INSPECTION PROCEDURE 75001 ATTACHMENT 10

PREOPERATIONAL TESTING

Effective Date: April 1, 2026

PROGRAM APPLICABILITY: IMC 2573

75001.10-01 INSPECTION OBJECTIVES

To determine with reasonable assurance that safety-related (SR) and non-safety-related, safety-significant (NSRSS) structures, systems, and components (SSCs) can perform their required safety functions and that testing activities are performed in accordance with requirements of the design specification, approved procedures, applicable codes and standards, and the safety analysis report (SAR).

75001.10-02 INSPECTION REQUIREMENTS

02.01 Vertical Slice Inspection of Quality Assurance:

Verify the licensee, manufacturer, or project vendor is effectively implementing its quality assurance (QA) and quality control (QC) requirements, in accordance with the quality assurance program (QAP) for testing activities associated with SR and NSRSS SSCs. Inspection guidance for this portion of the inspection is provided in inspection procedure (IP) 75001, Appendix A. Inspectors should focus on 10 CFR Appendix B Criterion X “Inspection,” Criterion XI “Test Control,” Criterion XII “Control of Measuring and Test Equipment,” Criterion XIV “Inspection, Test, and Operating Status,” and Criterion XVI “Corrective Actions.”

02.02 SSC Inspection Samples:

Verify testing activities for SR and NSRSS SSCs conform to applicable codes and standards, design requirements, the SAR, and the licensee’s testing requirements.

02.03 Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC)—only applicable for construction under a combined operating license (COL):

Verify the inspections, tests, and analysis (ITA) are performed and that the acceptance criteria (AC) in the combined license (COL) are met.

02.04 Operational Program Inspections:

Inspect implementation of the Initial Test Program (ITP) or the Post-construction and manufacturing Inspection, Testing, and Analysis Program (PITAP), as applicable.

Inspectors should use the project-specific inspection scoping matrix (scoping matrix) for guidance on the required number of inspection samples. Inspectors will augment testing

inspection with an inspection of applicable quality assurance processes utilized in the testing of the SSCs. This “vertical slice” approach is an important technique for inspectors to establish a reasonable assurance determination with respect to the inspection area quality in accordance with IMC 2572, “Assessment of Advanced Reactor Construction Projects.”

75001.10-03 INSPECTION GUIDANCE

General Guidance

Preoperational Testing includes tests conducted following completion of construction inspections and tests, but before fuel loading, to demonstrate, to the extent practicable, the capability of SSCs to meet the performance requirements to satisfy the design criteria. Construction testing typically consists of activities such as initial instrument calibration, flushing, cleaning, wiring continuity and separation checks, hydrostatic pressure tests, and functional checks of components. Inspectors should choose samples to focus on preoperational system testing performed near the end of facility construction, after routine construction testing, and before fuel load.

Test selection should be based on SSC importance to operational safety and should include diverse SSCs to the extent practical. Prior to inspecting selected tests, the inspector(s) should review the specifications, drawings, work procedures, QA procedures, and work schedules appropriate to the SSCs selected for inspection. Inspectors should assess whether test activities are performed in accordance with approved work procedures, specifications, and drawings. Inspection of selected tests should be accomplished by observation, when practical, and evaluations of test results.

Each inspection using this IP will constitute at least one inspection sample, regardless of how many sections are implemented during the inspection. As described in IMC 2572 and IMC 2573, “Inspection of the Advanced Power Reactor ‘Quality of Reactor Plant Construction’ Strategic Performance Area,” the number of inspection samples needed to complete inspections in the inspection area are determined by the specified range of inspection samples listed in the scoping matrices and on the results of the continual assessment process.

This IP is used for various advanced reactor designs and is scalable and flexible. Completion of every section/step of this IP is not expected or required for individual inspections or to complete the baseline inspection program for a project. Inspectors should perform the inspection activities in the following sections of this IP, as available.

In addition to the guidance below, inspectors may refer to supplemental inspection guidance in the attachments to this IP or other IPs as necessary to aid in completing the inspections in this procedure.

Inspection samples shall be selected in accordance with the Advanced Reactor Construction Oversight Program (ARCOP) scoping matrices, as described in IMC 2573.

