

APPENDIX F

EXAMPLES OF CROSS-CUTTING ASPECTS

The examples in this appendix are meant as an aid to demonstrate how to document cross-cutting aspects associated with inspection findings. A more detailed discussion of cross-cutting areas, components, and aspects associated with inspection findings can be found in IMC-0305, "Operating Reactor Assessment Program." Because the causes of inspection findings are unique to each finding, inspectors should use their judgement in deciding which cross-cutting aspect is most appropriate, if any, and inspectors should not rely exclusively on the examples provided in this Appendix. Usually, there should be only one principal cause and one cross-cutting aspect associated with each finding.

Inspectors are not expected to document a cross-cutting aspect for each and every inspection finding. A cross-cutting aspect of an inspection finding should be discussed in the report details if the inspector determines that the cross-cutting aspect of the finding was a significant contributor to the performance deficiency and if the cross-cutting aspect is indicative of current licensee performance.

Inspectors shall not use the existence of a cross-cutting aspect to determine that a finding is greater than minor. Appendix B, "Issue Screening" should be used to determine whether the inspection finding is greater than minor.

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A. Human Performance

1. Decision-Making

Example: Control Room Supervisor (CRS) directed an Instrumentation and Controls (I&C) supervisor to reset a sealed-in relay on the condensate polisher system. The CRS and the I&C supervisor reviewed circuit schematics and decided to momentarily lift the power supply lead to the relay without discussing their planned actions with the engineering department. As a result of lifting this lead, the condensate polisher post-filter bypass valve closed, resulting in all condensate flow to be sent to the condensate polisher. Since the polisher did not have sufficient capacity to handle the full condensate flow, this caused a reduction in main feed pump suction pressure, and subsequent reduction in feed pump speed and flow. The resultant steam and feedwater flow mismatch caused a lowering of steam generator water levels. An automatic reactor trip signal was generated based on the steam flow/feed flow mismatch signal coincident with the low steam generator water level.

The licensee's failure to provide adequate work controls for a troubleshooting activity with the potential to initiate a plant transient or reactor trip was considered a performance deficiency. The licensee did not properly plan and control this maintenance activity in accordance with their IP-XXX-XXX, "Work Control Process," procedure in that the CRS and I&C supervisor treated this activity as "operational maintenance" when it did not meet this definition. This finding is more than minor because the licensee's human performance error of failing to implement appropriate controls for a maintenance activity affected the initiating event cornerstone objective of limiting the likelihood of events that upset plant stability. The finding was determined to have very low safety significance (Green) based on a Phase 1 analysis in accordance with IMC 0609, Appendix A, "Significance Determination of Reactor Inspection Findings for At-Power Situations" because all safety systems were available during the event.

Cross-cutting aspect:

This finding has a cross-cutting aspect in the area of human performance because the licensee did not use a systematic decision-making process and did not obtain interdisciplinary input on a risk-significant decision.

2. Resources

Example: Self-revealing (Green) NCV of 10 CFR 50 Appendix B, 10 CFR 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings,"

was identified because the licensee staff did not accomplish activities affecting quality in accordance with the prescribed station procedure, XX-XX-XXX, "Operability Determinations." Specifically, the licensee failed to declare a component inoperable upon discovery of leakage from a Class 2 component pressure boundary because of an out-of-date design document.

On February 4, 2006, an equipment operator (EO) identified steam leaking from the Unit 2 HPCI steam admission valve. The licensee issued a condition report and a maintenance work request to inspect and repair the suspected packing leak. The following day on February 5, 2006, a system engineer inspected the steam admission valve and determined that the leak was not from the valve packing but was from the leak-off plug. The steam leak from the leak-off plug was discussed with the operations shift personnel and engineering management and operability determinations was performed using, in part, design dwg. XX-XXXXXX, revision 6, which showed that the leak-off plug was outside the ASME Class 2 code boundary. The condition report was also changed to reflect that the leak was from the leak-off plug.

On February 8, 2006, the ASME Code program manager at the corporate office reviewed the condition report written for the HPCI leak and determined that the leakage was through a component within the ASME Code Class 2 pressure boundary. Although the proposed revision 7 to design dwg. XX-XXXXXX correctly showed that the leak-off plug was within the ASME Class 2 code boundary, it had not been approved for use by plant personnel. Revision 7 to the design dwg. XX-XXXXXX was completed in August of 2003, and was in the backlog of engineering dwgs for review and approval by corporate engineering department. Inspectors noted that there were many other open engineering evaluation requests or recommended changes to various engineering documents in the engineering backlog that were more than two years old. Work order (RXXXXXXX) was used to install and seal weld the threaded plug in the 2-MO-14 leakoff port and the licensee entered a 72 hour LCO based on the inoperable train of a unit 2 HPCI system

The licensee's failure to properly evaluate the significance of the steam leak on the unit 2 steam admission valve on the operability of the unit 2 HPCI system was considered a performance deficiency. This finding was determined to be greater than minor because it was associated with the equipment performance attribute (availability of one train of unit 2 HPCI system) and it affected the objective to ensure availability, reliability, and capability of systems that respond to initiating events.

