6. Review at least two licensee boric acid evaluations.
7. Conduct a boric acid walk-down.
8. Review a licensee's boric acid program.
9. Review corrective action documents related to boric acid.
10. Meet with your supervisor, or the person designated to be your resource for this activity to discuss any questions you may have as a result of this activity and to demonstrate that you can meet the evaluation criteria for this activity.

DOCUMENTATION:      ISI Inspector Advanced-Level Signature Card Item OJT-ISI-2

## (OJT-ISI-3) Steam Generator Tube Inspection

### PURPOSE:

The objective of this OJT is to prepare the inspector to review and evaluate licensee's performance in assessing the condition of the steam generator tubes. This OJT will familiarize the inspector with (1) inspection activities in Inspection Procedure 71111.08, "Inservice Inspection Activities," and (2) NRC staff and industry positions related to the inspection of steam generator tubes.

COMPETENCY AREA:   INSPECTION AREA TECHNICAL EXPERTISE  
                              PROBLEM ANALYSIS  
                              ASSESSMENT AND ENFORCEMENT  
                              COMMUNICATION  
                              INSPECTION

LEVEL OF EFFORT:     50 hours

### REFERENCES:

All the references used in the ISAs and those listed in the ISI Guidance Documents Section are appropriate for this activity. Most of the efforts in this OJT will rely on licensee procedures and related regulatory documents (Technical Specifications, Orders, FSAR, etc.). Any references used other than licensee procedures will be used to determine the regulatory stance that has been historically applied by the NRC for a given situation. References selected should support the actual inspection efforts.

### EVALUATION CRITERIA:

Upon completion of this OJT, you should be able to:

1. Describe industry experience with steam generator tube degradation.
2. Describe the requirements for performing examinations of the steam generator tubes including personnel and technique qualification.
3. Describe the capabilities and limitations of the inspections performed.
4. Describe the licensee's indication evaluation process and whether the indications were evaluated in accordance with the procedure requirements and industry and NRC guidance.
5. Describe the licensee's flaw acceptance criteria and repair process.
6. Describe the licensee's last operational assessment and identify how it influenced the length of operation in between steam generator inspections as well as the type and extent of inspections planned for the current outage.

7. Review corrective action documents related to SG tube examinations.
8. Describe the licensee's condition monitoring assessment. If it was not complete at the time of the inspection, discuss the licensee's plans/expectations for the condition monitoring assessment based on inspection results to date.

**TASKS:**

1. Monitor an NDE Technician during data acquisition.
2. Review electronic data results with an NDE analyst.
3. Review the licensee's steam generator degradation assessment.
4. Review the last steam generator operational assessment conducted by the licensee.
5. Review the licensee's condition monitoring assessment.
6. Review the licensee's repair criteria for degraded tubes.
7. Meet with your supervisor, or the person designated to be your resource for this activity to discuss any questions you may have as a result of this activity and to demonstrate that you can meet the evaluation criteria for this activity.

**DOCUMENTATION:**      ISI Inspector Advanced-Level Signature Card Item OJT-ISI-3



### ISI Inspector Advanced-Level Signature Card

Inspector Name: _____	<u>Employee Initials/Date</u>	<u>Supervisor's Signature/Date</u>
<b><u>A. Training Courses</u></b>		
E-306, Nondestructive Examination (NDE) Technology and Codes		
ASME Code Section XI - Inservice Inspection (PD-192)		
E-901, Welding and NDE Overview		
or		
ASME Code Section IX – Welding, Brazing and Fusing Qualifications and ASME Practical Welding Technology Courses		
<b><u>B. Individual Study Activities</u></b>		
(ISA-ISI-1) ASME Code Sections and Code Cases		
(ISA-ISI-2) Industry Initiatives for Material Degradation		
(ISA-ISI-3) Reactor Pressure Vessel Head Penetrations		
(ISA-ISI-4) Boric Acid Corrosion Control		
(ISA-ISI-5) Steam Generator Examinations		
<b><u>C. On-the-Job Training Activities</u></b>		
(OJT-ISI-1) NDE and Welding Inspection	1)	
	2)	
	3)	
(OJT-ISI-2) Reactor Pressure Vessel Head (RPVH) Penetration Inspection and Boric Acid Corrosion Control Program		
(OJT-ISI-3) Steam Generator Tube Inspection	1)	
	2)	

Note that for OJT's 1 and 3 there are multiple initials/signature lines. The intent is for the inspector to accompany a minimum of three inservice inspections for NDE and Welding activities, and a minimum of two steam generator inspections. At least one inspection accompaniment for volumetric examination of RPVH penetrations should be completed.