Specific Guidance

03.01 Quality Assurance Implementation

Appendix B to 10 CFR Part 50 specifies criteria for the QA program to provide adequate confidence that SSCs will perform their safety-related functions satisfactorily in service, for example Criterion III, “Design Control,” Criterion IV, “Procurement Document Control,” and Criterion XI, “Test Control.”

The inspectors should refer to IP 75001, “Inspection of Manufacturing and Construction Quality for Advanced Power Reactor Structures, Systems, and Components,” and IP 75001, Appendix A, “Implementation of the Quality Assurance Program,” for additional inspection guidance. The inspectors should select a sample of QA attributes to inspect during each inspection based on the scope and content of the planned inspection, the prior completed samples, and indication of potential issues for a particular attribute.

03.02 SSC Inspection Samples

Verify that preoperational testing activities for SSCs are conducted in accordance with applicable codes, standards, and the licensee’s testing requirements. Testing should include instrument calibration, functional verification, and performance testing, to demonstrate that systems and components can achieve their required setpoints, accuracy, tolerance, and performance under expected service conditions. Testing activities should use current, approved procedures; properly identified, traceable, and calibrated test equipment; and qualified personnel. Inspectors should observe testing, if practical, and review test records to verify adherence to acceptance criteria, the recording of results, and disposition of discrepancies.

Additional guidance for preoperational test inspections is contained in Attachment 1 of this IP.

03.03 ITAAC Verification

Review the licensee’s plan for completion of applicable ITAAC associated with the work activities being inspected. Review the activities that the licensee intends to credit for future ITAAC closure. For example, if the licensee intends to rely on a specific quality control (QC) observation during the installation of an SSC, then the inspector should review a sample of these QC observations to determine whether the activity was performed in accordance with applicable quality and technical requirements. Because ITAAC has special regulatory significance, licensees should document ITAAC closure under their QAP. This means that even if an ITAAC is for a non-safety-related SSC, the completion package and subsequent notifications on ITAAC will be controlled by the QAP.

03.04 Operational Programs

Verify that testing is performed in accordance with the licensee’s initial test program (ITP) or the Post-construction Inspection, Testing and Analysis Program (PITAP), as applicable consistent with licensing commitments. Additional inspection information is in Attachment 1 of this IP.

75001.10-04 RESOURCE ESTIMATE

The number of inspection samples and inspection hours are identified in the project-specific inspection scoping and planning matrix.

75001.10-05 PROCEDURE COMPLETION

Completion of this IP is based on 1) completing the minimum required inspection samples identified in the site-specific inspection scoping matrix and 2) an assessment pursuant to IMC 2572 that there is reasonable assurance that the testing activities for SSCs are being accomplished with quality in accordance with the licensing basis requirements.

75001.10-06 REFERENCES

Facility licensing basis, including Preliminary or Final Safety Analysis Report and Design Control Document

END

List of Attachments:

Attachment 1: Supplemental Preoperational Test Inspection Information
Attachment 2: Revision History for IP 75001.10

Attachment 1: Supplemental Inspection Guidance

Preoperational testing involves testing activities to verify performance of structures, systems and components prior to fuel load. The Inspectors should select diverse, risk-informed preoperational tests for inspection. Inspection should include procedure review, test observation, and test results review. Additionally, it is anticipated that some preoperational tests will be used to accomplish ITAAC for plants with a COL. The primary objective of preoperational testing is to ensure SSCs can fulfill their required safety functions. Inspectors should prioritize inspection activities that verify that this objective is met.

Procedure review

a. Review test procedure(s) and associated documentation (e.g., calculations, diagrams, drawings, calibration records, etc.) for technical adequacy and completeness.

b. Review current licensing basis to verify that the test procedure adequately addresses licensee commitments and NRC requirements relating to the license.

c. Reviews should consider if important equipment performance attributes are adequately confirmed by the operational test program. The focus reviews should be on the technical adequacy of the test rather than the format of the document.

d. Each procedure should be reviewed for the following attributes:

    1. Appropriate licensee staff and management approval is indicated on the document.

    2. Test objectives are clearly stated. Verify that all related licensing commitments are included. Ensure that the latest codes and standards, etc. are referenced where applicable.

    3. All required testing prerequisites are identified, e.g.:

        (a) Required plant systems availability is specified.

