



**SLR-ISG-2021-03-STRUCTURES**

**Updated Aging Management Criteria for Structures Portions  
of Subsequent License Renewal Guidance**

**Interim Staff Guidance**

**February 2021**



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## Updated Aging Management Criteria for Structures Portions of Subsequent License Renewal Guidance

### Interim Staff Guidance

ADAMS Accession No.:ML20181A381

CAC: TM3021

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## INTERIM STAFF GUIDANCE

### UPDATED AGING MANAGEMENT CRITERIA FOR STRUCTURES PORTIONS OF SUBSEQUENT LICENSE RENEWAL GUIDANCE

#### SLR-ISG-2021-03-STRUCTURES

#### PURPOSE

The U.S. Nuclear Regulatory Commission (NRC) staff is providing this subsequent license renewal (SLR) interim staff guidance (ISG) to clarify existing guidance to facilitate staff and industry understanding of the aging management of systems, structures, and components required in Title 10 of the *Code of Federal Regulations* (10 CFR) Part 54, "Requirements for renewal of operating licenses for nuclear power plants."

This SLR-ISG identifies revisions to the structures portions of NUREG-2191, "Generic Aging Lessons Learned for Subsequent License Renewal (GALL-SLR) Report," issued July 2017, and NUREG-2192, "Standard Review Plan for Review of Subsequent License Renewal Applications for Nuclear Power Plants," issued July 2017 (SRP-SLR).

#### BACKGROUND

The NRC staff has reviewed three applications to extend plant operations to 80 years (i.e., for SLR) for Turkey Point Nuclear Generating Units 3 and 4 (Turkey Point); Peach Bottom Atomic Power Station, Units 2 and 3 (Peach Bottom); and Surry Power Station, Units 1 and 2 (Surry). During these reviews, the staff and applicants have identified ways to prepare and review future SLR applications more effectively and efficiently.

#### RATIONALE

The NRC held public meetings on March 28, 2019; December 12, 2019; February 20, 2020; March 25, 2020; April 3, 2020; and April 7, 2020, with industry representatives to discuss staff and industry experience in the preparation and review of the initial license renewal application for River Bend Station, Unit 1, which piloted the optimized 18-month review process for SLR applications, as well as the reviews of the first three SLR applications from Turkey Point, Peach Bottom, and Surry.

This SLR-ISG includes revisions to the following GALL SLR Report and SRP-SLR sections:

- SRP-SLR Section 3.5.2.2.1.5, "Cumulative Fatigue Damage," SRP-SLR Section 3.5.3.2.1.5, "Cumulative Fatigue Damage," SRP-SLR Section 3.5.6, "References," GALL-SLR Report Chapter II, and aging management review (AMR) items associated with cracking due to cyclic loading in SRP-SLR Table 3.5-1, "Summary of Aging Management Programs for Containments, Structures and Component Supports Evaluated in Chapters II and III of the GALL-SLR Report"
- GALL-SLR Report Aging Management Program (AMP) XI.S8, "Protective Coating Monitoring and Maintenance"

- GALL-SLR Report Chapter II to Allow Plant-Specific Aging Management Options
- GALL-SLR Report Chapter III to Allow Plant-Specific Aging Management Options
- SRP-SLR Section 3.5 and Table 3.5-1 to Allow Plant-Specific Aging Management Options and Provide Option to Perform Further Evaluation Related to Fatigue Waiver Analyses

## **APPLICABILITY**

All holders of operating licenses for nuclear power reactors, under 10 CFR Part 50, “Domestic licensing of production and utilization facilities,” except those that have permanently ceased operations and have certified that fuel has been permanently removed from the reactor vessel.

## **GUIDANCE**

In 10 CFR Part 54, the NRC provides requirements for the submission and review of applications to extend plant operations beyond the initial 40-year operating period.

The GALL-SLR Report and SRP-SLR provide guidance to licensees that wish to extend their plant operating licenses from 60 years to 80 years, and to the NRC staff who will review the SLR applications.

The staff and nuclear industry have identified several areas for which future SLR applications and staff reviews can be completed more effectively and efficiently. A series of SLR-ISGs will capture these areas, known as lessons learned.

