

ATTACHMENT 71111.04

INSPECTABLE AREA: Equipment Alignment

CORNERSTONES: Initiating Events
Mitigating Systems
Barrier Integrity

INSPECTION BASES: Systems or components that are not properly aligned can lead to the initiation of an event and can impact the availability and functional capability of plant equipment, thereby significantly increasing the overall risk to the plant. Inspection activities would normally be performed following emergent work activities and planned removal of risk-significant systems for online maintenance.

LEVEL OF EFFORT: The goal is to perform 12 to 16 partial walkdowns and 2 complete walkdowns per calendar year, depending on the number of reactor units at a given site. Unit differences at a particular site may necessitate more walkdowns to adequately complete site specific inspection objectives at each unit.

71111.04-01 INSPECTION OBJECTIVES

01.01 To verify equipment alignment and identify any discrepancies that impact the function(s) of the system and, therefore, potentially increase risk.

01.02 To verify that the licensee has properly identified and resolved equipment alignment problems that could cause initiating events or impact the availability and functional capability of mitigating system or barrier.

71111.04-02 INSPECTION REQUIREMENTS

Inspectors shall perform partial walkdown inspections to verify the operability or functionality of a redundant or backup system/train or a remaining operable or functional system/train with a high risk significance for the current plant configuration (considering out-of-service, inoperable, non-functional, or degraded condition); or a risk-significant system/train that was recently realigned following an extended system outage, maintenance, modification, or testing; or a risk-significant single-train system. This inspection activity shall be performed during both shutdown and operating conditions.

One of the two annual complete walkdowns must be on a mitigating system.

02.01 Partial Walkdown

- a. Select a system/train with a high risk significance for the current plant configuration (considering **out-of-service**, inoperable, or degraded condition); or a risk-significant system/train that was recently realigned following an extended system outage, maintenance, modification, or testing; or an **out-of-service** risk-significant system/train.
- b. Review documents to determine the correct system/train lineup. Consider plant procedures, abnormal and emergency operating procedures, updated final safety analysis report, **vendor** technical manuals, **piping and instrument** drawings, **valve, switch and breaker** lineups, and plant tagout logs.
- c. **Perform the walkdown inspection.** Verify that the critical portions of the selected system/train are correctly aligned, and identify any discrepancies. **Verify systems/trains credited as being operable or functional were not rendered inoperable, non-functional, or degraded by maintenance. As appropriate consider items in Section 02.02e.**

02.02 Complete Walkdown

- a. Select a system to walkdown based on risk-informed insights from site-specific risk studies together with other factors, such as engineering analysis and judgment, operating experience, performance history, current plant mode, and previous walkdowns. One walkdown must be performed on a mitigating system every calendar year. **The mitigating system sample need not be constrained to systems covered by the Mitigating Systems Performance Indicator or IMC 609 Attachment 4.**
- b. Review documents to determine the correct system lineup. Consider plant procedures, abnormal and emergency operating procedures, updated final safety analysis report, vendor technical manuals, **piping and instrument** drawings, **valve, switch and breaker** lineups, and plant tagout logs.
- c. Review any outstanding maintenance work requests on the system and any deficiencies that could affect the ability of the system to perform its function(s).
- d. Review any outstanding design issues, including temporary modifications, operator workarounds, and items that are tracked by the engineering department.
- e. Perform the walkdown inspection. Identify any discrepancies between the existing alignment of the system equipment and the correct alignment. Use the following examples to identify items to review during the walkdown.
 1. **Observe whether there is indication of degradation on systems, structures or components.**
 2. Valves are correctly positioned and do not exhibit leakage that would impact the function(s) of any given valve.
 3. Valves are locked as required by the licensee's locked valve program.

4. Electrical power is available as required.
5. Major system components are correctly lubricated, cooled, ventilated, etc.
6. As built configuration matches plant documentation. For example isometric drawings reflect the same nomenclature as found in the actual plant labeling.
7. Hangers and supports are correctly installed as designed and functional.
8. Essential support systems are operational.
9. Ancillary equipment, temporary services, blocked doors, disassembled components, or debris does not interfere with in service system performance.
10. Boundaries or features intended to mitigate initiating events, such as high-energy line breaks, flooding, fire, and security remain operable or functional as required.
11. Tagging clearances or maintenance isolation boundaries do not disable required functions.
12. Components subject to harsh environments, including high energy line breaks, have the appropriate environmental qualification.
13. Components potentially vulnerable to threats such as tornado generated missiles (steam exhaust piping, EDG exhaust piping, etc.) are appropriately protected.

