

Part 52 - PRESERVICE INSPECTION - NON-DESTRUCTIVE EXAMINATION

PROGRAM APPLICABILITY: 2504

73754-01 INSPECTION OBJECTIVE

To determine whether the Preservice Inspection (PSI) of ASME Code Class 1, Class 2, Class 3, Class MC, and Class CC components is performed in accordance with 10 CFR 52, 10 CFR 50.55a, the ASME Code, Section III and Section XI, Technical Requirements Manual (TRM)/Site Director Procedures Manual (SDPM), and any documented licensing agreements between the NRC and the licensee. Specifically, the objective of this inspection activity is to verify that:

- a. The plant is designed and provided with access to enable the performance of preservice examination (PSI) and inservice examination.
- b. The Non-Destructive Examination (NDE) procedures that will be/are being used are adequate to satisfy PSI requirements.
- c. Personnel qualification is adequate to conduct NDE.
- d. NDE procedures are being properly implemented for PSI examinations.
- e. Preservice examinations are completed, or are on schedule to be completed, prior to plant operation.
- f. Conditions that do not meet acceptance criteria are being adequately addressed; that the results are being recorded, the conditions corrected, and the examinations rescheduled.

73754-02 INSPECTION REQUIREMENTS AND GUIDANCE

The inspections are to be performed and completed prior to plant operation.

02.01 General Guidance. The PSIs of interest in this procedure are the nondestructive examinations of Class 1, Class 2, Class 3, Class CC, and Class MC Components necessary to meet the following requirements:

- a. The TRM/SDPM;
- b. The PSI program as developed and implemented by the COL holder during plant construction;

- c. Any additional commitments made by the COL holder filed with the NRC during the review of the combined license application; and
- d. Any additional requirements imposed by the NRC through Bulletins, Generic Letters, or Orders.

Inservice testing of pumps and valves as described the ASME Code for Operation and Maintenance of Nuclear Power Plants (OM Code) is not included within the scope of this procedure. Refer to Inspection Procedure (IP) 73756, for inservice testing of pumps and valves.

This inspection may be performed in increments. The section for observing the NDE methods should be done during peak periods of PSI activity. Personnel performing this inspection must be familiar with NDE methods and techniques, their applications, limitations, and the recording and analysis of examination results. Inspectors should also be familiar with the process of evaluating findings or indications and determining if they are acceptable within code limits. Should the inspector find that either the use of NDE to perform an examination, an exception from procedures, a request for relief from ASME Code requirements, or an issued exemption is not adequately justified or valid, discuss the issue with regional management and process the issue in accordance with IMC 0613, Documenting 10 CFR Part 52 Construction and Test Inspections.

Pursuant to 10 CFR 50.55a, each construction permit, issued under 10 CFR Part 50, is subject to all the conditions in §50.55a in addition to those specified in §50.55. All the provisions of §50.55a that are applicable to holders of construction permits for nuclear power reactors also apply to holders of combined licenses issued under 10 CFR Part 52, except that combined license holders are not subject to the conditions of paragraphs (f) and (g) of §50.55a until after the Commission makes the finding under §52.103(g).

10 CFR 50.55a(g)(3)(i) and 10 CFR 50.55a(g)(3)(ii) both require that components are designed to provide access for inservice examination and that components meet the preservice inspection requirements set forth in the Code editions and addenda applied to the their construction. 10 CFR 50.55a(g)(3)(i) applies to ASME Code Class 1 components (including supports), and 10 CFR 50.55a(g)(3)(ii) applies to ASME Code Class 2 and 3 components (including supports for components that are classified as ASME Code Class 1, 2 and 3).

10 CFR 50.55a(g)(3)(v), states, "All components (including supports) may meet the requirements set forth in subsequent editions of codes and addenda or portions thereof which are incorporated by reference in paragraph (b) of this section {10 CFR 50.55a}, subject to the conditions therein. This provision allows the holder of a construction permit or combined license to use later editions and addenda of the code that are incorporated by reference in paragraph (b) of § 50.55a, for preservice inspection only, without the need for NRC approval or authorization.

