

NRC INSPECTION MANUAL

IRIB

INSPECTION PROCEDURE 71111 ATTACHMENT 22

SURVEILLANCE TESTING

Effective Date: January 1, 2019

PROGRAM APPLICABILITY: IMC 2515 A

CORNERSTONES: Mitigating Systems
Barrier Integrity

INSPECTION BASES: See IMC 0308 Attachment 2

SAMPLE REQUIREMENTS

Sample Requirements		Minimum Baseline Completion Sample Requirements		Budgeted Range	
Sample Type	Section	Frequency	Sample Size	Samples	Hours
Surveillance Tests (other)	03.01	Annual	10 (size may be lower depending on applicability of sample types)	14 to 22 tests per site	100 hours per site
Inservice Testing	03.01	Annual	3		
FLEX Testing	03.02	Annual	1		
Containment Isolation Valve Testing	03.01	Annual (if applicable)	1		
Ice Condenser Testing	03.01	Annual (if applicable)	1		
RCS Leakage Detection Testing	03.01	Annual (if applicable)	1		

71111.22-01 INSPECTION OBJECTIVE

01.01 **Verify** that surveillance testing (including inservice testing) activities provide objective evidence that risk- or safety-significant structures, systems, and components (SSCs) remain capable of performing their intended safety functions and maintain their operational readiness consistent with their design and licensing bases (i.e., will operate within safety limits and limiting conditions for operation will be met.)

01.02 Verify that testing activities provide objective evidence that FLEX SSCs remain capable of performing their intended functions and maintain their operational readiness consistent with their licensing bases.

71111.22-02 GENERAL GUIDANCE

Once or twice a year, inspectors should consider conducting a “vertical slice” review of work activities on safety-significant systems to assess whether different aspects of the licensee’s processes work effectively together, e.g., Maintenance, Operations, Risk Management, Scheduling, etc. For a given evolution, a “vertical slice” review could involve performing (in conjunction with IP 71111.22, as applicable) an associated sample in IP 71111.04, “Equipment Alignment,” IP 71111.12, “Maintenance Effectiveness,” IP 71111.13, “Maintenance Risk Assessments and Emergent Work Control,” IP 71111.18, “Plant Modifications, IP 71111.19, “Post-Maintenance Testing,” and IP 71152, “Problem Identification & Resolution.”

The following table outlines additional inspection guidance for selecting risk- or safety-significant systems.

Cornerstone	Inspection Objective	Risk Priority	Example
Mitigating Systems	Identify any mitigating system, credited by the licensee as operable when assessing risk, which is adversely impacted by surveillance testing related failures such as failure to adequately test, failure to meet test criteria or, failure to realign equipment after the surveillance.	<p>Focus in areas with potential for common mode failures.</p> <p>Select surveillance tests which cross technical disciplines (electrical, mechanical, I&C)</p> <p>IST of pumps and valves that perform important functions in mitigating systems.¹</p>	<p>Integrated safeguards testing</p> <p>Emergency diesel start/load testing</p> <p>Battery performance testing</p> <p>Reactor protection, RCS leakage detection, and safety injection instrumentation testing</p> <p>Safety bus loss of voltage and degraded voltage relay testing</p> <p>Pumps that provide injection water flow and valves that change position to provide injection water flow to the reactor coolant system.</p>

Cornerstone	Inspection Objective	Risk Priority	Example
Barrier Integrity	Identify any containment integrity supporting system, credited by the licensee as operable when assessing risk, which is adversely impacted by surveillance test failures such as failure to adequately test, failure to meet test criteria or failure to realign equipment after the test.		Containment isolation valve testing, ventilation/filtration system testing

For additional guidance on IST inspection refer to IP 73756, “In-service Testing of Pumps and Valves” and NUREG-1482, “Guidelines for Inservice Testing at Nuclear Power Plants.”

Consider selection of the IST activity based on the component or system performance history (known deficiencies), or if the component or system had recently undergone corrective or preventive maintenance.

Include observation of surveillance testing activities of at least one containment isolation valve(s) each refueling cycle as part of the inspection sample. Also, for ice condenser containment design sites, select one or two ice condenser system surveillances to observe during each refueling outage as part of the inspection sample.

In addition, if the Reactor Coolant System (RCS) is being monitored by the licensee due to performance degradation (i.e., increasing leakage), include RCS leakage detection surveillance testing as part of the inspection sample (See Section 02.02b.14).