The NRC staff considers the information in this ISG to provide an acceptable approach for managing aging in structures and structural components within the scope of 10 CFR Part 54. It will improve the quality, uniformity, effectiveness, and efficiency of NRC staff reviews of future SLR applications.

## **IMPLEMENTATION**

The staff will use the information discussed in this ISG to determine whether, pursuant to 10 CFR 54.21(a)(3), a license renewal application demonstrates that the effects of aging on structures and components subject to an AMR are adequately managed so that their intended functions will be maintained consistent with the current licensing basis for the subsequent period of extended operation. This ISG contains an update in redline/strikeout of the existing guidance identified in the “Rationale” section above. An applicant may reference this ISG in an SLR application to demonstrate that the AMPs at the applicant’s facility correspond to those described in the GALL-SLR. If an applicant credits an AMP as updated by this ISG, it is incumbent upon the applicant to ensure that the conditions and operating experience at the plant are bounded by the conditions and operating experience for which this ISG was evaluated. If these bounding conditions are not met, it is incumbent upon the applicant to address any additional aging effects and augment its AMPs. For AMPs that are based on this ISG, the NRC staff will review and verify whether the applicant’s AMPs are consistent with those described in this ISG, including applicable plant conditions and operating experience.

## BACKFITTING AND ISSUE FINALITY DISCUSSION

Issuance of this ISG does not constitute a backfit as defined in 10 CFR 50.109(a)(1) and is not otherwise inconsistent with the issue finality provisions in 10 CFR Part 52, “Licenses, certifications, and approvals for nuclear power plants.” Thus, the NRC staff did not prepare a backfit analysis for the issuance of this ISG.

The NRC staff’s position is based upon the following considerations:

- The ISG positions do not constitute backfitting, inasmuch as the ISG is guidance directed to the NRC staff with respect to its regulatory responsibilities. The ISG provides interim guidance to the staff on how to review certain requests. Changes in guidance intended for use by only the staff are not matters that constitute backfitting as that term is defined in 10 CFR 50.109, “Backfitting,” or that involve the issue finality provisions of 10 CFR Part 52.
- Backfitting and issue finality—with certain exceptions discussed in this section—do not apply to current or future applicants. Applicants and potential applicants are not, with certain exceptions, the subject of either the Backfit Rule or any issue finality provisions under 10 CFR Part 52. This is because neither the Backfit Rule nor the issue finality provisions of 10 CFR Part 52 were intended to apply to every NRC action that substantially changes the expectations of current and future applicants. The exceptions to the general principle are applicable whenever a 10 CFR Part 50 operating license applicant references a construction permit or a 10 CFR Part 52 combined license applicant references a license (e.g., an early site permit) or an NRC regulatory approval (e.g., a design certification rule) (or both) for which specified issue finality provisions apply. The NRC staff does not currently intend to impose the positions represented in this ISG in a manner that constitutes backfitting or is inconsistent with any issue finality provision of 10 CFR Part 52. If in the future the NRC staff seeks to impose positions stated in this ISG in a manner that would constitute backfitting or be inconsistent with these issue finality provisions, the NRC staff must make the requisite showing as set forth in the Backfit Rule or address the regulatory criteria set forth in the applicable issue finality provision, as applicable, that would allow the staff to impose the position.
- The NRC staff has no intention to impose the ISG positions on existing nuclear power plant licensees either now or in the future (absent a voluntary request for a change from the licensee). The staff does not intend to impose or apply the positions described in the ISG to existing (i.e., already issued) licenses (e.g., operating licenses and combined licenses). Hence, the issuance of this ISG—even if considered guidance subject to the Backfit Rule or the issue finality provisions in 10 CFR Part 52— would not need to be evaluated as if it were a backfit or as being inconsistent with issue finality provisions. If, in the future, the NRC staff seeks to impose a position in the ISG on holders of already issued licenses in a manner that would constitute backfitting or does not provide issue finality as described in the applicable issue finality provision, then the staff must make a showing as set forth in the Backfit Rule or address the criteria set forth in the applicable issue finality provision that would allow the staff to impose the position.