Metal containment pressure retaining components, metallic shell and penetration liners which are pressure retaining, and their integral attachments must meet the inservice inspection requirements applicable to components which are classified as ASME Code Class MC [10 CFR 50.55a(g)(4)(v)(A) & 10 CFR 50.55a(g)(4)(v)(B)].

Concrete containment pressure retaining components and their integral attachments, and the post-tensioning systems of concrete containments must meet the inservice inspection requirements applicable to components which are classified as ASME Code Class CC [10 CFR 50.55a(g)(4)(v)(C)].

Guidance: A COL holder is granted a license based on a description in its Updated Final Safety Analysis Report (UFSAR) of a PSI program that meets the ASME Code and the regulations. The designers and the COL holders are expected to design and construct plants to ensure that preservice and inservice examinations can be performed as required under Part 50. When reviewing PSI results, the inspector should investigate instances where the ASME Code coverage could not be obtained because of interferences due to design, geometry and materials of construction that could have been eliminated at the design stage. The ability to perform ISI without interferences provides assurance that unforeseen failure modes (if any should develop) are detected early in plant life, and provides a more robust plant design.

While the inspection areas covered in this procedure form a base for inspection, it is recognized that emergent issues, may demand the attention of the inspector. In this instance, the requirements of the core procedure would be satisfied by management directed inspection of the emergent, safety-significant NDE issues.

02.02 Personnel Qualification & Certification. Verify that personnel involved in the performance, evaluation, or supervision of nondestructive examination of safety-related items meet the qualification and certification requirements of ASME Code, Section III or Section XI, as applicable.

- a. Verify that qualification certificates, the last annual visual acuity examination, and color vision test results are a part of the NDE records.
- b. Review the qualifications and certifications of a sample of the inspection personnel (Levels I and II). If there are less than 20 total Level I and II personnel, then review the qualifications and certifications for all Level I and Level II personnel.
- c. Review the qualifications and certifications of a sample of licensee and contractor Level III examiners who approve final NDE reports. If there are less than five Level III personnel, then review the qualifications and certifications for all Level III personnel.

Guidance: NDE personnel qualification and certification records should include a training record, certification record, an experience record, a record of previous experience (if applicable), and a current visual examination record. From these records, the inspector should be able to determine the NDE method for which the person is qualified and certified, the level of certification, the effective period of certification, the basis used for certification, and that all applicable ASME Code requirements have been met.

No one shall perform NDE activities at a level higher than that for which they are qualified and certified. The three levels of examiners are:

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| Level I | - | Authorized to perform specific set-ups, calibrations, and examinations under the guidance of a Level II or III individual. |
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- Level II - Authorized to perform set-ups, calibrations, examinations, and record data, evaluate, and report examination results, as well as Level I activities.
- Level III - Authorized to develop and approve inspection and examination procedures, as well as administer training, examinations, and certifications, if specified, as well as Level I and II activities

02.03 Non-destructive Examination (NDE) Review

Because the specific NDE technical requirements vary among ASME Code editions and addenda, the inspector must ensure, that the requirements reflect those specified in the ASME Code of record committed to by the licensee being inspected. The inspector should also be aware of NRC initiatives in the areas of procedure and personnel certification such as the ASME Section XI, Appendix VIII and the Performance Demonstration Initiative (PDI) procedure and personnel certification requirements for UT inspections.