Note that all training courses are one week, except for E-306, which is two weeks.

Supervisor's signature indicates successful completion of all required courses and activities listed in this training standard.

Supervisor's Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Form 1: ISI Inspector Advanced-Level Equivalency Justification

Inspector Name: _____		Identify equivalent training and experience for which the inspector is to be given credit
<b>A. Training Courses</b>		
E-306, Nondestructive Examination (NDE) Technology and Codes		
ASME Code Section XI - Inservice Inspection (PD-192)		
E-901, Welding and NDE Overview		
or		
ASME Code Section IX – Welding, Brazing and Fusing Qualifications and ASME Practical Welding Technology Courses		
<b>B. Individual Study Activities</b>		
(ISA-ISI-1) ASME Code Sections and Code Cases		
(ISA-ISI-2) Industry Initiatives for Material Degradation		
(ISA-ISI-3) Reactor Pressure Vessel Head Penetrations		
(ISA-ISI-4) Boric Acid Corrosion Control		
(ISA-ISI-5) Steam Generator Examinations		
<b>C. On-the-Job Training Activities</b>		
(OJT-ISI-1) NDE and Welding Inspection	1)	
	2)	
	3)	
(OJT-ISI-2) Reactor Pressure Vessel Head (RPVH) Penetration Inspection and Boric Acid Corrosion Control Program		
(OJT-ISI-3) Steam Generator Tube Inspection	1)	
	2)	

Note that for OJT's 1 and 3 there are multiple initials/signature lines. The intent is for the inspector to accompany a minimum of three **Inservice** inspections for NDE and Welding activities, and a minimum of two steam generator inspections. At least one inspection accompaniment for volumetric examination of RPVH penetrations should be completed.

Supervisor's signature indicates successful completion of all required courses and activities listed in this training standard.

Supervisor's Signature \_\_\_\_\_ Date: \_\_\_\_\_

Attachment 1: Revision History for IMC 1245 Appendix D2

Commitment Tracking Number	Accession Number Issue Date Change Notice	Description of Change	Description of Training Required and Completion Date	Comment Resolution and Closed Resolution Feedback Form Accession Number (Pre-Decisional, Non-Public Information)
N/A	ML090360523 07/08/09 CN-09-017	Initial issuance	None	ML091590710
N/A	ML15177A330 10/21/15 CN 15-020	This revision updates format and adds training, as “recommended,” on ultrasonic examination, eddy current testing, and radiographic examination to more completely define an expert level of knowledge.	None	ML15195A203 Closed FF: 1245D2-1940 ML15078A281
N/A	ML18047A475 08/23/18 CN 18-029	This revision update references, as well as offers flexibility in completing some of the training requirements, by offering the option to take E-118 in lieu of PD-190 and PD-359.	None	ML18065A660 Closed FF: 1245D2-2257 ML18134A060 1245D2-2302 ML18226A257
N/A	ML20077L277 06/26/20 CN 20-026	This revision updated references and removed course E-118 as a training option. In place of the E-118 course, E-901 was offered as an option. This revision also recognized how the adoption of 10 CFR 50.69 may impact licensee ISI and IST programs. This revision also removed references to out of date websites and procedures. Feedback form 1245D2-2393, which recommended addition of an AMSE stress analysis course to the training program was included in this update as a suggested training course.	None	ML20079E419 Feedback form 1245D2-2393

Commitment Tracking Number	Accession Number Issue Date Change Notice	Description of Change	Description of Training Required and Completion Date	Comment Resolution and Closed Resolution Feedback Form Accession Number (Pre-Decisional, Non-Public Information)
N/A	ML23094A289 04/11/23 CN 23-011	This revision updated the names of courses and inspection procedures that had changed since the previous issuance of this document. The list of required courses was adjusted to reflect feedback from course attendees.	None	