NRC INSPECTION MANUAL

INSPECTION PROCEDURE 73754

Part 52 - PRESERVICE INSPECTION - NON-DESTRUCTIVE EXAMINATION

PROGRAM APPLICABILITY: 2504

73754-01 **INSPECTION OBJECTIVE**

To determine whether the Preservice Inspection (PSI) of ASME Section III, Class 1, 2, and 3 pressure retaining 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:

- The plant is designed and provided with access to enable the performance of a. preservice and inservice examinations.
- The Non-Destructive Examination (NDE) procedures that will be/are being used are b. adequate to satisfy PSI requirements.
- Personnel qualification is adequate to conduct NDE. C.
- NDE procedures are being properly implemented for PSI examinations. d
- Preservice examinations are completed, or are on schedule to be completed, prior e. 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 <u>General Guidance</u>. The PSIs of interest in this procedure are the nondestructive examinations of Class 1, 2, and 3 components necessary to meet the following requirements:

- The TRM/SDPM; a.
- The PSI program as developed and implemented by the COL holder during plant b. construction:
- Any additional commitments made by the COL holder filed with the NRC during the C. review of the combined license application; and
- Any additional requirements imposed by the NRC through Bulletins, Generic d. Letters, or Orders. 1

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. Evaluate findings or indications and determine if these are acceptable within code limits. Should the inspector find that use of NDE to perform an examination, or exception from procedures, or 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 52.99, after issuance of a combined license, the Commission shall ensure that the required inspections, test, and analyses are performed and, prior to operation of the facility, shall find that the prescribed acceptance criteria are met.

Pursuant to 10 CFR 52.83, all provisions of 10 CFR 50 and its appendices applicable to holders of construction permits for nuclear power reactors also apply to holders of combined licenses issued under this subpart.

Pursuant to 10 CFR 50.55a(g)(3), components (including supports) that are classified as ASME Code Class 1, 2, and 3, must be designed and be provided with access to enable the performance of inservice examinations. Furthermore, they must meet the applicable preservice examination requirements set forth in the editions and addenda of Section III and Section XI of the ASME Boiler and Pressure Vessel Code incorporated by reference in paragraph 10 CFR 50.55a(b). The optional ASME Code cases listed in NRC Regulatory Guide 1.147 and incorporated by reference in paragraph 10 CFR 50.55a(b) may be used in place of the associated Section III and XI requirements. The use of these Code cases must be consistent with NRC's approvals. Section III of the ASME Code provides certain requirements for performing PSI under Section III rules.

<u>Guidance</u>. A COL holder is granted a license based on a description in its FSAR 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 interferences due to design, geometry and materials of construction could have been eliminated at the design stage and maintained during construction. 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.

It is not required for the inspector to complete all areas of this 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. 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 <u>Personnel Qualification Certification</u>. Verify the following:

a. Personnel involved in the performance, evaluation, or supervision of nondestructive examination of safety-related items meet the qualification and certification Issue Date: 10/27/10 2 73754

requirements of ASME Code, Section III or Section XI, as applicable.

- Qualification certificates, the last annual visual acuity examination, and color vision b. test results are a part of the NDE records.
- C. Review the qualifications and certifications of a sample of the inspection personnel (Levels I and II) observed during observation of work identified in section 02.05. Review the qualifications and certifications of a sample of licensee and contractor Level III examiners who approve final NDE reports. If the number of records is less than 20 for Level I and II or less than five for Level III, then review the qualification and certifications for all personnel at that level. Verify the qualification and certification records properly reflect the following:
 - 1. Employer's name;
 - 2. Person certified;
 - 3. Activity qualified to perform;
 - 4. Level of certification;
 - 5. Effective period of certification;
 - Signature of individual certifying title and level; 6.
 - 7. Basis used for certification, such as the required number of training hours, etc. for the examination method specified; and
 - 8. Annual visual acuity, color vision examination, and periodic recertification.

Guidance. NDE activities will be performed according to these levels. No one shall perform NDE activities at a level higher than that for which they are gualified. The three levels of examiners are:

- Level I Authorized to perform specific set-ups, calibrations, and examinations under the guidance of a Level II or III individual.
- Level II Authorized to set-up, calibrate, examine 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) Procedure Review.

Because the specific NDE technical requirements vary among ASME Code editions and addenda, the inspector should ensure, when using the 570X0 series IPs as technical requirements checklists, that the requirements reflect those specified in the ASME Code of record committed to by the licensee being inspected.

Verify the following:

Technical adequacy of at least one procedure from each type of NDE. a. Issue Date: 10/27/10 3

<u>Guidance</u>. The inspector should 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.

