

CONSTRUCTION DEGRADED PERFORMANCE COLUMN INSPECTIONS

PROGRAM APPLICABILITY: 2505

CORNERSTONES: ALL

INSPECTION BASIS: This procedure provides guidance for the supplemental response described in the Construction Action Matrix in Inspection Manual Chapter (IMC) 2505, "Periodic Assessment of Construction Inspection Program Results." This inspection procedure will be completed when a degraded cornerstone or three white findings in a strategic performance area are identified. In addition,

- Supplemental inspections will not be done for single or multiple green issues;
- The baseline inspection procedure (IP) 35007, "Quality Assurance Program Implementation During Construction and Pre-Construction Activities" is independent of the supplemental response;
- New examples of performance issues resulting from supplemental inspections will be evaluated and categorized in a similar manner to that of the baseline inspection program using the construction significance determination process (SDP).

90002-01 INSPECTION OBJECTIVES

01.01 To provide assurance that the root and contributing causes of individual and collective (multiple white inputs) safety significant performance issues are understood.

01.02 To independently assess and provide assurance that the extent of condition and the extent of cause of individual and collective (multiple white inputs) safety significant performance issues are identified.

01.03 To independently determine if a weakness in safety culture traits caused or significantly contributed to the individual and collective (multiple white inputs) safety significant performance issues.

01.04 To provide assurance that a licensee's corrective actions for the **safety significant** performance issues are sufficient to address the root and contributing causes and prevent recurrence.

90002-02 INSPECTION REQUIREMENTS

The following inspection requirements relate to the minimum set of information that the NRC will generally need to acquire in order to ensure that the causes of **safety** significant performance issues are identified and that appropriate corrective actions are planned or taken to prevent recurrence. While the inspection requirements are generally written to address individual performance issues, this IP may also be used to assess the adequacy of the licensee's evaluations associated with multiple performance issues.

While these inspection requirements do not necessarily represent NRC requirements for the licensee, **the licensee's evaluation will generally need to address each of the inspection requirements in order to ensure that the causes of the performance issue are identified and effective corrective actions are taken to prevent recurrence.** It is recognized that the depth of the licensee's evaluation may vary depending on the significance and complexity of the issues. In some cases, the answers to specific inspection requirements will be self-evident with little additional review or analysis required by the inspectors. This procedure also requires an independent NRC inspection of the adequacy of the licensee's extent of condition and extent of cause determination.

The inspection report associated with a construction supplemental inspection performed in accordance with this IP should contain the NRC's assessment of the licensee's evaluation for each inspection requirement. The results of a construction supplemental inspection should be documented in accordance with the guidance contained in IMC 0613, "**Power Reactor Construction Inspection Reports.**"

Significant weaknesses in the licensee's actions to address the performance issues, including the failure to identify weaknesses in the safety culture **traits** described in IMC 0613, **Appendix F**, or the failure to perform an adequate evaluation of the performance issues may be subject to additional agency actions, **including:** (1) those specified in IMC 2505; (2) additional enforcement actions; or (3) an expansion of this procedure as necessary to independently acquire the information necessary to satisfy the inspection **objectives defined in Section 90002-01.** **An expansion** of this IP may be necessary if inspectors need to independently evaluate the performance issue(s) or safety culture **traits** as a result of the licensee not performing its own analysis. It is not expected for inspectors to perform this evaluation as a separate construction supplemental inspection.

In general, **a failure to satisfy this IP's inspection objectives as defined in Section 95002-01 should result in an expansion of this IP through continued or follow-up inspections. When the licensee's performance indicates the need to hold open a finding past two quarters in the Construction Action Matrix, an inspection report should be issued which describes specific licensee deficiencies and clearly states the necessary licensee actions required to meet all**

supplemental inspections objectives. Refer to IMC 2505 for additional guidance on holding open findings in the Construction Action Matrix. When continued and follow-up inspections are performed, the inspection scope should normally be limited to verifying only the licensee's actions necessary to meet the remaining unmet supplemental inspections objectives from the previous inspection efforts. Additionally, the licensee should be given an opportunity to correct any identified deficiencies prior to re-inspection. A final supplemental inspection report should be issued when all inspection objectives are met.

