XI.S5 MASONRY WALLS

Program Description

Nuclear Regulatory Commission (NRC) IE Bulletin (IEB) 80-11, "Masonry Wall Design," and NRC Information Notice (IN) 87-67, "Lessons Learned from Regional Inspections of Licensee Actions in Response to IE Bulletin 80-11," constitute an acceptable basis for a masonry wall aging management program (AMP). IEB 80-11 required (a) the identification of masonry walls in close proximity to or having attachments from safety-related systems or components and (b) the evaluation of design adequacy and construction practice. NRC IN 87-67 recommended plant-specific condition monitoring of masonry walls and administrative controls to ensure that the evaluation basis developed in response to NRC IEB 80-11 is not invalidated by (a) deterioration of the masonry walls (e.g., new cracks not considered in the reevaluation), (b) physical plant changes such as installation of new safety-related systems or components in close proximity to masonry walls, or (c) reclassification of systems or components from non-safety-related to safety-related, provided appropriate evaluation is performed to account for such occurrences.

Important elements in the evaluation of many masonry walls during the NRC IEB 80-11 program included (a) installation of steel edge supports to provide a sound technical basis for boundary conditions used in seismic analysis and (b) installation of steel bracing to ensure stability or containment of unreinforced masonry walls during a seismic event. Consequently, in addition to the development of cracks in the masonry walls, loss of function of the structural steel supports and bracing would also invalidate the evaluation basis. The steel edge supports and steel bracings are considered component supports and aging effects are managed by the Structures Monitoring program (AMP XI.S6).

The program requires periodic visual inspection of masonry walls in the scope of license renewal to detect loss of material and cracking of masonry units and mortar. The aging effects that could impact masonry wall intended function or potentially invalidate its evaluation basis are entered in the corrective action process for further analysis, repair, or replacement.

Since the issuance of NRC IEB 80-11 and NRC IN 87-67, the NRC promulgated 10 CFR 50.65, the Maintenance Rule. For license renewal, masonry walls may be inspected as part of the “Structures Monitoring Program” (AMP XI.S6) conducted for the Maintenance Rule, provided the 10 attributes described below are incorporated in AMP XI.S6. The aging effects on masonry walls that are considered fire barriers also are managed by AMP XI.M26, Fire Protection.

Evaluation and Technical Basis

1. ***Scope of Program:*** The scope includes all masonry walls identified as performing intended functions in accordance with 10 CFR 54.4. The aging effects on masonry walls that are considered fire barriers also are managed by AMP XI.M26, Fire Protection, as well as being managed by this program.

2. ***Preventive Action:*** This is a condition monitoring program and no specific preventive actions are required.

3. ***Parameters Monitored or Inspected:*** The primary parameters monitored are potential shrinkage and/or separation and cracking of masonry walls and gaps between the supports and masonry walls that could impact the intended function or potentially invalidate its evaluation basis.

4. ***Detection of Aging Effects:*** Visual examination of the masonry walls by qualified inspection personnel is sufficient. In general, masonry walls should be inspected every 5 years, with provisions for more frequent inspections in areas where significant loss of material or cracking is observed to ensure there is no loss of intended function between inspections. However, masonry walls that are fire barriers are visually inspected in accordance with AMP XI.M26.

5. ***Monitoring and Trending:*** Trending is not required. Condition monitoring for evidence of shrinkage and/or separation and cracking is achieved by periodic examination. Degradation detected from monitoring is evaluated.

6. ***Acceptance Criteria:*** For each masonry wall, the extent of observed shrinkage and/or separation and cracking of masonry may not invalidate the evaluation basis or impact the wall's intended function. However, further evaluation is conducted if the extent of cracking and loss of material is sufficient to impact the intended function of the wall or invalidate its evaluation basis.

7. ***Corrective Actions:*** A corrective action option is to develop a new analysis or evaluation basis that accounts for the degraded condition of the wall (i.e., acceptance by further evaluation). Other alternatives include repair or replacing the degraded wall. 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.

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:*** Since 1980, masonry walls that perform an intended function have been systematically identified through licensee programs in response to NRC IEB 80-11, NRC Generic Letter 87-02, and 10 CFR 50.48. NRC IN 87-67 documented lessons learned from the NRC IEB 80-11 program and provided recommendations for administrative controls and periodic inspection to ensure that the evaluation basis for each safety-significant masonry wall is maintained. NUREG-1522 documents instances of observed cracks and other deterioration of masonry-wall joints at nuclear power plants. Whether conducted as a stand-alone program or as a part of structures monitoring, a masonry wall AMP that incorporates the recommendations delineated in NRC IN 87-67 should ensure that the intended functions of all masonry walls within the scope of license renewal are maintained for the period of extended operation.

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 50.48, *Fire Protection,* Office of the Federal Register, National Archives and Records Administration, 2009.

10 CFR 50.65, *Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants,* Office of the Federal Register, National Archives and Records Administration, 2009.

10 CFR 54.4, *Scope*, Office of the Federal Register, National Archives and Records Administration, 2009.

NRC Generic Letter 87-02, *Verification of Seismic Adequacy of Mechanical and Electrical Equipment in Operating Reactors, Unresolved Safety Issue (USI) A-46,* U.S. Nuclear Regulatory Commission, February 19, 1987.

NRC IE Bulletin 80-11, *Masonry Wall Design,* U.S. Nuclear Regulatory Commission, May 8, 1980.

NRC Information Notice 87-67, *Lessons Learned from Regional Inspections of Licensee Actions in Response to IE Bulletin 80-11*, U.S. Nuclear Regulatory Commission, December 31, 1987.

NRC Regulatory Guide 1.160, Rev. 2*, Monitoring the Effectiveness of Maintenance at Nuclear Power Plants,* U.S. Nuclear Regulatory Commission, March 1997.

NUMARC 93-01, Rev. 2, *Industry Guideline for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants (Line-In/Line-Out Version),* Nuclear Energy Institute, April 1996.

NUREG-1522, *Assessment of Inservice Condition of Safety-Related Nuclear Power Plant Structures,* June 1995.