During plant outages, sample selection **should** focus on infrequent surveillance tests, and particularly large-scale actuation tests and full-flow ESF pump testing, as well as inspections of normally inaccessible SSCs (e.g., containment sump inspections, RWST or CST internal inspections).

As part of the sample, consider reviewing surveillance tests in which there was a modification of the surveillance frequency in accordance with the Risk Management Technical Specification (TS) Initiative 5b Surveillance Frequency Control Program.

After Fukushima, the NRC ordered every U.S. commercial reactor to have mitigation strategies for dealing with the long-term loss of normal safety systems following the occurrence of a beyond-design-basis external event (NRC Order EA-12-049, ML12054A735). Because of the low probability of an external event causing a simultaneous loss of all AC and normal access to the ultimate heat sink, FLEX equipment may not be risk/safety significant. However, FLEX increases defense-in-depth for beyond-design-basis scenarios to address loss of power and loss of the ultimate heat sink occurring simultaneously at all units on a site. As a result, as a minimum, one inspection sample a year is associated with FLEX testing.

Implementation guidance for FLEX is found in Nuclear Energy Institute (NEI) 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide," and endorsed via Japan Lessons Learned Project Directorate Interim Staff Guidance (JLD-ISG) 2012-01, "Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events." Various revisions are in effect. NEI 12-06, Revision 0 (ML12242A378) is endorsed via JLD-ISG 2012-01, Revision 0 (ML12229A174). NEI 12-06, Revision 2 (ML15348A015) is endorsed via JLD-ISG 2012-01, Revision 1 (ML15357A163). NEI 12-06, Revision 4 (ML16354B421) is endorsed via JLD-ISG 2012-01, Revision 2 (ML17005A188). It should be noted that not all revisions of NEI 12-06 are endorsed.

Verification of activities under this procedure should focus on performance-based field observations of complete surveillance / testing evolutions, followed by verification of the bases and of the proper demonstration of performance that supports operability / functionality determinations.

For each sample, conduct a routine review of problem identification and resolution activities using IP 71152, "Problem Identification and Resolution." Examples of significant surveillance testing problems and appropriate inspector follow-up include:

- a. Licensee actions to address M&TE that fails calibration. Inspectors should assess the adequacy of the licensee's corrective actions, considering the following: the licensee tracks which surveillance tests used each piece of M&TE, compares the failed M&TE calibration information to each surveillance test that used that M&TE, and then assesses the impact to the operability of the affected system. Inspectors should also consider performing a 71111.15, "Operability Determinations and Functionality Assessments," sample to more thoroughly assess the potential effects on operability.
- b. Licensee actions to address degraded system performance identified during in-service testing. When degraded performance is revealed, inspectors should review the condition reporting data base to determine if the licensee is implementing appropriate corrective actions, such as testing with increased frequency in accordance with ASME Code, Surveillance Frequency Control Program, or other applicable requirements.

71111.22-03 INSPECTION SAMPLES

03.01 Surveillance Testing

Verify by witnessing surveillance tests and/or reviewing the test data, that surveillance testing activities and results provide objective evidence that the affected SSCs remain capable of performing their intended safety functions (under conditions as close as practical to design bases conditions or as required by TS) and maintain their operational readiness consistent with the facility's current licensing basis.

Specific Guidance

Significant surveillance test attributes for consideration include the following:

1. Effect of testing on plant operations has been adequately addressed by licensee (control room and/or engineering) personnel.

