XI.M32   ONE-TIME INSPECTION

Program Description

A one-time inspection of selected components is used to verify the system-wide effectiveness of an aging management program (AMP) that is designed to prevent or minimize aging to the extent that it will not cause the loss of intended function during the period of extended operation. For example, effective control of water chemistry under the XI.M2, "Water Chemistry," program can prevent some aging effects and minimize others. However, there may be locations that are isolated from the flow stream for extended periods and are susceptible to the gradual accumulation or concentration of agents that promote certain aging effects. This program provides inspections that verify that unacceptable degradation is not occurring. It also may trigger additional actions that ensure the intended functions of affected components are maintained during the period of extended operation.

The program verifies the effectiveness of an AMP and confirms the insignificance of an aging effect. Situations in which additional confirmation is appropriate include (a) an aging effect is not expected to occur, but the data are insufficient to rule it out with reasonable confidence; or (b) an aging effect is expected to progress very slowly in the specified environment, but the local environment may be more adverse than generally expected. For these cases, confirmation demonstrates that either the aging effect is not occurring or that the aging effect is occurring very slowly and does not affect the component's or structure's intended function during the period of extended operation based on prior operating experience data.

This program does not address Class 1 piping less than nominal pipe size (NPS) 4. That piping is addressed in AMP XI.M35, "One Time Inspection of ASME Code Class 1 Small Bore-Piping."

The elements of the program include (a) determination of the sample size of components to be inspected based on an assessment of materials of fabrication, environment, plausible aging effects, and operating experience; (b) identification of the inspection locations in the system or component based on the potential for the aging effect to occur; (c) determination of the examination technique, including acceptance criteria that would be effective in managing the aging effect for which the component is examined; and (d) evaluation of the need for follow-up examinations to monitor the progression of aging if age-related degradation is found that could jeopardize an intended function before the end of the period of extended operation.

An acceptable (one-time inspection) program to verify system-wide effectiveness of an AMP may consist of a one-time inspection of selected components and susceptible locations in the selected system. Verification may include a review of routine maintenance, repair, or inspection records to confirm that selected components have been inspected for aging degradation and that significant aging degradation has not occurred. A one-time inspection program is acceptable to verify the effectiveness of AMP XI.M2, "Water Chemistry"; AMP XI.M30, "Fuel Oil Chemistry"; and AMP XI.M39, "Lubricating Oil Analysis," programs or where the environment in the period of extended operation is expected to be equivalent to that in the prior 40 years and for which no aging effects have been observed. However, one-time inspection for environments that do not fall in the above category, or of any other action or program created to verify the effectiveness of an AMP and confirm the absence of an aging effect, is to be reviewed by the staff on a plant-specific basis.

This program cannot be used for structures or components with known age-related degradation mechanisms or when the environment in the period of extended operation is not expected to be equivalent to that in the prior 40 years. Periodic inspections should be proposed in these cases.

Evaluation and Technical Basis

1. *Scope of Program:* The scope of this program includes systems and components that are subject to aging management using the GALL AMPs XI.M2, "Water Chemistry"; XI.M30, "Fuel Oil Chemistry"; and XI.M39, "Lubricating Oil Analysis," and for which no aging effects have been observed or for which the aging effect is occurring very slowly and does not affect the component's or structure's intended function during the period of extended operation based on prior operating experience data. The scope of this program also may include other components and materials where the environment in the period of extended operation is expected to be equivalent to that in the prior 40 years and for which no aging effects have been observed.

   The program cannot be used for structures or components subjected to known age-related degradation mechanisms or when the environment in the period of extended operation is not expected to be equivalent to that in the prior 40 years. Periodic inspections should be proposed in these cases.

2. *Preventive Actions:* One-time inspection is a condition monitoring program. It does not include methods to mitigate or prevent age-related degradation.

3. *Parameters Monitored/Inspected:* The program monitors parameters directly related to the age-related degradation of a component. Examples of parameters monitored and the related aging effect are provided in the table in Element 4, below. Inspection is performed using a variety of nondestructive examination (NDE) methods, including visual, volumetric, and surface techniques.

4. *Detection of Aging Effects:* Elements of the program include (a) determination of the sample size of components to be inspected based on an assessment of materials of fabrication, environment, plausible aging effects, and operating experience; (b) identification of the inspection locations in the system or component based on the potential for the aging effect to occur; and (c) determination of the examination technique, including acceptance criteria that would be effective in managing the aging effect for which the component is examined. Where practical, the inspection includes a representative sample of the system population and focuses on the bounding or lead components most susceptible to aging due to time in service, and severity of operating conditions. For components managed by the AMP XI.M2, Water Chemistry"; AMP XI.M30, "Fuel Oil Chemistry"; and AMP XI.M39, "Lubricating Oil Analysis," programs, a representative sample size is 20% of the population (defined as components having the same material, environment, and aging effect combination) or a maximum of 25 components. Otherwise, a technical justification of the methodology and sample size used for selecting components for one-time inspection should be included as part of the program's documentation.

   The program relies on established NDE techniques, including visual, ultrasonic, and surface techniques. Inspections are performed by personnel qualified in accordance with site procedures and programs to perform the type of examination specified. For code components, examinations should follow procedures consistent with the American Society

of Mechanical Engineers (ASME) Code[16] and 10 CFR Part 50, Appendix B. For non-code components, examinations should follow site procedures that include requirements for items such as lighting, presence of protective coatings, and cleaning processes that ensure an adequate examination. In addition, a description of Enhanced Visual Examination (EVT-1) is found in Boiling Water Reactor Vessel and Internals Project (BWRVIP)-03 and Materials Reliability Program (MRP)-228.

