

NRC INSPECTION MANUAL

IQMB

INSPECTION PROCEDURE 62700

MAINTENANCE PROGRAM IMPLEMENTATION

PROGRAM APPLICABILITY: 2515

CORNERSTONES: Initiating Events
 Mitigating Systems
 Barrier Integrity.

62700-01 INSPECTION OBJECTIVES

01.01 To verify that maintenance activities for structures, systems, and components (SSCs) are being conducted in a manner that results in the reliable and safe operation of the plant.

01.02 To supplement the maintenance rule implementation procedure (IP 71111.12) and maintenance risk assessment and emergent work control procedure (IP 71111.13).

01.03 To perform inspections following an event caused by maintenance problems or as otherwise directed by NRC management.

01.04 To take a risk-informed performance-based or results-based approach to the inspection of maintenance activities by using plant or equipment performance data to focus inspection activities.

01.05 To evaluate maintenance by observing ongoing maintenance activities or by reviewing and evaluating maintenance history and equipment or plant performance.

62700-02 INSPECTION REQUIREMENTS

This procedure is implemented to independently assess licensee conclusions regarding extent of condition of issues, when selected as a part of supplemental inspections using IP 95002, " Inspection For One Degraded Cornerstone or Any Three White Inputs in a Strategic Performance Area."

02.01 Review licensee corrective action documentation, event reports, plant operating history, equipment operating history, and maintenance records to identify equipment maintenance problems that may have occurred in the following categories:(Particular emphasis

should be placed on those SSC covered by the licensee's Maintenance Rule Program in the high risk significant areas.)

- a. Equipment that has a history of recurring problems.
- b. Equipment whose failure resulted in a safety system actuation or plant shutdown.
- c. Equipment whose failure resulted in reduced system capability.

02.02 For those items identified in section 02.01 above, for which the inspector has determined that the problem may be caused by inadequate maintenance, attempt to identify the cause by performing some or all of the reviews described in steps 02.02.a through 02.02.g below. (If the problems are identified by the maintenance rule program, then the inspector should select several licensee identified problems, such as from LERs and from operating experience, for further detailed inspection. Also, it is noted that any "maintenance problem" has as element of inadequate maintenance in it.)

- a. Evaluate the adequacy of pre-job planning by reviewing available records or questioning responsible licensee personnel to determine if the licensee performed the following pre-job planning activities:
 1. Reviewed plant machinery history or industry operating data for similar equipment failures.
 2. Reviewed vendor technical manuals and incorporate appropriate vendor recommendations into maintenance procedures.
 3. Obtained engineering support, when needed, to address complex maintenance issues.
 4. Prepared written procedures, where necessary, to perform complex maintenance activities.
 5. Reviewed post-maintenance and/or post-modification system test alignments and control for exiting those alignments.
 6. Used formal root-cause analysis methods, as necessary, to identify the causes of maintenance failures.
 7. Identified special skills or qualifications, special tools and equipment, or spare parts needed to perform the maintenance activity.
 8. Assessed the total equipment out of service to determine the overall effect on safety of performing the planned maintenance activity.
- b. Determine if the work package (work request, maintenance procedure, tag-out, etc.) prepared for the maintenance activity addressed the elements listed below.