**CONGRESSIONAL REVIEW ACT**

This ISG is a rule as defined in the Congressional Review Act (5 U.S.C. 801-808). However, the Office of Management and Budget has not found it to be a major rule as defined in the Congressional Review Act.

**FINAL RESOLUTION**

By July 1, 2027, the staff will transition this information into GALL-SLR and SRP-SLR. Following the transition of this guidance to GALL-SLR and SRP-SLR, this ISG will be closed.

**APPENDICES**

- A. Revisions to SRP-SLR Section 3.5 and GALL-SRP Report Chapter II to Provide Option to Perform Further Evaluation Based on Fatigue Waiver Analyses to Address AMR of Cracking due to Cyclic Loading
- B. Revisions to GALL-SLR Report AMP XI.S8, "Protective Coating Monitoring and Maintenance"
- C. Revisions to GALL-SRP Report Chapter II to Allow Plant-Specific Aging Management Options
- D. Revisions to GALL-SLR Report Chapter III to Allow Plant-Specific Aging Management Options
- E. Revisions to SRP-SLR Section 3.5 to Allow Plant-Specific Aging Management Options and Provide Option to Perform Further Evaluation Related to Fatigue Waiver Analyses
- F. Disposition of Public Comments

## APPENDIX A

### REVISIONS TO SRP-SLR SECTION 3.5 AND GALL-SLR REPORT CHAPTER II TO PROVIDE OPTION TO PERFORM FURTHER EVALUATION BASED ON FATIGUE WAIVER ANALYSES TO ADDRESS AMR OF CRACKING DUE TO CYCLIC LOADING

#### Summary of Revisions

This appendix modifies NUREG-2192, "Standard Review Plan for Review of Subsequent License Renewal Applications for Nuclear Power Plants," issued July 2017 (SRP-SLR), further evaluation Section 3.5.2.2.1.5, "Cumulative Fatigue Damage," and Section 3.5.3.2.1.5, "Cumulative Fatigue Damage"; SRP-SLR Table 3.5-1, "Summary of Aging Management Programs for Containments, Structures and Component Supports Evaluated in Chapters II and III of the GALL-SLR Report," Items 027 and 040 (revisions are provided in Appendix E below); and corresponding aging management review (AMR) items evaluated in Chapter II of NUREG-2191, "Generic Aging Lessons Learned for Subsequent License Renewal (GALL-SLR) Report," (revisions are provided in Appendix C below). The changes provide the option to perform a further evaluation based on the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section III, Division 1, Subsection NE, fatigue waiver analysis for containment metallic pressure-retaining boundary components that are subject to cyclic loading but have no current licensing basis (CLB) fatigue analysis.

#### Basis for Revisions

ASME Code, Section III, Division 1, includes provisions to analytically address cumulative fatigue damage (cracking due to cyclic loading) through detailed fatigue analysis or fatigue waiver analysis. If the code criteria for a fatigue waiver are satisfied, then a detailed fatigue analysis is not required. SRP-SLR Section 4.6.1, "Areas of Review," states that ASME Code fatigue analyses and fatigue waiver analyses that are in the CLB may be time-limited aging analyses (TLAAs).

The fatigue waiver analysis described in this change is a TLAA, except that it will not be in the CLB at the time of a subsequent license renewal application (SLRA) submittal. It therefore does not meet the sixth criterion of Title 10 of the *Code of Federal Regulations* (10 CFR) 54.3, "Definitions," for TLAA, which states that the analysis "[is] contained or incorporated by reference in the CLB." Nevertheless, as indicated above, performing a fatigue waiver analysis in accordance with the ASME Code is a technically acceptable approach to analytically address the effects of cyclic loading (fatigue aging effects) for containment metallic pressure-retaining boundary components. Therefore, satisfying the six conditions for fatigue waiver analysis in the ASME Code for applicable component materials provides an acceptable technical basis to demonstrate that a detailed fatigue analysis is not required, and cracking due to cyclic loading is not an aging effect requiring management.

