XI.M26 FIRE PROTECTION

Program Description

For operating plants, the Fire Protection aging management program (AMP) includes a fire barrier inspection program. The fire barrier inspection program requires periodic visual inspection of fire barrier penetration seals; fire barrier walls, ceilings, and floors; and periodic visual inspection and functional tests of fire-rated doors to ensure that their operability is maintained. The AMP also includes periodic inspection and testing of the halon/carbon dioxide (CO_2) fire suppression system.

Evaluation and Technical Basis

1. ***Scope of Program:*** This program manages the effects of loss of material and cracking, increased hardness, shrinkage and loss of strength on the intended function of the penetration seals; fire barrier walls, ceilings, and floors; other fire resistance materials (e.g., flamastic, 3M fire wrapping, spray-on fire proofing material, intumescent coating, etc.) that serve a fire barrier function; and all fire-rated doors (automatic or manual) that perform a fire barrier function. It also manages the aging effects on the intended function of the halon/CO_2 fire suppression system.

2. ***Preventive Actions:*** This is a condition monitoring program. However, the fire hazard analysis assesses the fire potential and fire hazard in all plant areas. It also specifies measures for fire prevention, fire detection, fire suppression, and fire containment and alternative shutdown capability for each fire area containing structures, systems, and components important to safety.

3. ***Parameters Monitored/Inspected:*** Visual inspection of not less than 10% of each type of penetration seal is performed during walkdowns. These inspections examine any sign of degradation, such as cracking, seal separation from walls and components, separation of layers of material, rupture and puncture of seals that are directly caused by increased hardness, and shrinkage of seal material due to loss of material. Visual inspection of the fire barrier walls, ceilings, and floors and other fire barrier materials detects any sign of degradation, such as cracking, spalling, and loss of material caused by freeze-thaw, chemical attack, and reaction with aggregates that could affect their intended fire protection function. Fire-rated doors are visually inspected to detect any degradation of door surfaces.

   The periodic visual inspection and function test are performed to examine for signs of corrosion that may lead to the loss of material of the halon/CO_2 fire suppression system.

4. ***Detection of Aging Effects:*** Visual inspection of penetration seals detects cracking, seal separation from walls and components, and rupture and puncture of seals. Visual inspection by fire protection qualified personnel of not less than 10% of each type of seal in walkdowns is performed at a frequency in accordance with an NRC-approved fire protection program (e.g., Technical Requirements Manual, Appendix R program, etc.) or at least once every refueling outage. If any sign of degradation is detected within that sample, the scope of the inspection is expanded to include additional seals. Visual inspection by fire protection qualified personnel of the fire barrier walls, ceilings, floors, doors, and other fire barrier materials performed in walkdowns at a frequency in accordance with an NRC-approved fire protection program ensure timely detection of concrete cracking, spalling, and loss of material. Visual inspection by fire protection qualified personnel detects any sign of

degradation of the fire doors, such as wear and missing parts. Periodic visual inspection and function tests detect degradation of the fire doors before there is a loss of intended function.

Visual inspections of the halon/CO_2 fire suppression system are performed to detect any sign of corrosion. The periodic functional test is performed at least once every 6 months or on a schedule in accordance with an NRC-approved fire protection program. Inspections are performed to detect degradation of the halon/CO_2 fire suppression system before the loss of the component intended function.

5. ***Monitoring and Trending:*** The results of inspections of the aging effects of cracking, spalling, and loss of material on fire barrier penetration seals, fire barriers, and fire doors are used to trend future actions.

   The performance of the halon/CO_2 fire suppression system is monitored during the periodic test to detect any degradation in the system. These periodic tests provide data necessary for trending.

6. ***Acceptance Criteria:*** Inspection results are acceptable if there are no signs of degradation that could result in the loss of the fire protection capability due to loss of material. The acceptance criteria include (a) no visual indications (outside those allowed by approved penetration seal configurations) of cracking, separation of seals from walls and components, separation of layers of material, or ruptures or punctures of seals; (b) no significant indications of concrete cracking, spalling, and loss of material of fire barrier walls, ceilings, and floors and in other fire barrier materials; (c) no visual indications of missing parts, holes, and wear; and (d) no deficiencies in the functional tests of fire doors. Also, no indications of excessive loss of material due to corrosion in the halon/CO_2 fire suppression system is acceptable.

7. ***Corrective Actions:*** For fire protection structures and components identified that are subject to an AMR for license renewal, the applicant's 10 CFR Part 50, Appendix B, program is used for corrective actions, confirmation process, and administrative controls for aging management during the period of extended operation. This corrective action program is documented in the final safety analysis report supplement in accordance with 10 CFR 54.21(d). 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:*** As discussed in the Appendix for GALL, the staff finds the requirements of 10 CFR Part 50, Appendix B, acceptable to address the confirmation process.

9. ***Administrative Controls:*** As discussed in the Appendix for GALL, the staff finds the requirements of 10 CFR Part 50, Appendix B, acceptable to address the administrative controls.

10. ***Operating Experience:*** Silicone foam fire barrier penetration seals have experienced splits, shrinkage, voids, lack of fill, and other failure modes (U.S. Nuclear Regulatory Commission [NRC] Information Notice [IN] 88-56, IN 94-28, and IN 97-70). Degradation of electrical raceway fire barrier such as small holes, cracking, and unfilled seals are found on routine walkdown (NRC IN 91-47 and NRC Generic Letter 92-08). Fire doors have experienced wear of the hinges and handles.

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.

NRC Generic Letter 92-08, *Thermo-Lag 330-1 Fire Barrier*, U.S. Nuclear Regulatory Commission, December 17, 1992.

NRC Information Notice 88-56, *Potential Problems with Silicone Foam Fire Barrier Penetration Seals*, U.S. Nuclear Regulatory Commission, August 14, 1988.

NRC Information Notice 91-47, *Failure of Thermo-Lag Fire Barrier Material to Pass Fire Endurance Test*, U.S. Nuclear Regulatory Commission, August 6, 1991.

NRC Information Notice 94-28, *Potential Problems with Fire-Barrier Penetration Seals*, U.S. Nuclear Regulatory Commission, April 5, 1994.

NRC Information Notice 97-70, *Potential Problems with Fire Barrier Penetration Seals*, U.S. Nuclear Regulatory Commission, September 19, 1997.