1. The procedure conforms to the licensee's administrative requirements for format, approval, and control.
2. The procedure specifies post-maintenance testing that is appropriate for the repairs made.
3. Inspection hold points, independent verification points, or appropriate peer reviews are identified in the procedure or in a documented plan and are appropriate for the activity.
4. Supplementary reference materials, such as drawings and technical manuals, are adequate, controlled, and up to date.
5. The work activities are described in a level of detail that is commensurate with the complexity of the maintenance activity.
6. Consideration is given to cleanliness requirements and personnel hazards such as chemical, radiological, temperature, pressure, and electrical hazards.
7. Provisions for fire protection, and security are included.
8. Instructions and quality control checks are included to verify that environmentally qualified equipment is properly protected against moisture intrusion when reassembled and that proper EQ material, especially elastomers, have been installed.
9. Provisions for control of equipment, including lifted leads, jumpers, bypasses, and mechanical blocks are included.
10. Provisions for obtaining formal approval from operations are included, as well as methods for notifying operations when affected systems are removed from service, ready to be restored to normal service, or if problems are encountered.
11. Provisions for material, parts, and tool accountability to ensure loose items are not inadvertently left inside equipment after the work is complete.
12. Provisions for procedure or standard task prerequisites, such as scaffold engineering evaluations and requests, breach of fire/air/radiation barriers, and radiation protection requirements, are included. Breach of barriers may be a Technical Specification requirement.
13. Replacement parts for a given job will be properly controlled and identified for its end-use (ANSI N18.7 of the licensee's Topical Report, Technical Requirements Manual/Chapter 17 of Final Safety Analysis Report (TR/FSAR)).

c. Review the completed work package (work request, maintenance procedure, tag-out, etc.) for the selected work activity to determine whether:

1. Required administrative approvals were obtained before beginning the work.
2. Technical Specification limiting conditions for operation were met while the component or system was removed from service.
3. Approved procedures were used if the activity appeared to exceed the normal skills possessed by qualified maintenance personnel.
4. Quality control (QC) inspections were made in accordance with the licensee's requirements, and QC records were completed.
5. Functional testing and calibrations were completed and test data was reviewed by supervision and verified to meet all Technical Specifications and licensee acceptance criteria before returning the equipment to service.
6. Personnel who performed the tests were properly qualified and trained for special tests.
7. Activities performed by outside contractors were controlled in accordance with the licensee's approved quality assurance program or a licensee-approved QA program commensurate with the activity.
8. System failures that necessitated the maintenance were evaluated and reported in accordance with 10 CFR 50.73, if required.
9. Corrective and preventive maintenance records were updated, assembled, and stored as part of the maintenance history. Information added to industry-wide databases as appropriate (e.g. NPRDS).
10. Measuring and test equipment (M&TE) used was identified within calibration date limits, and appropriate for its end-use.
11. Parts and materials used were identified and at least met the specifications of the original equipment. Appendix B requirements were met or commercial grade dedication was completed where required.
12. Special processes were controlled and documented.
13. System lineups were made and verified before returning the system to service. Retests were completed and any out-of-specification test results were appropriately addressed.

- d. Determine if M&TE was appropriate for critical measurements affecting equipment operability. Review those M&TE records to verify:
 - 1. The M&TE was in calibration at the time of use.
 - 2. The calibration of the M&TE can be traced to nationally recognized standards.
 - 3. The M&TE is properly stored, controlled, identified with a unique number, and labeled with calibration status.
 - 4. M&TE is calibrated against standards that have an accuracy that is better than or equal to the instrument being calibrated.

- e. Review the calibration records for safety-related plant instruments, preferably those associated with the selected maintenance activity. Include at least one instrument that was not specifically required to be calibrated by technical specifications (TS), but was relied upon during the performance of a TS surveillance test. Verify the following:
 - 1. The instrument calibration history is kept up to date.
 - 2. The calibration of these instruments is traceable to nationally recognized standards and the calibration accuracy ratio is in accordance with generally accepted industry standards.
 - 3. The person who calibrated these instruments is clearly identified and qualified to perform the calibration.
 - 4. An approved procedure was used to perform the calibration.

- f. Review the preventive maintenance program and verify the following:
 - 1. Preventative maintenance (PM) activities are performed as scheduled. When not performed as scheduled, management controls are followed to defer and/or reschedule the PM.
 - 2. Equipment failures should be evaluated to determine if the preventive maintenance program could be changed to prevent future failures.
 - 3. Preventive maintenance procedures are available and are sufficiently detailed.
 - 4. A lubrication control system is available and kept up to date.
 - 5. Preconditioning equipment prior to testing is controlled and does not ensure success of testing.