Therefore, the revised further evaluation section and modified AMR line items in this change provide one acceptable approach to address the aging effect of cracking due to cyclic loading for specific containment metallic pressure-retaining boundary components in lieu of supplemental surface examinations or performing or crediting an appropriate leak-rate test pursuant to Appendix J, "Primary Reactor Containment Leakage Testing for Water-Cooled Power Reactors," to 10 CFR Part 50, "Domestic licensing of production and utilization facilities," as discussed in GALL-SLR Report Aging Management Program (AMP) XI.S1, "ASME



Section XI, Subsection IWE,” for which no CLB fatigue analysis exists at the time of SLRA submittal.

#### AMP Revisions

None

#### Revisions to FSAR Supplement

None

#### Revisions to SRP-SLR Section 3.5

##### *3.5.2.2.1.5 Cumulative Fatigue Damage*

Evaluations involving time-dependent fatigue, cyclical loading, or cyclical displacement of metal liner, metal plates, suppression pool steel shells (including welded joints) and penetrations (including personnel airlock, equipment hatch, control rod drive (CRD) hatch, penetration sleeves, dissimilar metal welds, and penetration bellows) for all types of PWR and BWR containments and BWR vent header, vent line bellows, and downcomers may be TLAAAs as defined in 10 CFR 54.3. TLAAAs are required to be evaluated in accordance with 10 CFR 54.21(c)(1). The evaluation of this TLAA is addressed in Section 4.6, “Containment Liner Plates, Metal Containments, and Penetrations Fatigue Analysis,” and for cases of plant-specific components, in Section 4.7, “Other Plant-Specific Time-Limited Aging Analyses,” of this SRP-SLR. For plant-specific cumulative usage factor calculations, the method used is appropriately defined and discussed in the applicable TLAAAs.

For the above-stated containment pressure-retaining components (corresponding to Table 3.5-1, Items 027 and 040) subject to cyclic loading for which no CLB fatigue analysis exists at the time of an SLRA submittal, a plant-specific further evaluation may be performed to demonstrate that cracking due to cyclic loading is an aging effect that does not require aging management for the component. As one acceptable approach, the aging effect does not require aging management actions if the further evaluation demonstrates that the six criteria for cyclic loading in paragraph NE-3222.4(d) (NE-3221.5(d) in 1980 and later code editions), “Analysis for Cyclic Operation, Vessels Not Requiring Analysis for Cyclic Service,” of ASME Code, Section III, Division 1 (1974 edition or later edition incorporated by reference in 10 CFR 50.55a(a)(i)), that provide for a waiver from detailed fatigue analysis are satisfied for applicable component materials through the end of the subsequent period of extended operation. The option to perform a fatigue waiver analysis to address the aging effect of cracking due to cyclic loading, for specific containment metallic components, is in lieu of performing supplemental surface examinations or performing or crediting an appropriate 10 CFR Part 50, Appendix J, leak-rate test discussed in GALL-SLR Report AMP XI.S1, “ASME Section XI, Subsection IWE.”

##### *3.5.3.2.1.5 Cumulative Fatigue Damage*

Evaluations involving time-dependent fatigue, cyclical loading, or cyclical displacement included in the CLB for the metal liner, metal plates, suppression pool steel shells (including welded joints) and penetrations (including personnel airlock, equipment hatch, CRD hatch, penetration sleeves, dissimilar metal welds, and penetration bellows) for all types of PWR and BWR containments and BWR vent header, vent line bellows, and downcomers are

TLAAs as defined in 10 CFR 54.3. TLAAs are required to be evaluated in accordance with 10 CFR 54.21(c). The evaluation of this TLAA is addressed in Section 4.6, "Containment Liner Plate, Metal Containments, and Penetrations Fatigue Analysis," and for cases of plant-specific components, in Section 4.7, "Other Plant-Specific Time-Limited Aging Analyses," of this SRP-SLR.

The staff reviews the information on a case-by-case basis consistent with the review procedures in SRP-SLR Sections 4.6 or 4.7 (as applicable) to determine whether the applicant has provided a sufficient basis for dispositioning the TLAAs in accordance with the acceptance criteria in 10 CFR 54.21(c)(1)(i), (ii), or (iii). This includes staff's review of those cumulative usage factor analyses that qualify as TLAAs based on plant-specific calculation methods.