1. Visual Examination;

<u>Guidance</u>. Use procedure review requirements from IP 57050 as a checklist for this review.

2. Liquid Penetrant Examination;

<u>Guidance</u>. Use procedure review requirements from IP 57060 as a checklist for this review.

3. Magnetic Particle Examination;

<u>Guidance</u>. Use procedure review requirements from IP 57070, as a checklist for this review.

4. Ultrasonic Examination;

<u>Guidance</u>. Use procedure review requirements from IP 57080, "Nondestructive Examination Procedure Ultrasonic Examination Procedure Review/Work Observation/Record Review" as a checklist for this review, supplemented by any special requirements imposed by NRC/industry initiatives (e.g., ASME Code Case N729-1 as modified by 10 CFR 50a(g)(6)(ii)(D)).

- (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 50.55 a(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.
- 5. Radiographic Examination;

<u>Guidance</u>. Use procedure review requirements from IP 57090, "Nondestructive Examination Procedure Radiographic Examination Procedure Review/Work Observation/Record Review" as a checklist for this review.

6. 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; and
- (f) References written approval for use of Code cases.
- b. Review a sample of procedures and 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.

<u>Guidance:</u> Records identified for retention should include:

- (a) Examination results and data sheets; and
- (b) Film, tape and electronic records.

02.04 Observations.

a. Observe and verify acceptable performance of each method of examination of components, as follows:

<u>Guidance</u>. Because the specific NDE technical requirements vary among Code editions and addenda ensure that when using the various IP checklists, the requirements reflect those specified in the Code of record committed to by the licensee being inspected.

- 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 using ultrasonic technique.

<u>Guidance</u>. For volumetric examinations using ultrasonic techniques, items 1, 2, and 3 above, use work observation requirements from IP 57080 as a

checklist for this review, supplemented by any special requirements imposed by NRC or industry initiatives (i.e., Performance Demonstration Initiative and 10 CFR 50.55a.)

4. Volumetric examination of welds using radiographic technique.

<u>Guidance</u>. For volumetric examination using radiographic technique, use work procedure requirements from IP57090 as a checklist for this review.

- 5. Volumetric examination of components (control rod drive housings, bolts, studs, bolt hole ligaments, integrally welded supports).
- 6. Volumetric examination of steam generator tubes.

<u>Guidance</u>. For volumetric examination of steam generator tubes, refer to the Electric Power Research Institute (EPRI) Pressurized Water Reactor Steam Generator Examination Guidelines (Revision 7, Report No. 1013706, October 2007, or latest revision). Also refer to SRP Section 5.4.2.2, which states that it is important to inspect all of the tubes before placing a steam generator in service, using techniques expected to be used during subsequent inspections (i.e., ISI).

7. Surface examination of welds, bolts, nuts, or studs using liquid penetrant (PT) or magnetic particle (MT) technique.

<u>Guidance</u>. For surface examination using liquid penetrant technique, use work observation requirements from IP 57060 as a checklist for this review. For surface examination using magnetic particle technique, use work observation requirements from IP 57070 as a checklist for this review.

8. Visual examination of core support structures.

<u>Guidance</u>. For visual examination, use work observation requirements from IP 57050 as a checklist for this review.

9. Visual examination of support components (mechanical or hydraulic), or other components listed in ASME Code Section XI.

<u>Guidance</u>. For pipe support and restraint systems, use work observation requirements from IP50090.

- b. For each selected method of examination from above, 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 are knowledgeable of examination method and operation of test equipment.

If some or all of these individuals are contractor personnel, interview several individuals to verify that:

- (a) They are familiar with the scope of work and division of responsibilities between the contractor and the licensee.
- (b) They are knowledgeable of the requirements of the approved, licensee procedures which they are using, as well as the licensee's overall PSI program.
- 3. 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.
- 4. Examination results, evaluation of results, and any corrective actions/repairs/replacements are being recorded as specified in the PSI program and NDE procedures

<u>Guidance</u>. 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.

02.05 <u>PSI Plans and Schedules</u>. 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.

<u>Guidance</u>. The ASME Code, Section III, NC-3252 and NB-5280 as well as Section XI, IWB-220, IWC-2200, and IWD-2200, establish the requirements for preservice inspection. 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.

02.06 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.

<u>Guidance</u>. 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.

<u>Guidance</u>. 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 300 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 six 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: 120 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 <u>Verification of PSI performance</u>. 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

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"

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	Issue Date	Description of Change	Training Needed	Training Completion Date	Comment 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.	None	N/A	ML070920418