Significant weaknesses in the licensee's actions to address a performance issue associated with an inspection finding, including a substantial inadequacy in the licensee's evaluation of the root causes of the original performance issue do not provide the assurance level required to meet the inspection objectives defined in Section 95002-01. General weaknesses associated with the licensee's evaluation of the performance issue shall be briefly described in the transmittal letter and documented as observations in the summary of findings and details sections in the inspection report. New or additional examples of performance issues that are identified during this supplemental inspection or by the licensee during their evaluation should be inspected under the applicable baseline procedure and screened in accordance with IMC 0613, Appendix B, "Issue Screening."

The following inspection requirements are generally applicable for both single and multiple inspection findings. The scope of this inspection should include all white or yellow inspection findings in the associated degraded cornerstone or strategic performance area. For example, if this procedure is being performed due to a yellow finding in the construction/installation systems cornerstone, the inspection scope should also include any white inspection findings in that cornerstone. If the procedure is being performed due to three white findings in the construction reactor safety strategic performance area, then the inspection scope should include all white findings in the construction reactor safety strategic performance area.

If evaluations of multiple performance issues are performed, then it is expected that the licensee's evaluation should address each of the events or occurrences collectively, as well as individually. In those instances where the licensee's evaluation was previously reviewed as part of a supplemental inspection performed in accordance with IP 90001, "Construction Regulatory Response Column Inspections," a re-review of the evaluation during this procedure is not required; however, a review of the licensee's collective evaluation for multiple performance issues would generally need to be performed.

02.01 Problem Identification

- a. Determine that the evaluation documented who identified the issue (i.e. licensee-identified, self-revealing, or NRC-identified) and under what conditions the issue was identified.
- b. Determine that the evaluation documented how long the issue existed and prior opportunities for identification.
- c. Determine that the evaluation documented the impact on the quality of construction (i.e. structure, system, component, etc.) and if applicable, any compliance concerns associated with the issue(s) both individually and collectively.

02.02 Root Cause, Extent of Condition, and Extent of Cause Evaluation

- a. Determine that the problem was evaluated using a systematic methodology to identify the root and contributing causes.
- b. Determine that the root cause evaluation was conducted to a level of detail commensurate with the significance of the problem.
- c. Determine that the root cause evaluation included a consideration of prior occurrences of the problem and knowledge of prior construction experience.
- d. Determine that the root cause evaluation addresses the extent of condition and the extent of cause of the problem.

02.03 Corrective Actions

- a. Determine that appropriate corrective actions are specified for each root and contributing cause or that the licensee has an adequate evaluation for why no corrective actions are necessary.
- b. Determine that the corrective actions have been prioritized with consideration of risk significance and regulatory compliance.
- c. Determine that a schedule has been established for implementing and completing the corrective actions.
- d. Determine that quantitative or qualitative measures of success have been developed for determining the effectiveness of the corrective actions to prevent recurrence.
- e. Determine that the corrective actions planned or taken adequately address the finding that was the basis for the construction supplemental inspection, if applicable.

02.04 Independent Assessment of Extent of Condition and Extent of Cause.

Perform a focused inspection(s) to independently assess the validity of the licensee's conclusions regarding the extent of condition and extent of cause of the issues. In order to accomplish this objective, the inspection team leader should develop a customized inspection plan using the applicable portions of the IP(s) listed in IMC 2501, IMC 2502, IMC 2503, and IMC 2504. The objective should be to independently sample performance, as necessary, to provide assurance that the licensee's evaluation regarding extent of condition and extent of cause is sufficiently comprehensive. The intent is to assess the validity of the licensee's evaluation by independently sampling performance within the key attributes of the cornerstone(s) that are related to the subject performance issue(s); not to re-perform the licensee's evaluation. The results of this review should be documented in the construction supplemental inspection report, including the NRC's assessment of the licensee's evaluation in this area.