        (b) Any associated facility procedures are specified.

        (c) Prior completion of calibration checks, limit switch setting, protective device settings, etc. are included where applicable.

        (d) All special supplies and test equipment needs are specified.

        (e) Special environmental conditions and hold times, if any, are identified.

        (f) Test precautions and limitations are specified.

        (g) If computer software is involved in the testing, inspectors should confirm that the software has received the appropriate validation and verification.

    4. Test acceptance criteria should be clearly identified, with the procedure requiring comparison of results with acceptance criteria. The source of the acceptance criteria is also identified e.g., ITAAC, FSAR, technical specifications, facility license, etc.

5. Initial test conditions are specified.

   (a) Valve lineups.

   (b) Electrical power and control requirements.

   (c) Temporary installations or equipment modifications (instrumentation, electrical, and piping).

   (d) Necessary special conditions (e.g., temperatures, pressures, flows, water chemistry, etc.)

6. The procedure includes a section listing references to appropriate ITAAC, SAR sections, technical specifications, drawings, design specifications, industry codes, and other requirements.

7. Step-by-step instructions for the performance of the procedure, including hold points if needed, are included to the extent necessary to ensure that the test is performed correctly, and the test objectives are met.

8. Blank spaces are provided for initials indicating that all items, including prerequisites, are verified as having been performed.

9. Provisions are made for recording details of the conduct of the test, including all test anomalies or observed deficiencies, their resolution, and all necessary retesting.

10. Test procedures require that all temporary connections, blind flanges, disconnections or jumpers be restored to normal at the end of the test or references their control by another procedure.

11. Test procedures provide for the identification of both personnel conducting the testing and those evaluating the test data. Provision is made for the evaluator to document acceptability of the data.

12. Test procedures provide for quality control or quality assurance verification of critical steps or test parameters.

13. All special precautions for personnel and equipment safety are specified.

14. Expected performance of all automatic functions or controls (e.g., response to step and ramp control changes) is specified.

Test Observation

The inspector should review the following attributes for each of the tests selected for observation:

a. Before observing a test, the inspector should complete a content review of the test procedure. The inspector should be familiar with the test procedure to adequately observe the testing described in the procedure. Communication should be maintained between the inspector and the licensee so that the licensee's test dates are known far enough in advance for the inspector to be ready to observe the selected tests. The current revision of the test procedure should be available at the test location and is used

by test personnel. Test personnel should use the current procedure revision and be familiar with the procedural requirements, especially the limitations and precautions. If a pre-test brief is conducted, the inspectors should attend.

b. Consider if test staffing meets the minimum requirements and test personnel meet qualification requirements.

c. All test prerequisites and initial conditions should be met. If any are waived, this should be reviewed and approved in accordance with current approved administrative procedures. Verification should be performed by the inspector's review of the required records (valve lineup list, instrumentation calibration procedure, system checklist, or signoff item in the test procedure) or by direct observation (monitoring instrumentation indications, valve positions, equipment status, etc. or observation of personnel actions).

d. Consider if measuring and test equipment (M&TE) required by the procedure is calibrated and in service at the time of the test. Test data recording equipment required by procedure is calibrated to a common time base. Test equipment with possibly greater accuracy than installed control instrumentation is normally required for measuring important parameters to demonstrate equipment performance in accordance with design criteria. This M&TE must be properly calibrated within the prescribed period. If the M&TE was calibrated in the appropriate period, it does not normally need to be recalibrated each time that piece of equipment is used.

e. Consider if testing personnel have the required level of training necessary to conduct the test, pretest briefings are conducted, appropriate shift turnover is performed to ensure continuity in ongoing test activities, and test personnel actions and coordination activities are adequately performed. Specifically, coordination can be an important aspect of a test if several personnel are involved in performing procedural steps. Many of these steps may involve coordinated activities between two or more personnel.