- a. Review a sample of NDE procedures used by the licensee or contractor and verify conformance with the ASME Code and regulatory requirements. At a minimum, the inspector is to review at least one procedure for each of the NDE methods (i.e., RT, UT, PT, MT, ECT, etc.) performed as part of the licensee's PSI/ISI program.
 - 1. For Ultrasonic Examination;
 - (a) Ensure that there are no interferences to essentially 100 percent of the examination volume due to design, materials of construction, or geometry;
 - (b) Ensure that austenitic and dissimilar metal welds are examined by equipment, personnel, and procedures as required under 10 CFR 50.55a(b)(2)(xv)(A).;
 - (c) Where interferences prevent obtaining essentially 100 percent of the volume, RT may be used to supplement the ultrasonic examination to obtain the necessary coverage. However, the RT must be performed throughout the operation of the plant under the ISI program.
 - 2. For Eddy Current Examination. Ensure the licensee's procedure;
 - (a) Specifies the multi-channel examination unit;
 - (b) Describes the method of examination;
 - (c) Describes the method of calibration and sequence of calibration;
 - (d) Addresses the requirements of TRM/SDPM or ASME Code Section III or Section XI (whichever is applicable);
 - (e) References steam generator tube examinations consistent with the plant licensing basis as discussed in SRP 5.4.2.2, "Steam Generator Program"; and

(f) References written approval for use of Code cases

Guidance: The inspector must be knowledgeable of the Code requirements associated with the various NDE procedures. If needed, the procedure review section of the applicable 570X0 series IPs (see references) may be used to aid the inspector this portion of the procedure. In some instances, an in-depth review of one NDE procedure may provide more insight into licensee activity than reviewing three examinations in less detail in the same amount of time. In this case, the review sample may be modified as appropriate to make the best use of inspection resources.

b. For each procedure selected in 02.03.a, Verify the following

1. Requirements are specified and agree with licensee's commitments, including specified or referenced acceptance levels.
2. Qualifications of NDE personnel are specified and in accordance with the licensee's PSI program.
3. Methods of recording, evaluating, and disposition of findings are established and reporting requirements are in compliance with applicable Code requirements.

Guidance: For additional coverage, the inspector may expand the sample to ensure that an appropriate number of procedures are reviewed. A minimum of 10 NDE procedures should be reviewed under 02.03.b.

c. Observe a sample of NDE activities and verify acceptable performance of each method of examination in accordance with the ASME Code and regulatory requirements. At a minimum, the inspector is to observe and verify the acceptable performance of the following exams:

1. Volumetric examination of welds using manual (A-scan) ultrasonic technique.
2. Volumetric examination of welds using automatic or programmable ultrasonic technique.
3. Volumetric examination of nozzle-to-vessel inner radius section.
4. Volumetric examination of welds using radiographic technique.
5. Volumetric examination of steam generator tubes.

6. Volumetric examination of components.
7. Surface examination of welds, bolts, nuts, or studs using liquid penetrant (PT) or magnetic particle (MT) technique.
8. Containment visual examinations (as required by IWE/IWL).
9. Visual examinations (VT-1 and/or VT-3 on risk significant components).
10. Visual examination of core support structures (Examination Category B-N-1, B-N-2, B-N-3).
11. Visual examination of support components (mechanical or hydraulic), or other components listed in ASME Code Section XI.

Guidance: The inspector is provided sufficient flexibility to ascertain whether the examinations are being conducted properly. It is expected that when different methods of examinations are in progress simultaneously, the inspector will select methods of examination of higher risk significance (e.g., volumetric examination of reactor pressure vessel pressure retaining welds or nozzle radius sections, volumetric examination of Class 1 component pressure retaining welds inside containment, volumetric examination of steam generator tubes). Additionally, a history of problems with a particular technique also should form a basis for the selection of a given technique to inspect. The work observation section of the 570X0 series IPs may be used to aid the inspector in performing this portion of the procedure.

- d. For each preservice examination observed, verify that accessibility to perform the NDE method is provided as follows;
 1. When observing preservice examination of Class 1, 2, and 3 components (and their supports) in their final installed position, verify that the installed component is provided with the access necessary to perform the NDE exam and obtain the required ASME Code coverage.
 2. When observing preservice examinations of Class 1, 2, and 3 components (and their supports) that are not in their final installed position, confirm that access for subsequent inservice examination of the installed component is provided.
 3. When observing preservice examinations of Class MC and CC components, verify that accessibility is in accordance with the Section IWE/IWL of the Code.