02.05 Safety Culture Consideration

Perform a focused inspection to independently determine that the root cause evaluation appropriately considered whether any safety culture **trait** caused or significantly contributed to any **safety significant performance issue**. If a weakness in any safety culture **trait** did cause or significantly contributed to such an issue, and the licensee's evaluation did not recognize that cause or contribution, then refer to IMC 2505.

90002-03 INSPECTION GUIDANCE

General Guidance

This IP is used to assess the adequacy of the licensee's evaluation of **safety** significant performance issues. As such, a reasonable time (generally within 30-60 days) should be allowed for the licensee staff to complete their evaluation (or self assessment for multiple performance issues); however, all corrective actions may not be fully completed upon commencement of the construction supplemental inspection. The inspection should not be scheduled until the licensee has completed its problem identification, evaluation, and corrective action plan. In the event that the licensee has not defined their corrective action plan within a reasonable time, regional management should prompt the licensee to provide the basis for the delay. Implementation of the licensee's corrective actions may be verified during subsequent baseline inspections, such as the **annual** corrective action program **inspection performed** in accordance with IP 35007.

The following guidance is provided to help the inspector fulfill the specific inspection requirements contained in Section 90002-02. It is not intended that the inspector verify that the licensee's evaluation of the performance issues addresses every attribute contained in the inspection guidance section. The intent is that the inspector uses the guidance sections of the procedure to look for weaknesses in the licensee's evaluation that might indicate an issue associated with one of the inspection requirements.

Specific Guidance

Sections 03.01 through 03.03 apply to the licensee's evaluation of both individual and collective issues.

03.01 Problem Identification

- a. The evaluation should state how and by whom the issue was identified. When appropriate, the licensee's failure to identify the problem at a precursor level should be evaluated. Specifically, the licensee's failure to identify a problem before it becomes risk-significant may indicate a more substantial problem. Examples include the licensee's failure to: (1) enter a recognized **adverse condition** into the corrective action program; (2) raise safety concerns to management; or (3) complete corrective actions for a previously identified problem that resulted in further degradation. If the NRC

identified the performance issue, the evaluation should address why the licensee's processes, such as peer review, supervisory oversight, inspection, testing, self-assessments, or quality activities, did not identify the problem.

- b. The evaluation should state when the problem was identified, how long the condition(s) existed, and whether there were prior opportunities for correction. For example, if in the process of closing an ITAAC a significant failure to meet the acceptance criteria is identified and the failure should have been detected by post-construction quality assurance oversight but it was not, the licensee should state the reasons why the testing and quality oversight did not detect the error and the reasons should be included in the problem identification statement and addressed in the root cause evaluation.

03.02 Root Cause, Extent of Condition, and Extent of Cause Evaluation

- a. The licensee's evaluation should generally make use of systematic methods to identify root and contributing causes. The root cause evaluation methods that are commonly used in nuclear facilities include:
 1. Events and causal factors analysis – to identify the events and conditions that led up to an event;
 2. Fault tree analysis – to identify relationships among events and the probability of event occurrence;
 3. Barrier analysis – to identify the barriers that if present or strengthened would have prevented the event from occurring;
 4. Change analysis – to identify changes in the work environment since the activity was last performed successfully that may have caused or contributed to the event;
 5. Management Oversight and Risk Tree (MORT) analysis – to systematically check that all possible causes of problems have been considered;
 6. Critical incident techniques – to identify critical actions that if performed correctly would have prevented the event from occurring or would have significantly reduced its consequences;
 7. Why Staircase – to produce a linear set of causal relationships and use the experience of the problem owner to determine the root cause and corresponding solutions; and
 8. Pareto Analysis – a statistical approach to problem solving to determine where to start an analysis.

| **The licensee** may use other methods to perform root cause evaluations. A systematic evaluation of a problem should normally include:

1. A clear identification of the problem and the assumptions made as a part of the root cause evaluation.

For example, the evaluation should describe the initial status of the particular construction activity, level of quality assurance oversight and training requirements, as applicable.