2. Preconditioning of SSCs prior to or post-testing. Unacceptable preconditioning is defined as the alteration; variation; manipulation; or adjustment of the physical condition of a SSC before or during TS surveillance or ASME Code testing such that that it will alter one or more of SSCs operational parameters, which results in acceptable test results. Such changes could mask the actual as-found condition of the SSC and possibly result in an inability to verify the operability of the SSC. In addition, preconditioning could make it difficult to determine whether the SSC would perform its intended function during a design basis event in which the SSC might be needed (See [Inspection Manual](#) Part 9900, Technical Guidance, “Maintenance – Preconditioning of Structures, Systems, and Components Before Determining Operability,” for additional guidance).
3. Acceptance criteria are clearly derived from the supporting technical bases (design bases, setpoint calculations, UFSAR, [TS](#) Bases, etc.) and demonstrate operational readiness consistent with the facility’s current licensing basis.
4. Measuring and test equipment (M&TE) specified in procedures are part of the measuring and test equipment program, their calibration status is within acceptable limits, and their range and accuracy are consistent with the application as supported by design bases documents. Plant equipment calibration is correct, accurate, properly documented and the calibration frequency is in accordance with TS, UFSAR, licensee procedures and commitments.
5. Test is performed in sequence and in accordance with written procedure.
6. Jumpers installed or leads lifted during testing are properly controlled.
7. Electrical connections are properly torqued, secure, and maintain their intended design function.
8. For cases where the licensee relies on multiple surveillance tests to satisfy a surveillance requirement, the affected surveillance test procedures collectively accomplish the entire scope of the surveillance requirement.
9. Setpoints, required test accuracy, test frequency, and allowable setpoint drift for selected safety-related instrumentation and control surveillance tests (i.e., RPS, NIs, etc.) conform to applicable setpoint calculations. Reference setpoint data has been accurately incorporated into the applicable test procedure(s).
10. Annunciator and other alarms are demonstrated to be functional and setpoints are consistent with design bases documents. Alarm response procedure entry points and actions are consistent with plant design/licensing bases documents.
11. Testing methods, acceptance criteria, and required corrective actions for IST activities meet with the applicable version of the ASME Code, Section XI. In concert with [TS](#) requirements, IST programs are intended to ensure the operational readiness of certain safety related pumps and valves. Inspectors must review reference values or changes to reference values for consistency with the design bases and verify that the current acceptance criteria match the most recent reference test data. For pump testing, the inspectors [should](#) verify that the licensee established system operating conditions that reflect limiting operational conditions

and are sufficiently repeatable to allow performance trending. Inspectors should also review sufficient test performance history to verify that the licensee identified and is addressing any adverse trends.

12. For local leak rate testing, isolation valves inside and outside containment are each tested with pressure exerted in a direction consistent with expected accident conditions. The inspectors **should** verify that the licensee updates the total containment leak rate data with the new measured value, and confirm that the overall leak rate is still within acceptable limits. The inspectors **should** verify that the licensee schedules the isolation valve(s) for maintenance if administrative limits are exceeded. The inspectors **should** also verify that the containment penetration(s) is declared inoperable if acceptance criteria are exceeded.
13. Test frequency was adequate to demonstrate operability (meets **TS** requirements), and reliability. Appendix A, "Risk Management **TS** Initiative 5b Surveillance Frequency Control Program," provides additional information for **optional** reviews associated with the application of the Risk Management **TS** Initiative 5b Surveillance Frequency Control Program.
14. If an adverse trend in RCS leakage is being monitored by the licensee, **the inspectors should** verify that the licensee has programs and processes in place to (1) monitor plant-specific instrumentation that could indicate potential RCS leakage, (2) meet existing requirements related to degraded or inoperable leakage detection instruments, (3) use an inventory balance check when there is unidentified leakage (4) take appropriate corrective action for adverse trends in unidentified leak rates, and (5) pay particular attention to changes in unidentified leakage. [C1]
15. Unavailability of the tested equipment is appropriately considered in the licensee's Mitigating System Performance Index data.
16. After completion of testing, equipment is returned to the positions/status required for the SSCs to perform its intended safety function.
17. Test equipment is removed after testing.
18. Test data is complete, verified, and meets procedure requirements.
19. For test results that do not meet the acceptance criteria, the results of licensee engineering evaluations provide **an** acceptable bases for returning affected SSCs to an operable status.
20. Performance trends for the last several completed tests are appropriately documented and addressed. If testing indicates unacceptable setpoint drift or otherwise demonstrates degradation, the inspector must assess the adequacy of the licensee's corrective actions. These may include component replacement and/or increased frequency of testing, for example.

03.02 FLEX Testing

Verify by witnessing tests and/or reviewing the test data, that testing activities and results provide objective evidence that FLEX SSCs remain capable of performing their intended functions (under conditions as close as practical to licensing conditions) and maintain their operational readiness consistent with the facility's current licensing basis.

Specific Guidance

Section 11.5 of NEI 12-06 contains guidance on FLEX maintenance and testing. If needed, questions regarding FLEX issues can be raised with either the regional Technical Support Branch Chief or with the NRR Beyond Design Basis Engineering Branch (via the NRR DORL PM).