   The inspector should observe if the assigned individual directing the test activities is knowledgeable and that time sequencing, when required, is performed appropriately. On a sampling basis, the inspector should verify adherence to the procedural limitations and precautions, and the individual test steps.

f. Consider review of the Test Engineers Log (or equivalent), the Control Room Log, and the Shift Supervisor's Log, as applicable. Test anomalies, problems, interruptions, and/or deficiencies should be recorded in the logs and reviewed for inclusion in the licensee’s corrective action program.

g. Cognizant test personnel should perform a preliminary review of test results to determine that the observed test results meet the established acceptance criteria and that the test does not need to be repeated. The acceptance criteria should be clearly stated in the test procedure. If practicable, consider direct observation that overall test acceptance criteria have been satisfied. Consider review of the preliminary test results to verify that the licensee's initial test evaluation is consistent with inspector observations. The inspector should also, independent from the licensee evaluation, observe and evaluate certain critical events or data gathering during and following testing activities. These events or data gathering activities should be selected during the inspector's preparatory review of the procedure.

h. For inspection of reactor internals testing, the Standard Review Plan calls for a test program to demonstrate the design adequacy of the reactor internals to withstand the effects of flow-induced vibration. This consists of verifying the licensee's vibration test measurement and inspection results meet the acceptance criteria for flow-induced vibration. Consider if test measurement and verification scope for the prototype or non-prototype reactor internals is in accordance with Regulatory Guide (RG) 1.20, "Comprehensive Vibration Assessment Program for Reactor Internals during Preoperational and Initial Startup Testing," guidance. According to RG 1.20, the verification of the prototype reactor internals to withstand flow-induced vibration consists of vibration measurement and inspection. The verification of non-prototype reactor internals relies only on measurement or inspection. Given this option in RG 1.20, most applicants for non-prototype reactor internals have chosen to perform only inspection.

Test Results Review

a. The inspector should evaluate the following attributes for each test selected for results review. Two alternate levels of inspection guidance are provided in this procedure for test results review. The first level involves NRC detailed review of test results (Steps 1–5 below). The second level involves verification of licensee evaluation of tests results (Steps 4 and 5 below).

    1. Following test completion, test data packages are assembled by licensees. Consider reviewing the "as-run" copy of the test procedure to verify that individual test steps and data sheets have been properly initialed and dated, data sheets have been completed, all data is recorded where required and is within acceptance tolerances, and test deficiencies and test procedure changes are properly identified in accordance with established administrative procedures.

    2. Review test changes made during the performance of the test, including testing deletions, that each was approved in accordance with the pertinent administrative procedures, that the procedure is annotated to identify test changes, and that none of the changes have altered the basic objectives of the test.

    3. Review test anomalies and deficiencies. Consider if these conditions have been documented, resolved, that the resolution has been accepted by appropriate management, and that retest requirements, if any, have been completed. Consider if all system performance problems identified by a test deficiency have been properly documented and reviewed. Consider if all deficiencies which constitute a reportable occurrence as defined in 10 CFR 50.55e and/or 10 CFR 50 Part 21 have been properly reported.

    4. Review the licensee's test summary and results evaluation. The inspector should apply independent technical analysis and judgment to ensure that the licensee's evaluation of test results has been performed correctly. Consider if those personnel, responsible for review and acceptance of test results, have documented their review and acceptance of the data package and the results evaluation. Consider if the licensee's engineering staff has evaluated the test results and concluded that the testing demonstrated that the equipment met design requirements. Consider if the evaluation, specifically, compared test results with established acceptance criteria.

5. Consider if the Test Review Committee or equivalent group has examined the results in accordance with established administrative requirements, and if the Quality Assurance group or other independent review of test results has been accomplished as prescribed in the FSAR or other licensee commitments.

b. For reactor internals flow-induced vibration tests, consider if the test measurements of the reactor internals components meet the vibration acceptance criteria stated in the reactor internals comprehensive vibration assessment program and the ASME Code Section III high cycle fatigue stress limit. Some reactor designs may require all reactor internals, including fuel, to be present to complete testing. Verify all vibration testing related to reactor internals flow-induced vibration tests prior to fuel load are completed, documented, and meet acceptance criteria.

END

Attachment 2: Revision History for IP 75001.10

Commitment Tracking Number	Accession Number Issue Date Change Notice	Description of Change	Description of Training Required and Completion Date	Comment Resolution and Closed Feedback Form Accession Number (Pre-Decisional Non-Public Information)
N/A	ML26057A075 04/01/26 CN 26-011	Initial Issuance.	N/A	N/A