2. A timely collection of data, verification of data, and preservation of evidence to ensure that the information and circumstances surrounding the problem are fully understood. The analysis should be documented such that the progression of the problem is clearly understood, any missing information or inconsistencies are identified, and the problem can be easily explained or understood by others.

3. A determination of cause and effect relationships resulting in an identification of root and contributing causes which consider potential quality of component/structure, construction processes, and human performance issues. For example:

- (a) Quality of the construction component/structure could include design, materials, systems integration, and environmental conditions;
- (b) Construction process issues could include procedures, work practices, contractor/licensee policies, supervision and oversight, preventive and corrective programs, and quality control methods; and
- (c) Human performance issues could include training, communications, human-system interface, and fitness for duty.

- b. The root cause evaluation should be conducted to a level of detail that is adequate for the significance of the problem. Different root cause evaluation methods provide different perspectives of the problem. In some instances, using a combination of methods helps ensure the analysis is thorough. Therefore, the root cause evaluation should consider evaluating complex problems, which could result in significant consequences, using multi-disciplinary teams and/or different and complimentary methods appropriate to the circumstances. For example, problems that involve a family of ITAAC may be evaluated using barrier analysis, change analysis, or fault trees. The depth of a root cause evaluation is normally achieved by completely and systematically applying the methods of analysis described in Section 03.02.a and by repeatedly asking the question "Why?" about the occurrences and circumstances that caused or contributed to the problem. Once the analysis has developed all of the causes for the problem (i.e., root, contributing, and programmatic), the evaluation should also look for any relationships among the different causes. The depth of the root cause evaluation may be assessed by:

1. Determining that the questioning process appeared to have been conducted until the causes were beyond the licensee's control.

For example, problems that were initiated by an act of nature, such as a lightning strike or tornado, could have the act of nature as one of the causes of the problem. The act of nature would not be a candidate root cause, in part, because the licensee could not prevent it from happening again. However, a licensee's failure to plan for or respond properly to acts of nature would be under management control and could be root causes for the problem.

2. Determining that the problem was evaluated to ensure that other root and contributing causes were not inappropriately ruled out due to assumptions made as a part of the analysis.

For example, a root cause evaluation may not consider the adequacy of the design or process controls for a construction activity if the problem appears to be primarily human performance focused. Consideration of the technical adequacy of the assumptions used in the root cause evaluation and their impact on the root causes would also be appropriate.

3. Determining that the evaluation collectively reviewed all root and contributing causes for indications of more fundamental problems with the quality of construction activities. This is particularly important when the licensee has multiple risk-significant performance issues.

For example, a problem that involved a number of procedural inadequacies or errors may indicate a more fundamental or higher level problem in the processes for procedural development, control, review, and approval. Issues associated with personnel failing to follow procedures may also indicate a problem with supervisory oversight and communication of standards.

4. Determining that the root cause evaluation properly ensures that correcting the causes would prevent recurrence of the same and similar problems. Complex problems may have more than one root cause as well as several contributing causes. The evaluation should include a process to verify that corrective actions for the identified root causes do not rely on unstated assumptions or conditions that are not controlled or ensured.

For example, root cause evaluations that are based on specific type of construction activity may not be valid for all other work process at the site.

5. Determining that the evaluation appropriately considered other possible root causes. Providing a rationale for ruling out alternative possible root causes helps to ensure the validity of the specific root causes that are identified.

- c. The root cause evaluation should include a proper consideration of prior occurrences of the same or similar problems at the construction site and knowledge of prior construction experience. This review is necessary to help develop the specific root and contributing causes and to provide indication as to whether the issue is due to a more fundamental concern involving weaknesses in the licensee's corrective action program.

The licensee's root cause evaluation should:

1. Broadly question the applicability of other similar events or issues with related root or contributing causes.

For example, root cause evaluations associated with failure of a component to pass its acceptance criteria could include a review of prior incidents with the supplier, procurement organization, design requirements, unusual system installations, and infrequently performed evolutions.

2. Determine if previous root cause evaluations and/or corrective actions missed or inappropriately characterized the issues. Determine those aspects of prior corrective actions that did not prevent recurrence of the problem.