For specific containment metallic components (corresponding to Table 3.5-1, Items 027 and 040) for which no CLB fatigue analysis exists at the time of SLRA submittal, the applicant may perform a fatigue waiver analysis in accordance with the ASME Code to demonstrate that the fatigue aging effect does not require aging management. The reviewer verifies that the number of cycles for applicable cyclic loads has been adequately accounted for, the appropriate environment and material property inputs are used, and the acceptance criteria in paragraph NE-3222.4(d) (NE-3221.5(d) in 1980 and later code editions) of ASME Code, Section III, Division 1 (1974 edition or later edition incorporated by reference in 10 CFR 50.55a(a)(i)), that provide for a waiver of detailed fatigue analysis are satisfied through the end of the subsequent period of extended operation. The staff reviews any other justification provided on a case-by-case basis.

#### Revisions to SRP-SLR Section 3.5.6, "References"

1. 10 CFR Part 50, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants." Washington, DC: U.S. Nuclear Regulatory Commission. 2016.
2. 10 CFR 50.55a, "Codes and Standards." Washington, DC: U.S. Nuclear Regulatory Commission. 2016.
3. 10 CFR 50.59, "Changes, Tests, and Experiments." Washington, DC: U.S. Nuclear Regulatory Commission. 2016.
4. 10 CFR Part 50, Appendix J, "Primary Reactor Containment Leakage Testing for Water Cooled Power Reactors." Washington, DC: U.S. Nuclear Regulatory Commission. 2016.
5. 10 CFR 50.71, "Maintenance of Record, Making of Reports." Washington, DC: U.S. Nuclear Regulatory Commission. 2016.
6. 10 CFR 50.65, "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants." Washington, DC: U.S. Nuclear Regulatory Commission. 2016.
7. 10 CFR 54.4, "Scope." Washington, DC: U.S. Nuclear Regulatory Commission. 2016.

8. NRC. Regulatory Guide 1.127, "Inspection of Water-Control Structures Associated with Nuclear Power Plants." Revision 1. Agencywide Documents Access and Management System (ADAMS) Accession No. ML003739392. Washington, DC: U.S. Nuclear Regulatory Commission. March 1978.
9. NEI. NEI 95-10, "Industry Guideline for Implementing the Requirements of 10 CFR Part 54--The License Renewal Rule." Revision 6. ADAMS Accession No. ML051860406. Washington, DC: Nuclear Energy Institute. June 2005.
10. ASME. ASME Code, Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," Subsection IWL, "Requirements for Class CC Concrete Components of Light-Water Cooled Power Plants." New York, New York: The American Society of Mechanical Engineers. 2008.
11. ~~ASME.~~ ASME Code, Section XI, "~~Rules for Inservice Inspection of Nuclear Power Plant Components,~~" Subsection IWE, "Requirements for Class MC and Metallic Liners of Class CC Components of Light-Water Cooled Power Plants." New York, New York: The American Society of Mechanical Engineers. 2008.
12. ~~ASME.~~ ASME Code, Section XI, "~~Rules for Inservice Inspection of Nuclear Power Plant Components,~~" Subsection IWF, "Requirements for Class 1, 2, 3, and MC Component Supports of Light-Water Cooled Power Plants." New York, New York: The American Society of Mechanical Engineers. 2008.
13. NEI. NUMARC 93-01, "Industry Guideline for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants." Revision 2. ADAMS Accession No. ML11116A198. Washington, DC: Nuclear Energy Institute. April 1996.
14. NRC. Regulatory Guide 1.160, "Monitoring the Effectiveness of Maintenance at Nuclear Power Plants." Revision 2. Agencywide Documents Access and Management System (ADAMS) Accession No. ML003761662. Washington, DC: U.S. Nuclear Regulatory Commission. March 31, 1997.
15. ~~NRC.~~ NUREG-1557, "Summary of Technical Information and Agreements from Nuclear Management and Resources Council Industry Report addressing License Renewal." Washington, DC: U.S. Nuclear Regulatory Commission. October 1996.
16. ACI. ACI Standard 318, "Building Code Requirements for Reinforced Concrete and Commentary." Farmington Hills, Michigan: American Concrete Institute. 1995.
17. Hilsdorf, H.K., J. Kropp, and H.J. Koch. "The Effects of Nuclear Radiation on the Mechanical Properties of Concrete." ACI SP 55-10. pp 223-251. Farmington Hills, Michigan: American Concrete Institute. 1978.
18. NRC. NUREG/CR-7171, "A Review of the Effects of Radiation on Microstructure and Properties of Concretes Used in Nuclear Power Plants." ADAMS Accession No. ML13325B077. Washington, DC: U.S. Nuclear Regulatory Commission. November 2013.