Guidance: Any case in which the accessibility requirements are not met should be documented and dispositioned as appropriate to ensure the resolution of the issue. Follow-up inspections may be necessary.

- e. For each preservice examination observed, verify that the following requirements are met:
 - 1. Approved procedures are available, are being followed, and specified NDE equipment is being used.
 - 2. Examination personnel with proper level of qualification and certification are performing the various examination activities, including designation of examination method/technique to be used, equipment calibration, examination, and interpretation/evaluation/acceptance of test results.
 - 3. Examination results, evaluation of results, and any corrective actions/repairs/replacements are being recorded as specified in the PSI program and NDE procedures.

02.04 PSI Plans and Schedules. Review the licensee's PSI plans and schedules for the construction period and perform the following.

- a. Select a sample of approximately 25 percent of the ASME Code Class 1 components. By review of the NDE record, verify the PSI examination is complete. If the examination is not complete, verify the schedule of examinations includes this as a future examination.
- b. Select a sample of approximately 10 percent of the ASME Code Class 2 components. By review of the NDE record, verify the PSI examination is complete. If the examination is not complete, verify the schedule of examinations includes this as a future examination.
- c. Select a sample of approximately 5 percent of the ASME Code Class 3 components. By review of the NDE record, verify the PSI examination is complete. If the examination is not complete, verify the schedule of examinations includes this as a future examination.
- d. Select approximately 25 ASME Code Class 1, 2, and 3 supports for review. Utilizing the NDE record, verify the PSI examination is complete. If the examination is not complete, verify that the schedule of examinations includes this as a future examination.
- e. Verify the PSI examinations for the containment are complete.

Guidance: The ASME Code, Section III, NCA-3252 and NB-5280 as well as Section XI, IWB-220, IWC-2200, and IWD-2200, establish the requirements for preservice inspection of Class 1, 2, and 3 components. Requirements for preservice inspection for Class MC and CC components are established in Section XI, Subsection IWE-2200, and Subsection IWL-2200, respectively. For PSI, there should be few, if any deviations from the ASME Code requirements because the design and construction of the plant should enable the performance of preservice and inservice examinations.

02.05 Effectiveness of Licensee Processes for Control of PSI Examinations.

- a. Evaluate the effectiveness of the licensee's process to identify, resolve, and prevent problems by reviewing such areas as corrective action systems, root cause analysis, safety committees, and self-assessment in the area of preservice inspections.

Guidance: When safety issues, events, or problems are reviewed, the adequacy of the results of licensee process may be assessed by determining how effective the licensee was in performing the following quality affecting activities:

1. Initial identification of the problem;
 2. Elevation of problems to the proper level of management for resolution (internal communications and procedures);
 3. Root cause analysis for significant conditions adverse to quality;
 4. Implementation of corrective actions and actions to preclude recurrence; and
 5. Expansion of the scope of corrective actions to include applicable related systems, equipment, procedures, and personnel actions.
- b. Evaluate the effectiveness of the licensee's process used in the oversight of PSI contractors. Determine to what extent licensee personnel are involved in ensuring the quality of the examination and evaluation of work done by contractors.

Guidance: For additional inspection guidance on licensee controls, please refer to Appendix 16 of IP 35007, "Quality Assurance Program Implementation during Construction."

73754-03 INSPECTION RESOURCES

For planning and budget purposes, this IP shall require 400 hours of direct inspection effort. However, modifications to the required time may be warranted. PSI observed at vendor facilities will impact the hours at the reactor site required to complete this procedure. The following breakdown of inspection hours should be used as guidance to direct and adjust inspector efforts:

- 03-01 Review of a minimum of ten NDE procedures and their implementation of various program requirements. Estimate: 32 hours.
- 03-02 Review of personnel qualification information. Estimate: 24 hours.
- 03-03 Observation of various PSI examination types. Estimate: 40 hours. Note, some of these observations may take place at vendor facilities, for such things as reactor vessel PSI or steam generator tube PSI. As such, additional hours will need to be allotted for travel.