For example, the evaluation should review the implementation of the previously specified corrective actions and a reassessment of the identified root causes to determine process or performance errors that may have contributed to the repeat occurrence.

3. Determine if the root cause evaluation for the current problem specifically addresses those aspects of the prior root cause evaluation or corrective actions that were not successfully addressed.

For example, if during the review of a tagging error that resulted in a mis-positioned valve the licensee determines that a previous similar problem occurred and the corrective actions only focused on individual training, then the root cause evaluation for the repeat occurrence should document why the previous corrective actions were inadequate.

4. Include a review of prior documentation of problems and their associated corrective actions to determine if similar incidents have occurred in the past.

For example, the licensee staff should consider the following in their review of prior construction experience: internal self-assessments; quality oversight history; adverse condition reports; and external data bases developed to identify and track construction experience issues. Examples of external databases may include Information Notices, Generic Letters, and vendor/industry generic communications.

The inspectors should discuss the problem and associated root causes with other resident, regional, or headquarters personnel to assess whether previous similar problems or root causes should have been considered.

- d. The root cause evaluation should include a proper consideration of the extent of condition and the extent of cause of the problem and whether other systems, equipment, programs, or conditions could be affected.

1. The extent of condition review should assess the degree that the actual condition (e.g., improperly installed valve, inadequate procedure, improper human action, etc.) may exist in other installed plant equipment, processes, or human performance.
2. The extent of cause review should assess the applicability of the root causes across disciplines or departments to different programmatic activities, human performance, or different types of **equipment**.

For example, the licensee's quality assurance staff considered that the root cause identified for the improper installation of the safety injection system in accordance with approved design could potentially affect the installation of the fire suppression systems because the design documents are reviewed by the same engineering group. As a result, feedback was provided to the incident review committee to enhance the design change control procedure to include the approval of the quality manager and to provide remedial training to personnel performing the installations and the engineering staff to check design documents used are correct.

The extent of condition review differs from the extent of cause review in that the extent of condition review focuses on the actual condition and its existence in other places. The extent of cause review should focus more on the actual root causes of the condition and on the degree that these root causes have resulted in additional weaknesses.

03.03 Corrective Actions

The licensee's proposed corrective actions to the root and contributing causes should:

- a. Address each of the root and contributing causes and any weaknesses associated with the extent of condition and extent of cause of the performance issues. The corrective actions should be clearly defined. Examples of corrective actions may include but are not limited to modifications, inspections, testing, process or procedure changes, and training. The proposed corrective actions should not create new or different problems as a result of the corrective actions. If the licensee determines that no corrective actions are necessary, then the basis for this decision should be documented in the evaluation.
- b. Include consideration of the licensee's risk assessment results of the issue in prioritizing the type of corrective actions chosen. Attention should be given to solutions that involve only changing procedures or providing training because they are sometimes overused. In such cases, consideration should be given to more comprehensive corrective actions such as design modifications. The corrective action plan should also include a review of the regulations to ensure that it achieves compliance if compliance issues exist.
- c. Be assigned to the appropriate individuals or organizations to ensure that the actions are planned or taken in a timely manner. The licensee should also establish a formal tracking mechanism for each of the specific corrective actions.

- d. Establish a method to validate the effectiveness of the overall corrective action plan. Specifically, a method should be established to quantitatively or qualitatively measure the effectiveness of the corrective actions. Effective methods would include but are not limited to assessments, audits, inspections, tests, trending of plant construction data, or follow-up discussions with plant construction personnel.

The licensee's response to a **finding** that directly corresponds with the performance issue that was the basis for the supplemental inspection should address the reason for the violation, corrective actions that have been taken and the achieved results, corrective actions that will be taken, and the date when full compliance was or will be achieved. The adequacy of the corrective actions should be reviewed in accordance with the guidance above to determine if they address the violation.

03.04 Independent Assessment of Extent of Condition and Extent of Cause

The objective of the independent extent of condition review is to ensure that the licensee's evaluation was of sufficient breadth to identify additional issues similar to those for which the supplemental inspection was performed. For example, if the issue was improper installation of rebar due to inadequate **design translation**, the inspectors should sample other rebar to ensure the design requirements are being met before concrete is poured. If the issue was due to an inadequate procedure, the inspectors should sample other procedures to determine their adequacy.