Cross-cutting aspect:

This finding has a cross-cutting aspect in the area of human performance because the licensee did not provide complete, accurate and up-to-date design documentation to plant personnel.

3. Work Control

Example: On February 8, 2006, station personnel completed their biennial preventive maintenance (PM) to clean and inspect the station 125 volt DC battery charger #1. The technicians completed their PM on the battery charger with the exception of checking the cables and connections for degradation, cracks or other signs of damage. The work order did not require inspection of the cables and connections because the license had deferred these inspections and plan to complete inspection of these components during the next biennial inspection of the battery charger. The PM was completed with no identified deficiencies.

On March 15, 2006, the operators received DC battery alarms and determined that the station battery charger #1 had failed. The unit was shutdown when the maintenance technicians were not able to repair and restore the battery charger to service in two hours. The licensee's inspection of the charger identified that all three battery charger output fuses were blown and two leads and a jumper in the inductive-resistive-capacitive filter circuit had degraded insulation with some exposed wire. The licensee's root cause analysis concluded that the condition of the wires was the most likely cause of the charger failure. Similar, but less severe, wire insulation degradation was found on two of the other three battery chargers.

The inspectors determined that the licensee's failure to perform adequate preventive maintenance to detect degradation of station battery charger was a performance deficiency. This finding was determined to be greater than minor because the failure of battery charger #1 is associated with the equipment performance attribute (availability and reliability) and its failure affected the objective to ensure availability, reliability and capability of the 125 volt DC system to respond to initiating events.

Cross-cutting aspect:

This finding has a cross-cutting aspect in the area of human performance because the licensee's planned work activities did not effectively minimize the safety system unavailability and the completed maintenance activity did not effectively support the long-term equipment reliability.

4. Work Practices

Example: A Green finding was identified involving poor maintenance work practices (failure to follow vendor manual instructions) and insufficient contractor oversight (monitoring, quality verification, and knowledge of work activity) which contributed to the failure of the 345 kV output breaker on January 9 and on March 8, 2006. The unit tripped as a result of the failure of 345 kV generator output breaker. In both instances, the licensee's root cause investigations concluded that the breaker failures were directly attributed to inadequately performed maintenance.

Contributing to these failures was the lack of appropriate contractor oversight of the preventive and corrective maintenance activities performed on breaker No. 3. The January 9 failure was traced to a breaker overhaul performed during the Spring 2005 refueling outage. The misalignment of the breaker contacts did not have an immediate impact, but rather caused a degradation of the contact surfaces over time, due to high resistance overheating. The March 2006 failure was the result of improperly conducted corrective maintenance following the January failure. The B phase dielectric was compromised due to moisture in the SF6 gas and contamination of a pull rod assembly caused by the vendor not adhering to the established repair guidance.

The inspectors concluded that poor workmanship and inadequate work practices (failing to follow established vendor instructions) on the part of the contracted vendor; and poor vendor and supervisory oversight of the work on the breaker in the field constituted a performance deficiency. This finding is greater than minor because it is associated with equipment performance attribute (reliability and maintenance of the 345 KV output breaker) and it affected the objective of limiting the likelihood of events that upset plant stability and challenge safety functions at power for the initiating events cornerstone.

Cross-cutting aspect:

This finding has a cross-cutting aspect in the area of human performance because the contracted vendor did not follow established maintenance instructions and the licensee did not ensure supervisory and management oversight of work activities, including contractors, such that nuclear safety was supported.

B. Problem Identification and Resolution

1. Corrective Action Program

Example: The licensee encountered various compatibility and design problems associated with the installation of modified breakers in their 6.9-kV breaker cabinets leading to the failures of an RHR pump to start when required. Several of these issues required modifications to the mechanism-operated cell (MOC) linkage to address operational problems. A similar binding problem on a different breaker had been discovered one year ago, when maintenance technicians discovered a tight shoulder bolt during a receipt inspection. Following a series of failures during post maintenance testing, the vendor found a binding problem (due to bradding in the MOC slide assembly) on one of four breakers the licensee had sent to the vendor for a root-cause analysis.

The vendor suggested either a visual or functional inspection should be conducted on installed breakers with the modification. The vendor stated that a visual inspection was somewhat subjective and therefore, a functional test, which included disconnecting the MOC actuator at its gear drive and exercising it to prove that no binding occurs, was a more accurate method of inspection. The licensee elected to do visual inspections, not the functional tests. Consequently, the binding/bradding problem that led to the failure of RHR Pump was not detected when the licensee personnel performed the visual inspection on the RHR breaker.