- g. Check whether the licensee has appropriately considered the prioritization, timing of repairs, and managing of maintenance work items backlog.

02.03 Select a number of corrective and preventive maintenance activities that are in progress, preferably those that are related to problem components or systems. For the maintenance activities selected, verify the following:

- a. Maintenance personnel assigned understand the scope of the task.
- b. Applicable parts of items 02.02.b and 02.02.c are satisfied for the work in progress.
- c. The maintenance personnel are qualified for their respective tasks.
- d. Supervisory oversight of the work is adequate.
- e. QC personnel assigned are knowledgeable of the task.
- f. Apparent cause of failure appears to be addressed by appropriate corrective action, including measures to prevent recurrence.
- g. Personnel are following up-to-date procedures.
- h. Appropriate health physics support available.

62700-03 INSPECTION GUIDANCE

General Guidance

Use this procedure in conjunction with the requirements of the maintenance rule, 10 CFR 50.65 (see IP 62706, IP71111.12 and IP 71111.13 when inspecting those activities associated with SSCs identified as having poor performance by the licensee's monitoring program. See IP 62706 for additional details on cause determination analyses, corrective actions, goal setting and monitoring needed to improve SSC performance. The results of risk-informed, performance-based inspections may reveal maintenance program implementation concerns.

Evaluate the significance of the event, performance of safety systems, and actions taken by the licensee. Determine whether goals established for the performance of SSCs are commensurate with safety, and where practical, industry-wide experience was applied.

Data collection should be directed to those measures related to safety-significant aspects of the maintenance process, including determining whether goals established for the performance of SSCs

are commensurate with safety, and whether practical industry -wide experience was applied.

As appropriate, review provisions established to track unavailability time, and evaluate maintenance activities for identification of maintenance preventable functional failures as defined in Regulatory Guide 1.160 revision 2 and NUMARC 93-01, Revision 2.

The inspector should be aware that additional guidance is available for evaluating any human performance problems observed during the inspection. IP 71841 and Human Performance Investigation Process (NUREG-CR 5455) provide additional guidance.

Inspection requirements listed in Section 62700-02 describe the maintenance elements to be considered by the inspector in completing this aspect of the inspection program and in arriving at conclusions with regard to the objectives of the inspection procedure. Depending on the inspection entry point, i.e., the reason the management has invoked the use of this IP, IP sections may be used to concentrate on featured results-based activities. Additional specific guidance is described below.

As with all inspection procedures, the inspector is not required to complete all the inspection requirements listed in 02.01, nor be limited to those inspection requirements. The inspector may choose to explore any aspect of maintenance that appears to warrant further review.

Specific Guidance

The specific guidance listed below provides additional information intended to clarify the inspection requirements listed in paragraphs 02.01, 02.02, and 02.03. The designations used below correspond to the letters used in paragraph 62700-02 (i.e., paragraph 03.01 provides specific inspection guidance for inspection requirement 02.01). The inspection shall emphasize reviewing those activities associated with SSCs identified as having poor performance by the licensee's monitoring program established to comply with the requirements of the maintenance rule, 10 CFR 50.65 (see IP 62706, IP71111.12 and IP 71111.13).

03.01 The number of equipment maintenance problems selected for review by the inspector will depend on the number of inspection hours allotted for the task by regional management and the scope and complexity of the maintenance tasks selected for review. The inspector will focus the inspection on what appears to be the most severe problem area and continue until the problem has been resolved. The inspector will then focus on the next problem area until that is resolved satisfactorily. There is no minimum number of problems that must be inspected during each inspection. If the inspector identifies a problem that cannot be resolved during the planned inspection period, the inspector will advise regional management that additional inspection hours should be allotted to resolve the issue.