The objective of the independent extent of cause review is to ensure that the licensee's evaluation was of sufficient breadth and depth to identify other plant equipment, processes, or human performance issues that may have been impacted by the root causes of the performance issue. For example, if in the above example the inadequate installation of rebar was due to inadequate oversight from the procurement organization, the inspectors should review other components being accepted by procurement to assess their adequacy. The depth of the extent of cause review should be commensurate with the nature and complexity of the original performance issue. For those instances where multiple issues have been documented, the inspectors should consider performing a broad-based inspection(s) to assess performance across the different work processes. If this IP is being performed due to a single **yellow issue**, a more focused inspection would likely be appropriate.

Consideration should also be given to the comprehensiveness of the licensee's evaluations. In those cases where significant weaknesses are identified in the licensee's evaluations during implementation of Sections 90002-02.01 through 02.03 of this procedure, consideration should be given to performing a more in-depth programmatic review of the licensee's corrective action program.

03.05 Safety Culture Consideration

For the individual and collective **safety** significant performance issues, determine that the root cause evaluation appropriately considered whether a weakness in any safety culture **trait** was a root cause or a significant contributing cause of any **safety**-significant performance issue, as follows:

- a. Confirm that the licensee performed an evaluation and considered all of the safety culture traits listed in IMC 0613, Appendix F, and that a basis exists for the conclusion of whether or not any safety culture trait could reasonably have been a root cause or significant contributing cause of the deficiency.
- b. Review the licensee's evaluation to determine and/or discuss with appropriate personnel whether the root cause methodology considered whether a possible weakness in a safety culture trait could have been a root cause or a significant contributing cause of the deficiency. If so, also verify that the consideration included at least those traits that the inspectors determined could reasonably have been a root cause or a significant contributing cause of the deficiency.
- c. If the licensee did not consider whether a possible weakness in a particular safety culture trait could have been a root cause or a significant contributing cause of the deficiency, and if the inspectors determined that a weakness in the same trait could reasonably have been a root cause or a significant contributing cause of the deficiency, then independently perform an evaluation. The evaluation should be extensive enough to (1) determine whether a weakness in that trait actually was a root cause or a significant contributing cause of the deficiency and (2) establish the relationship between the weakness and the deficiency. If the inspector's evaluation shows that a weakness in a safety culture trait actually was the root cause or a significant contributing cause of the deficiency, and the licensee's evaluation did not recognize that cause or contribution, refer to IMC 2505 to properly disposition the issue (e.g., holding open the associated performance issue past two quarters in the Construction Action Matrix).

90002-04 RESOURCE ESTIMATE

It is estimated that this procedure will take approximately 200 hours to complete. The resources required to complete this procedure will vary greatly depending on the specific procedure(s) chosen to independently assess the validity of the licensee's evaluation of extent of condition and extent of cause, the effectiveness of the licensee corrective action program, and the complexity of the issue(s).

A combination of procedures or portions of procedures as described in Section 02.04 can also be used as appropriate to independently assess the extent of condition and the extent of cause. Inspection hours utilized in fulfilling this inspection requirement should be charged to IP 90002, regardless of the specific procedure(s) chosen for implementation.

95002-05 PROCEDURE COMPLETION

Meeting the inspection objectives defined in Section 90002-01 of this IP will constitute completion. A failure to satisfy this IP's inspection objectives will normally result in continued inspection under this IP and may result in holding open the associated performance issue past two quarters in the Construction Action Matrix. Refer to IMC 2505 for additional information.

END

Attachment 1 – Revision History for IP 90002

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	ML112270533 11/22/2011 CN 11-037	This is an initial issuance	N/A	ML113250189
N/A	ML14231B076 10/28/14 CN 14-026	This revision changed terms related to safety culture to be consistent with IMC 0613, NUREG 2165 and the NRC safety culture policy.	N/A	N/A