The inspectors concluded that the licensee failure to identify and correct a known problem that resulted in the failure of an RHR Pump XX to start on demand was a performance deficiency. This finding was considered more than minor because, given that the breakers were used in both trains of several emergency core cooling system (ECCS) subsystems, the failure to identify and correct a problem that resulted in a pump failure to start on demand could reasonably be viewed as a precursor to a significant event. This finding was also determined to be potentially greater than very low risk significance because the loss of one train of RHR would result in reduced sump recirculation capability following a small or medium break size loss-of-coolant accident and no recirculation capability following the loss of 125-VDC battery.

Cross-cutting aspect:

This finding has a cross-cutting aspect in the area of problem identification and resolution because the licensee failed to thoroughly evaluate a similar problem such that extent of condition was considered and the cause was resolved.

2. Operating Experience

Example: The licensee's preventive maintenance (PM) strategy for the 22 KV electrical system did not effectively include pertinent information from industry operating experience related to inspections of isophase bus bars and flexible connections or the periodic testing of surge arresters or capacitors located in the generator potential transformer cabinets. As a result, degraded conditions on the "B" phase bus bar flexible connection and within the "A" phase surge arrester went undetected resulting in a two-phase electrical fault-to-ground that ignited a fire on top of the main transformer resulting in an automatic reactor scram.

The licensee determined that there were two root causes of this event. The first was that the PM performed on the 22KV isophase bus bars and flexible connections were not adequate because the scope of the PM did not include evaluation of the condition of the bus bars or the condition of the flexible connections. Industry operating experience (OE) indicated the need for inspections of the flexible connectors due to previous failures similar to that experienced at the site. Additional inspections to evaluate the condition of the bus bars and flexible connectors at the site would have allowed for the detection of the degraded flexible connector. The second root cause identified by the licensee was that no testing was performed on the surge arresters or capacitors located in the generator cabinets. Industry OE had revealed that surge arresters degrade over time due to a combination of age, service environment, and service conditions. Periodic testing would have detected degradation and allowed for replacement prior to failure.

The inspectors concluded that the licensee's failure to effectively incorporate operating experience (OE) into the PM strategy for the 22 KV electrical system as required by their procedure XX XXXX, "Preventive Maintenance Program Implementation" was a performance deficiency. Procedure XX XXXX required that PM strategies be developed using, in part, a reliability-based maintenance evaluation process which considers industry, vendor, and plant experience to support continuous improvement of the PM program. The finding was determined to be greater than minor because it is associated with equipment performance attribute (reliability and maintenance of the 22 KV system) and it affected the objective of limiting the likelihood of events that upset plant stability and challenge safety functions at power for the initiating events cornerstone.

Cross-cutting aspect:

This finding has a cross-cutting aspect in the area of problem identification and resolution because the licensee did not effectively incorporate pertinent industry operating experience into the preventive maintenance program for the 22 KV electrical system.

3. Self- and Independent Assessments

Example: Criteria were not established for the acceptability of the diesel generator oil sample collected in the licensee surveillance procedure. Consequently, the licensee failed to promptly investigate the cause of an increasing trend in the No. 3 emergency diesel generator (EDG) lubricating oil silver concentration. On April of 2005, the EDG No. 3 was shutdown during its monthly surveillance due high bearing temperatures. Licensee's investigation into the cause for the failed EDG No. 3 surveillance test found that there were severe damage on seven of the piston wrist pin and piston carrier bearing surfaces. The damage included displacement of the silver surface on the bearing surfaces such that all or some of the lubricating oil channels were blocked. The licensee concluded that prolonged operation would most likely have resulted in catastrophic failure of the engine.

The investigation also revealed that the lubricating oil silver concentration had been steadily increasing since June of 2004. In August of 2004, the lubricating oil concentration reached the vendor recommended range for increased oil sampling. In January of 2005, the lubricating oil concentration reached the vendor recommended range for inspection of the EDG for abnormal wear.

Licensee's review of past surveillances for EDGs found that lubricating oil samples were not always taken or if taken, not analyzed and some oil analyses results were not documented in the surveillances. Additionally, licensee determined that past reviews and self-assessments of the station's oil analyses program lacked sufficient depth, and were not sufficiently comprehensive in that these reviews did not identify that some of the required EDG oil samples had not been performed, no acceptance criteria were established for what constituted acceptable oil samples and EDG oil sample results were not always documented.

The licensee's failure to determine the acceptability of diesel generator oil samples was a performance deficiency. The finding was determined to be greater than minor because the EDG was inoperable for greater than the allowed outage time specified in the plant Technical Specifications.

Cross-cutting aspect:

The finding has a cross-cutting aspect in the area of problem identification and resolution because the station personnel's past reviews and self-assessments of their oil analyses program lacked sufficient depth, and were not sufficiently comprehensive in that these reviews did not identify that some of the required EDG oil samples were not taken, or analyzed and that no acceptance criteria were available and that some oil sample results were not documented.