02.03 Problem Identification and Resolution

- a. If an equipment alignment problem occurs or the inspector becomes aware of a significant equipment alignment problem that affects initiating event frequency or the ability of a mitigating system or barrier to perform its function(s), perform additional review to determine if the problem is accurately described and classified in the licensee's corrective action program.
- b. During each complete system walkdown inspection, sample the licensee's corrective action program records to verify that the licensee is identifying equipment alignment problems at an appropriate threshold and evaluate their resolution. This review includes equipment alignment problems for all risk-significant systems and is not restricted to the system being inspected. See Inspection Procedure (IP) 71152, "Problem Identification and Resolution," for additional guidance.
- c. Follow up on any equipment alignment problems that have been identified during daily plant tours and control room walkdowns performed using Inspection Manual Chapter (IMC) 2515, Appendix D, "Plant Status." The objective of this followup is to determine if the problem is accurately described and classified in the licensee's corrective action program.

General Guidance

For a given maintenance activity, a “vertical slice” review involves performing (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 71111.19, “Post-Maintenance Testing,” and IP 71111.22, “Surveillance Testing.” Once or twice a year, inspectors should consider conducting a “vertical slice” review of a maintenance activity to assess whether different parts of the maintenance process work together effectively.

Note that the most risk-significant system may not be the redundant or backup train; (for example, the most risk-significant system could be the electrical bus that provides power to the redundant or backup train). Also, risk insights might be available regarding the initiating events of greatest significance for the given plant equipment configuration. Such insights might be used to assess the licensee’s awareness of the need for compensatory measures pursuant to 10 CFR 50.65(a)(4). Refer to IP 71111.13 for more information.

The following table provides general inspection guidance to assist inspectors in selecting inspection activities to achieve each cornerstone objective and to identify those activities that have a risk priority.

Initiating Events Cornerstone	
Inspection Objective: Identify any equipment alignment discrepancies that could result in a risk-significant initiating event and impact the availability and functional capability of plant equipment.	
Risk Priority	Examples
Shutdown - Equipment lineups during special tests or evolutions	<p>System lineups during pressurized water reactor (PWR) mid-loop operation or boiling water reactor (BWR) vessel draindown.</p> <p>Misalignment of electrical equipment during shutdown could cause loss of offsite power (LOSP) and affect decay heat removal.</p>

Mitigating Systems Cornerstone	
Inspection Objective: Identify any equipment alignment discrepancies that could impact the availability and functional capability of a risk-significant mitigating system.	
Risk Priority	Examples
Operating - Equipment lineups following system restoration or equipment lineups that support another alternate system/train when a Maintenance Rule system is out-of-service .	Safety trains on the remaining emergency bus when one emergency diesel generator (EDG) is out-of-service or failed.
Shutdown - Equipment lineups that affect shutdown risk or equipment lineups that support another alternate system/train when Maintenance Rule system is out-of-service .	Safety trains on the remaining emergency bus when one EDG is out-of-service or failed.

Barrier Integrity Cornerstone	
Inspection Objective: Identify any equipment alignment discrepancies that could degrade the integrity of the fuel barrier, reactor coolant system, or containment.	
Risk Priority	Examples
Operating - Fuel cladding degradation can result from both inadequate human and equipment performance. Reactivity control systems must be properly configured to prevent and/or mitigate adverse reactivity transients and neutron flux distributions.	R eactivity control systems (e.g., control rod drives, rod block monitors, rod worth minimizers). C ontainment isolation valves (e.g., containment purge valves)
Shutdown - Equipment lineups that affect reactor coolant system (RCS) inventory and containment	C ontainment configuration during risk-significant evolutions (e.g., PWR mid-loop operation, BWR cavity draindown). P rovisions for prompt containment closure.

Specific Guidance

03.01 and 03.02.a-d No specific guidance provided.