03.02 If the plant equipment performs reliably and remains capable of performing its intended functions, there may be no need for the inspector to further examine the licensee's program or procedures by performing steps 02.02.a through 02.02.f. The inspector should perform only those steps that are appropriate considering plant and equipment reliability.

- a. Licensees are not required to perform all of the activities listed in section 02.02.a (1-6) as part of the pre-job planning for all maintenance activities. However, the inspector should expect that the licensees had performed those pre-job planning activities that were appropriate considering the complexity and scope of the maintenance activity.

a.1 No inspection guidance.

- a.2 While it is required for licensees to obtain and review vendor technical information, it is not required that all vendor recommendations be incorporated into the licensee's maintenance program. If the licensee determines that a vendor recommendation is not appropriate, the licensee may decide to disregard it. However, if equipment problems result in unacceptable loss of essential function, determine if vendor recommendations that could have precluded the problems were adequately implemented. Salem Readiness Assessment Team Inspection report 50-311/97-80 provides examples of potential vendor manual focal points. [Sections 3.3.5 and 3.4.5: are available on the external NRC web site]

Verify that the licensee has established an adequate vendor interface program. Additional information on this subject is provided in Generic Letter 90-03, "Relaxation of Staff Position in Generic Letter 83-28, Item 2.2 Part 2, 'Vendor Interface For Safety-Related Components,' dated March 14, 1990."

a.3-8 No inspection guidance.

- b. Licensees are not required to address all of the elements listed in section 02.02.b (1-11). The work package should be tailored to the complexity and scope of the maintenance activity. The inspector should expect that the appropriate elements were addressed by the licensee.

To assess the general control of maintenance activities, the scope of work packages reviewed can be expanded outside the items identified in 02.01. It is not necessary to review each work package selected against each of the criteria specified. It is left to the discretion of the inspector to ensure that a sufficient number of work packages are checked to develop some confidence that the individual attributes specified are being adequately addressed by the licensee. Because of the administrative complexity of maintenance work packages, avoid emphasizing nonrecurring minor administrative deficiencies, such as missing dates and incomplete forms. These minor issues must be brought to the attention of the

licensee but should not distract the inspector from evaluating the overall effectiveness of the licensee's maintenance activities.

- b.1 Regulatory Guide 1.33 provides exception for the generation of maintenance procedures for activities such as gasket replacement, troubleshooting of electrical circuits, etc. This is based on the assumption that these activities are part of the basic skills possessed by qualified maintenance personnel. The licensee should have guidance as to the level of detail required for steps in a maintenance procedure. Site maintenance training and administrative procedures should define what is "skill of the craft." This writer's guidance should have several sources of input such as INPO and/or EPRI. ANSI N18.7, Section 5.0, and the licensee's Technical Specifications have general procedure content requirements. Basic skill failures should be investigated as maintenance training program issues.
- b.2 As specified by the licensee's procedures, appropriate post maintenance or modification testing will be performed. Examples of required testing are: replacement component and weld testing should be in accordance with the code of record; modifications may require revised code of record testing; preservice and/or Inservice (ISI and IST) tests may be required under ASME Code Section XI with possible code exemptions; augmented ISI testing may be required due to commitments; and functional tests should be detailed in the work packages. In some instances, the standard component or system surveillance tests may not be sufficient to establish functionality (e.g., on a pump impeller or casing replacement). Special test prerequisites and system alignments should be detailed in the package.
- b.3-5 No inspection guidance.
- b.6 Work controls should have specified or general site procedures should account for foreign material exclusion, chemical controls, and hazard checks. The general site instructions are often required to be in the work packages as standing, standard written instructions (to reduce a memory burden). Foreign material controls should be clear in their intent to prevent material entry. Inspections such as quality control hold points for cleanliness should occur prior to closure of boundaries (e.g., valve or pump reassembly). Chemicals should be clearly marked and controlled from use in specific applications (e.g., halide containing water or cutting fluids should not be used on primary internals or stainless steels). Zero power checks should be standard training or a standing instruction prior to performance of electrical work.
- b.7 No inspection guidance.
- b.8 The June 1984 AEOD report, AEOD/C402, "Operating Experiences Related to Moisture Intrusion in Electrical Equipment at Commercial Power Reactors," studied failures of environmen-

tally qualified electrical devices in mild environments. In most cases these failures resulted from moisture intrusion that was often caused by improper reassembly of enclosures following maintenance or surveillance activities. Therefore, maintenance programs should include adequate controls to ensure the restoration of vapor barriers, gaskets, and seals to an environmentally qualified condition.