C. Safety Conscious Work Environment

All inspection findings that involve cross-cutting aspects related to safety conscious work environment must be reviewed by an NRC panel consisting of headquarters and regional staff prior to the issue being documented in an inspection report.

1. Environment for Raising Concerns

Example: On November 15, 2005, pipe fitters were instructed to cut out and sand a section of the RWCU system piping. Although the piping was known to be internally contaminated, the job was conducted “clean” (non-contaminated), and therefore the RWP did not require that workers wear personnel contamination clothing. After cutting through several sections of piping to remove it, the workers left the radiologically protected area. When exiting the area, the workers alarmed the personal contamination monitors at the radiologically protected area (RPA) egress. The licensee found significant skin contamination on one of the workers, and another worker received an intake radioactive material above the licensee’s administrative limits.

Licensee follow up confirmed that the RWP for the job did not require personal protective clothing. Discussions with the health physicist who developed the RWP indicated that he determined that no protective clothing was necessary based on previous RWPs written for removal of the piping that did not require personal protective clothing and the fact that the contamination on the piping was internal. He also indicated that conflicting information existed regarding whether the workers would need to cut the piping to remove it or whether it could simply be unbolted. While he questioned whether protective clothing was needed based on the potential difference in the scope of the work, he did not raise the issue to radiation protection management because the radiation protection supervisor had indicated in the shift turnover meeting that the piping must be replaced on that shift, that the number of questions raised regarding the job had delayed the work, and that further delays would be reflected in job performance reviews.

A finding of very low safety significance was identified for the licensee’s failure to understand and plan the scope of radiological work to be performed. This is a performance deficiency associated with implementation of Technical Specification required procedures for planning and conduct of radiological work. These specifications are to be implemented via the RWP program. The program must provide measures to limit internal and external radiation exposures including protective clothing, respiratory protection, etc., as applicable based on evaluated radiological conditions.

Cross-cutting aspect:

The finding has a cross-cutting aspect in the area of safety conscious work environment because the supervisor's behavior and interaction with the workers adversely impacted the free flow of information related to nuclear safety which significantly contributed to the inadequate planning for the radiological work on the reactor water cleanup system.

Note: For this example, the inspector had to determine:

- < Whether the referenced discussion at the turnover meeting occurred as suggested.
- < If others also interpreted the discussion to have an impact on SCWE (e.g., suppressing concerns which would slow job completion)

It is important to note that this constitutes inspection activity, and is not an allegation follow up activity. In this instance, the activity directly relates to an event and inspection follow up of that event. The focus of the inspection follow up is on the outcome of the supervisor's words (i.e., altered work environment, actions or changed paths) rather than supervisor's intent. Concerns regarding intent of the supervisor (e.g., willfulness) would be appropriate for follow up under the allegations program.

2. Preventing, Detecting, and Mitigating Perceptions of Retaliation

Example: On October 1, 2005, the licensee identifies a leak in the feedwater system near the "A" flow control valve. Licensee evaluation of the root cause of the leak determined that stresses on the piping likely contributed to the failure. Inspector review of the design documentation for the system indicates that a the value used in the design documentation for the assumed stresses on the piping did not consider all of the actual stresses on the piping. During discussions with a design engineer, the inspector determines that the engineer was concerned about potential additional stresses on the piping beyond those considered in the design documents, but did not raise the issue because another engineer was recently disciplined for raising a safety issue . The inspector also finds that the licensee had in fact disciplined an individual after he raised a safety issue, but for tardiness. However, the licensee had not reiterated the tardiness policy or its support for raising safety issues to mitigate this perception.

The licensee's failure to ensure 10 CFR 50, Appendix B Criterion III design control measures for verifying the adequacy of design, is a performance deficiency. The deficiency is more than minor since it affected the objective of limiting the likelihood of events that upset plant stability and challenge safety functions at power for the initiating events cornerstone.

Cross-cutting aspect:

This finding has a cross-cutting aspect in safety conscious work environment because the licensee's failure to mitigate potential chilling effects of disciplinary actions on individuals' willingness to raise safety concerns substantially contributed to improper consideration of stresses on a system during development of design documentation. The information gathered indicated that the adverse action against the other individual actually occurred and could have reasonably affected individuals' willingness to raise issues based on an ineffective communication to mitigate the perception.

ATTACHMENT

Revision History - Appendix F to IMC 0612

Commitment Tracking Number	Issue Date	Description of Change	Training Needed	Training Completion Date
N/A	06/22/06 CN 06-015	Initial issuance of Appendix F to IMC 0612 which provides how to document cross-cutting aspects of inspection findings based on changes made to IMC- 305 by the safety culture working group.	YES	07/01/2006