The inspection and test techniques shall have a demonstrated history of effectiveness in detecting the aging effect of concern. Typically, the one-time inspections shall be performed as indicated in the following table.

Examples of Parameters Monitored or Inspected and Aging Effect for Specific Structure or Component[17]			
Aging Effect	**Aging Mechanism**	**Parameter(s) Monitored**	**Inspection Method[18]**
Loss of Material	Crevice Corrosion	Surface Condition, Wall Thickness	Visual (VT-1 or equivalent) and/or Volumetric (ultrasonic testing [UT])
Loss of Material	Galvanic Corrosion	Surface Condition, Wall Thickness	Visual (VT-3 or equivalent) and/or Volumetric (UT)
Loss of Material	General Corrosion	Surface Condition, Wall Thickness	Visual (VT-3 or equivalent) and/or Volumetric (UT)
Loss of Material	MIC	Surface Condition, Wall Thickness	Visual (VT-3 or equivalent) and/or Volumetric (UT)
Loss of Material	Pitting Corrosion	Surface Condition, Wall Thickness	Visual (VT-1 or equivalent) and/or Volumetric (UT)
Loss of Material	Erosion	Surface Condition, Wall Thickness	Visual (VT-3 or equivalent) and/or Volumetric (UT)
Reduction of Heat Transfer	Fouling	Tube Fouling	Visual (VT-3 or equivalent)
Cracking	SCC or Cyclic Loading	Surface Condition, Cracks	Enhanced Visual (EVT-1 or equivalent) or Surface Examination (magnetic particle, liquid penetrant) or Volumetric (radiographic testing or UT)

With respect to inspection timing, the sample of components inspected before the end of the current operating term needs to be sufficient to provide reasonable assurance that the aging effect will not compromise any intended function during the period of extended operation. Specifically, inspections need to be completed early enough to ensure that the aging effects that may affect intended functions early in the period of extended operation are appropriately managed. Conversely, inspections need to be timed to allow the inspected components to attain sufficient age to ensure that the aging effects with long incubation

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[16] Refer to the GALL Report, Chapter I, for application of other editions of the ASME Code, Section XI.
[17] The examples provided in the table may not be appropriate for all relevant situations. If the applicant chooses to use an alternative to the recommendations in this table, a technical justification should be provided as an exception to this AMP. This exception should list the AMR line item component, examination technique, acceptance criteria, evaluation standard, and a description of the justification.
[18] Visual inspection may be used only when the inspection methodology examines the surface potentially experiencing the aging effect.

periods (i.e., those that may affect intended functions near the end of the period of extended operation) are identified. Within these constraints, the applicant should schedule the inspection no earlier than 10 years prior to the period of extended operation and in such a way as to minimize the impact on plant operations. As a plant will have operated for at least 30 years before inspections under this program begin, sufficient time will have elapsed for any aging effects to be manifested.

5. *Monitoring and Trending:* This is a one-time inspection program. Monitoring and trending are not applicable.

6. *Acceptance Criteria:* Any indication or relevant conditions of degradation detected are evaluated. Acceptance criteria may be based on applicable ASME or other appropriate standards, design basis information, or vendor-specified requirements and recommendations. For example, ultrasonic thickness measurements are compared to predetermined limits.

7. *Corrective Actions:* Unacceptable inspection findings are evaluated in accordance with the site's corrective action process to determine appropriate corrective actions and the need for subsequent (including periodic) inspections under another AMP. Site quality assurance (QA) procedures, review and approval processes, and administrative controls are implemented in accordance with the requirements of 10 CFR Part 50, Appendix B. As discussed in the Appendix for GALL, the staff finds the requirements of 10 CFR Part 50, Appendix B, acceptable to address the corrective actions, confirmation process, and administrative controls.

8. *Confirmation Process:* Confirmation processes to ensure that preventive actions are adequate and that appropriate corrective actions have been completed and are effective are implemented through the site QA program in accordance with the requirements of 10 CFR Part 50, Appendix B.

9. *Administrative Controls:* Administrative controls to provide a formal review and approval for corrective actions are implemented through the site QA program in accordance with the requirements of 10 CFR Part 50, Appendix B.

10. *Operating Experience:* The elements that comprise inspections associated with this program (the scope of the inspections and inspection techniques) are consistent with industry practice. An applicant's operating experience with detection of aging effects should be adequate to demonstrate that the program is capable of detecting the presence or noting the absence of aging effects in the components, materials, and environments where one-time inspection is used to confirm system-wide effectiveness of another preventive or mitigative AMP.

References

10 CFR Part 50, Appendix B, *Quality Assurance Criteria for Nuclear Power Plants*, Office of the Federal Register, National Archives and Records Administration, 2009.

10 CFR 50.55a, *Codes and Standards*, Office of the Federal Register, National Archives and Records Administration, 2009.

ASME Section XI, *Rules for Inservice Inspection of Nuclear Power Plant Components*, The ASME Boiler and Pressure Vessel Code, 2004 edition as approved in 10 CFR 50.55a, The American Society of Mechanical Engineers, New York, NY.

BWRVIP-03 (EPRI 105696- R6), *BWR Vessel and Internals Project: Reactor Pressure Vessel and Internals Examination Guidelines*, January 6, 2004, Final Safety Evaluation Report by the Office of Nuclear Reactor Regulation, June 2008.

MRP-228, *Materials Reliability Program: Inspection Standard for PWR Internals*, 2009.