71111.22-04 REFERENCES

Inspection Manual Chapter 2515, "Light-Water Reactor Inspection Program - Operations Phase"

Inspection Manual Chapter 2515, Appendix A, "Risk-Informed Baseline Inspection Program"

Inspection Procedure 73756, "Inservice Testing of Pumps and Valves"

Inspection Procedure 61720, "Containment Local Leak Rate Testing"

Inspection Procedure 71111.04, "Equipment Alignment"

Inspection Procedure 71111.12, "Maintenance Effectiveness"

Inspection Procedure 71111.13, "Maintenance Risk Assessments and Emergent Work Control"

Inspection Procedure 71111.15, "Operability Determinations and Functionality Assessments"

Inspection Procedure 71111.18, "Plant Modifications"

Inspection Procedure 71111.19, "Post-Maintenance Testing"

Inspection Procedure 71152, "Problem Identification and Resolution"

Bulletin 88-04, "Potential Safety-Related Pump Loss," May 5, 1988.

Code of Federal Regulations, Title 10, Part 50, Section 50.55a, "Codes and Standards."

Generic Letter 89-04, "Guidance on Developing Acceptable Inservice Testing Programs," April 3, 1989.

Information Notice 97-90, "Use of Nonconservative Acceptance Criteria in Safety-Related Pump Surveillance Tests," December 30, 1997

10 CFR 50, Appendix J, including Option B.

NUREG-1482, "Guidelines for Inservice Testing at Nuclear Power Plants"

ASME Boiler and Pressure Vessel Code, Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components"

Inspection Manual Part 9900, Technical guidance, "Maintenance - Preconditioning of Structures, Systems, and Components Before Determining Operability"

Regulatory Guide, 1.45, "Reactor Coolant Pressure Boundary Leakage Detection Systems"

Regulatory Issue Summary 06-17, "NRC Staff Position on the Requirements of 10 CFR 50.36, Technical Specifications, Regarding Limiting Safety System Settings During Periodic Testing and Calibration of Instrument Channels"

Information Notice 2010-25, "Inadequate Electrical Connections"

NEI 12-06, Revision 0, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide," (ML12242A378)

NEI 12-06, Revision 2, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide," (ML15348A015)

NEI 12-06, Revision 4, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide," (ML16354B421)

JLD-ISG 2012-01, Revision 0, "Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," (ML12229A174)

JLD-ISG 2012-01, Revision 1, "Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," (ML15357A163)

JLD-ISG 2012-01, Revision 2, "Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," (ML17005A188)

END

APPENDIX A

RISK MANAGEMENT TECHNICAL SPECIFICATIONS (TS) INITIATIVE 5b SURVEILLANCE FREQUENCY CONTROL PROGRAM (SFCP)

71111.22A-01 OBJECTIVE

The objective of this Appendix is to support the **optional** review of licensees' implementation of the risk management **TS** (RMTS) Initiative 5b, described in the RMTS Guidelines Document NEI 04-10, Risk Informed Method for Control of Surveillance Frequencies.

71111.22A-02 INSPECTION REQUIREMENTS AND GUIDANCE

02.01 Surveillance Frequency Changes

- a. Confirm that the surveillance frequency change was evaluated for prohibitive commitments, and either no such commitments existed or they were revised prior to implementation of the Surveillance Test Interval (STI) change.
- b. Confirm that the qualitative evaluation included, as a minimum, the items identified in NEI 04-10, step 7.
- c. If the affected component or system is modeled in the PRA, or was added to the PRA model to support application of the SFCP, then confirm that a full scope evaluation using the licensee's PRA model was completed and satisfied the acceptance criteria of $<1 \text{ E-6 } \Delta\text{CDF}$ and $<1 \text{ E-7 } \Delta\text{LERF}$.
- d. If the affected component or system is not modeled in the PRA, then confirm acceptable qualitative or bounding analyses were completed and satisfied the acceptance criteria of $<1 \text{ E-7 } \Delta\text{CDF}$ and $<1 \text{ E-8 } \Delta\text{LERF}$.
- e. Confirm the cumulative impact of all STI changes meets the acceptance criteria of $<1 \text{ E-5 } \Delta\text{CDF}$ and $<1 \text{ E-6 } \Delta\text{LERF}$.
- f. Confirm appropriate sensitivity studies were completed and acceptable to justify the surveillance frequency change.
- g. Confirm an acceptable procedural implementation and monitoring strategy was completed for the affected systems and components.

02.02 SFCP Process and Oversight

- a. SFCP Process:
 1. Review IDP meeting minutes for the selected Surveillance frequency.
 2. Verify that the required training/qualification of personnel involved with the approval

of the selected Surveillance Frequency change was conducted. The required training should cover the areas listed in Section 4 of NEI 04-10 and should be commensurate with their respective responsibilities.