03.02.e For observed degradation, consider whether the issue has been entered into the licensee's corrective action program at the appropriate threshold. Determine if there is an aging management program associated with a renewed license (e.g., External Surfaces Monitoring Program, Boric Acid Corrosion Program), and if so, ensure the degradation is being appropriately managed. (Potential resources available to inspectors may be the licensee's Aging Management Program notebooks and/or scoping documents developed during the license renewal process.)

03.03.a The intent of paragraph 02.03.a is to ensure that the licensee's corrective action program accurately classifies and describes any and all equipment alignment problems that have affected or could potentially affect **initiating event frequency** and the ability of a mitigation system or barrier to perform its function(s). The licensee is expected to take the appropriate immediate and long-term corrective actions to address equipment alignment issues **promptly** commensurate with **its** risk.

Although the inspector can select a system that has recently been identified as exhibiting an equipment alignment problem as one of the systems on which to perform the partial or full system walkdowns, such decisions should be founded on the inspector's determination that an additional equipment alignment inspection by the resident inspector staff is warranted, given the risk associated with the misalignment or the inadequate quality of the licensee's response to and resolution of the equipment alignment issue.

71111.04-04 RESOURCE ESTIMATE

The annual resource expenditure for this inspection procedure is estimated to be 68 to 92 hours to conduct partial and full system walkdowns at a site regardless of the number of reactor units at that site.

71111.04-05 COMPLETION STATUS

Inspection of the minimum sample size will constitute completion of this procedure in the Reactor Programs Systems (RPS). That minimum sample size will consist of 14 samples representing 12 partial system walkdowns, and 2 complete system walkdowns in a year. **Refer to Inspection Manual Chapter (IMC) 2515, "Light-Water Reactor Inspection Program - Operations Phase" for further guidance on procedure completion.**

71111.04-06 REFERENCES

IP 71111.12, "Maintenance Effectiveness"

IP 71111.13, "Maintenance Risk Assessments and Emergent Work Control"

IP 71111.19, "Post-Maintenance Testing"

IP 71111.22, "Surveillance Testing"

IP 71152, "Problem Identification and Resolution"

IMC 2515, "Light-Water Reactor Inspection Program - Operations Phase"

Operating Experience Smart Samples: http://nrr10.nrc.gov/ope-info-gateway/ope-smart-samples_2007_2008.html

Additional References: <http://nrr10.nrc.gov/rorp/ip71111-04.html>

END

Attachment 1 - Revision History for IP 71111.04

Commitment Tracking Number	Accession Number Issue Date Change Notice	Description of Change	Training Required and Completion Date	Comment and Feedback Resolution Accession Number
N/A	04/03/00 CN 00-003	711111.01 has been issued to provide the minimum inspection oversight for determine the safety performance of operating nuclear power reactors.	No	
N/A	01/17/02 CN 02-001	IP 71111.04 has been revised to provide clarifications to the inspection requirements concerning partial walkdowns and identification and resolution of problems. In addition, inspection resource estimates and level of effort are revised to provide a band for more inspection flexibility.	No	
N/A	ML070370430 02/27/07 CN 07-007	IP 71111.04 has been revised to address feedback form 71111.04-721 to clarify the wording in the Inspection Requirements section to address systems of high risk significance. Revision history reviewed for the last four years.	No	
N/A	ML11201A173 10/28/11 CN 11-025	The sample size for IP 71111.04 has been revised to reflect the 2011 ROP Realignment.	No	
N/A	ML13025A338 04/24/13 CN 13-012	Revised to allow the flexibility to perform one of the two complete system walkdowns outside of the mitigating systems cornerstone.	No	ML13060A500FF 71111.04-1856

Commitment Tracking Number	Accession Number Issue Date Change Notice	Description of Change	Training Required and Completion Date	Comment and Feedback Resolution Accession Number
N/A	ML13338A243 09/24/14 CN 14-022	Added additional guidance related to mitigating system sample selection, incorporated ROP Enhancement Initiative Improvements (ML14017A340 & ML14017A381), incorporated license renewal age management guidance, and addressed a Fort Calhoun lesson learned recommendation.	No	ML14233A087 71111.04-1935 ML14266A021 71111.04-1990 ML14266A026 71111.04-2054 ML14266A037