b.9-13 No inspection guidance.

c.1-4 No inspection guidance.

c.5 As required by ANSI N45.2 and N18.7 (from the licensee's Technical Requirements Manual/FSAR), testing and its status shall be controlled. Test equipment and instruments specific for the testing should be clearly identified. Test acceptance criteria shall be in the package along with sign off locations and appropriate review requirements. Test deficiencies shall be properly evaluated generally through the corrective action program. Equipment status should be known and documented prior to return to service.

c.6 No inspection guidance.

c.7 Depending on the entry point to this IP, contractor activities that are under 10CFR50, Appendix B, and the licensee's Quality Assurance Program may require detailed inspection. See licensee's TR/FSAR for the original standards' requirements. Examples of contractor control problems are described in various Information Notices, such as IN 94-13 (though supplement 2) and IN 80-26.

c.8-10 No inspection guidance.

c.11 Replacement parts, whether purchased, manufactured, or fabricated, should at least meet the specifications and requirements of the original equipment. In some cases, however, reanalysis of accident conditions may result in more severe environmental conditions than those to which the original equipment was procured. This would require the upgrade of replacement parts to withstand the more severe environmental conditions. Therefore, ensure that the documented basis for the environmental qualification of replacement parts correctly reflects the environmental conditions resulting from the revised accident analysis.

c.12-13 No inspection guidance.

d.1-3 No inspection guidance.

d.4 Calibration of M&TE should be against standards that have an accuracy of at least four times the required accuracy of the equipment being calibrated or, when this is not possible, have an accuracy that assures the equipment being calibrated will be within required tolerance and that the basis of acceptance is documented and approved.

- e. Assistance in selecting the instrument records to be reviewed can be gotten from the licensee's quality list, from the instrument index, or through personnel interviews. The instruments selected should be considered to be safety-related based on their function rather than the fact that they provide a safety-related pressure boundary, such as for an ASME Code class piping system.

f-g. No inspection guidance.

03.03 The inspector will consider safety significance when selecting maintenance activities for observation. Choose components that have had problems or activities, such as inadequate training or procedures, that have resulted in maintenance problems. Evaluate the rate of failures, not just the number of failures. The plant-specific probabilistic risk assessment (PRA) or individual plant examination (IPE) can provide information on the risk significance of plant equipment.

a-c. No inspection guidance.

- d. Adequate supervision by experienced personnel of maintenance work in progress is considered to be an essential element of an effective maintenance program. Through interviews with supervisory and nonsupervisory maintenance personnel, determine whether maintenance supervisors, such as foremen, have enough time available to supervise work in progress and whether the intended amount of supervision is actually taking place.

e-h. No inspection guidance.

62700-04 RESOURCE ESTIMATE

The resource estimate for this inspection procedure is approximately 64 hours of direct inspection effort.

62700-05 REFERENCES

U.S. Code of Federal Regulations, "Requirements for monitoring the effectiveness of maintenance at nuclear power plants," 10 CFR 50.65.

U.S. NRC, "Monitoring the Effectiveness at Nuclear Power Plants," Regulatory Guide 1.160.

Nuclear Management and Resources Council, "Industry Guideline for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," NUMARC 93-01.

ANSI 18.7/ANS 3.2, "Administrative Controls and Quality Assurance for the Operational Phase of Nuclear Power Plants"

END