3. Review any risk management actions that were implemented. Review NEI 04-10, Appendix A for SFCP documentation requirements.

b. SFCP Oversight:

1. Review plant on-site review committee meeting minutes for the selected Surveillance frequency.
2. If applicable, verify that any issue affecting the system or component for which the surveillance frequency applies is properly captured in the Corrective Actions Program.

71111.22A-03 REFERENCES

IP 71111.13, Maintenance Risk Assessments and Emergent Work Control.

RG 1.174, An Approach for Using Probabilistic Risk Assessment in Risk Informed Decisions on Plant Specific Changes to the Licensing Basis.

RG 1.177, An Approach for Plant-Specific, Risk-Informed Decision-making: Technical Specifications.

RG 1.200, An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk Informed Activities.

EPRI 1009474, Dec 2004 RMTS Guidelines.

Licensee Safety Evaluation Report (SER) for the license amendments adopting RITS 5b.

NEI 04-10 Revision 0¹, Risk-Informed Technical Specifications Initiative 5b, Risk Informed Method for Control of Surveillance Frequencies, Industry Guidance Document (ML062570416).

NEI 04-10 Revision 1, Risk-Informed Technical Specifications Initiative 5b, Risk Informed Method for Control of Surveillance Frequencies, Industry Guidance Document (ML071360456).

NUMARC 93-01, NEI – Industry Guidelines for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants, Revision 3.

GDC in 10 CFR Part 50, Appendix A.

NEI 00-04, Revision 0, 10 CFR 50.69 SSC Categorization Guideline (ML052900163).

END

¹ NEI 04-10, Revision 0, is referenced in the Limerick Generating Station technical specification surveillance frequency control program. All other licensees reference NEI 04-10, Revision 1.

Attachment 1 – Revision History for IP 71111.22

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	01/17/2002 CN 02-001	Revised to incorporate minor changes to the inspection requirements. In addition, inspection resource estimates and inspection level of effort are revised to provide a band for more inspection flexibility.	NO	N/A
C1 Reference: Davis-Besse Lessons Learned Task Force Item 3.2.1(3)	05/11/2004 CN 04-013	Revised to include RCS leak detection system surveillance as part of the surveillance testing samples. Revision also includes surveillance testing attributes for reviewing annunciator/alarm setpoints and alarm response procedure actions.	YES	9/24/2003
N/A	ML053490179 01/05/2006 CN 06-001	Reduced the estimated resources required to complete this inspection activity based on inspection hours charged to this IP during last several ROP cycles. Completed historical CN search.	NO	N/A
N/A	ML070540275 02/27/07 CN-07-007	IP 71111.22 address feedback form 71111.22-912 to clarify Section 02.02 to more clearly describe what is to be accomplished when conducting the leakage detection surveillance inspection.	NO	N/A

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	ML092780504 12/24/09 CN-09-032	<p>Revised IP to make changes recommended by 2009 ROP Realignment process. (Ref. ML092090312.)</p> <ul style="list-style-type: none"> • Did not make changes recommended by FF71111.19-1334; see FF for details. • Incorporated FF2515-1309 by adding reference to IMC 2515 in Section 2.02 to emphasize observation of plant activities. • Incorporated FF2515-1325 by removing quarterly sample requirements in Level Of Effort section and Section 2.01. Quarterly samples are not required by IMC 2515. • In Section 04, reduced the resource estimate by 5 hours. 	NO	N/A
N/A	ML11213A004 11/08/11 CN 11-031	Revised to incorporate feedback associated with Feedback Form No. 71111.22-1550.	NO	ML112840035

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	ML12086A064 04/12/2012 CN 12-005	Revised to reflect NRC approval of Risk Management Technical Specification Initiative 5b Surveillance Frequency Control Program.	YES To be conducted by NRR after IP issuance.	ML12086A084
N/A	ML15040A283 06/15/15 CN 15-011	Revised to incorporate feedback associated with the ROP Enhancement Project.	NO	ML15127A419
N/A	ML18177A109 11/19/18 CN 18-039	Revisions are made to: (1) Address recommendations from the working group established to update the ROP for regulatory actions taken following the Fukushima Dai-ichi accident (ML17164A285). IP revised to allow for oversight of FLEX testing, and as a minimum, require one inspection sample per year. (2) Conform to new IP format requirements found in IMC 0040 (ML18003A122).	None	ML18179A042