03-04 Verification of PSI performance Estimate – 80 hours.

03-05 Assessment of effectiveness of licensee processes should be performed concurrent with other observations in this procedure. Beyond this effort, estimate: 24 hours.

73754-04 REFERENCES

10 CFR 50.55a, "Codes and Standards"

ASME Code Section III, "Rules for Construction of Nuclear Facility Components"

ASME Code Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components"

Generic Letter 88-01, "NRC Position on IGSCC in BWR Austenitic Steel Piping"

NUREG/CR-5985, "Evaluation of Computer-Based Ultrasonic Inservice Inspection Systems"

EPRI Pressurized Water Reactor Steam Generator Examination Guidelines, Revision 7, Report No. 1013706, October 2007, or latest revision

IP 35007, "Quality Assurance Program Implementation during Construction"

IP 50090, "Pipe Support and Restraint Systems"

IP 73756, "Functional Design, Qualification and Inservice Testing Programs for Pumps, Valves, and Dynamic Restraints"

IP 57050, "Nondestructive Examination Procedure Visual Examination Procedure Review/Work Observation/Record Review"

IP 57060, "Nondestructive Examination Procedure Liquid Penetrant Examination Procedure Review/Work Observation/Record Review"

IP 57070, "Nondestructive Examination Procedure Magnetic Particle Examination Procedure Review/Work Observation/Record Review"

IP 57080, "Nondestructive Examination Procedure Ultrasonic Examination Procedure Review/Work Observation/Record Review"

NUREG 0800, Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition, Section 5.4.2.2, Steam Generator Program"

73754-04 PROCEDURE COMPLETION

The goal of the inspections conducted in Sections 03.01 and 03.02 is to review a sufficient number of procedures and personnel qualification records to verify that the NDE program exists and personnel are adequately trained and qualified to implement it.

The goal of the inspections conducted in Sections 03.03, 03.04 and 3.05 is to verify that the licensee has adequately implemented its program and documented results developed from its processes.

The target of Section 03.01 is to review at least six procedures; the target of Section 03.02 is to review the qualification records of approximately 20 Level II personnel and five Level III personnel. If fewer than 6 procedures or the stated number of records are available, then all available procedures or records should be reviewed. However, if fewer procedures or personnel records are reviewed, but the inspector(s) feel that the quality of the procedures or records is high and there are no significant findings, the intent of this portion of the Inspection Procedure may be met.

The target of the inspections conducted in Sections 03.03, 03.04, and 03.05 is to review a sufficient number of examinations and the processes used to perform them to demonstrate that the program results in accurate and verifiable NDE program implementation. The target samples for these sections are the percentages cited in Section 02.05, PSI Plans and Schedules. This procedure is complete upon satisfactory inspection results verifying that the NDE program adequately implements and documents the successful completion of NDE.

END

Attachment:

1. Revision History for IP 73754

Attachment 1 - Revision History Sheet for IP 73754

Commitment Tracking Number	Accession Number Issue Date Change Notice	Description of Change	Description of Training Required And Completion Date	Comment and Feedback Resolution Accession Number
N/A	10/27/10 CN 10-022	Initial issue to support inspections of operational programs described in IMC 2504, Construction Inspection Program – Inspection of Construction and Operational Programs. Completed 4 year historical CN search.	N/A	ML070920418
N/A	ML13267A086 12/12/2013 CN 13-028	Researched commitments for 4 years and found none. Complete re-write based on periodic review and update. Updates ASME and other references, provides greater level of detail for guidance, and makes editorial changes.	N/A	ML13267A087