19. Field, K.G., Y. Le Pape, and I. Remec. "Perspectives on Radiation Effects in Concrete for Nuclear Power Plants—Part I: Quantification of Radiation Exposure and Radiation Effects." Nuclear Engineering and Design. Vol 285. pp 126–143. February 2015.
20. ACI. ACI Standard 349 85, "Code Requirements for Nuclear Safety-Related Concrete Structures." Farmington Hills, Michigan: American Concrete Institute. 1985.
21. ASME. ASME Code, Section III, "Rules for Construction of Nuclear Facility Components," Division 1 – Subsection NE, "Class MC Components." New York, New York: The American Society of Mechanical Engineers. 1974 edition or later edition incorporated by reference in 10 CFR 50.55a(a)(i) as applicable

#### Revisions to GALL-SLR Report Chapter II

See Appendix C to this ISG. Revisions in this appendix only impact Item numbers II.A3.CP-37, II.B1.1.CP-49, II.B2.1.CP-107, II.B2.1.CP-142, II.B2.2.CP-64, and II.B4.CP-37.

#### Revisions to SRP-SLR Table 3.5-1

See Appendix E to this ISG. Revisions in this appendix only impact Item numbers 027 and 040 in SRP-SLR Table 3.5-1.

## APPENDIX B

### REVISIONS TO GALL-SLR REPORT AMP XI.S8, "PROTECTIVE COATING MONITORING AND MAINTENANCE"

#### Summary of Revisions

This appendix:

- (1) Revises the frequency of inservice coating inspection monitoring to allow the inspection of coatings meeting NUREG-2191, "Generic Aging Lessons Learned for Subsequent License Renewal (GALL-SLR) Report," Aging Management Program (AMP) XI.S8 Element 6, "Acceptance Criteria," to be performed on a frequency not to exceed 6 years, based on trending of the total amount of permitted degraded coatings.
- (2) Updates GALL-SLR Report AMP XI.S8 to reference Regulatory Guide (RG) 1.54, "Service Level I, II, III, and In-Scope License Renewal Protective Coatings Applied to Nuclear Power Plants," Revision 3, issued April 2017, as it is the most current revision at the time of this change.
- (3) Revises AMP XI.S8 Element 5, "Monitoring and Trending," to provide detail on extended inspection intervals.
- (4) Revises AMP XI.S8 Element 10, "Operating Experience," to provide detail on extended inspection intervals-, and reference Revision 3 of RG 1.54.

#### Basis for Revisions

The revisions are based on the following items:

- (1) ASTM International (formerly American Society for Testing and Materials) Specification D5163-08, "Standard Guide for Establishing a Program for Condition Assessment of Coating Service Level I Coating Systems in Nuclear Power Plants." West Conshohocken, Pennsylvania. ASTM International, 2008, paragraph 6, notes that the licensee shall determine the frequency of inservice coating inspections. ASTM D5163-08, paragraph 6, also notes that it is a good practice to perform inspections during each refueling outage. An interval not to exceed 6 years based on station operating experience may be justified if coatings meet the acceptance criteria (AMP XI.S8 Element 6) and trending activities for the total amount of degraded coatings in containment indicate a margin will be maintained (AMP XI.S8 Element 5). A qualified nuclear coating specialist performs a coating condition assessment report to determine the priority of repairs to be conducted during the current outage and repairs that can be postponed to a future date (ASTM D5163-08, paragraph 11.1.2). Trending of the total amount of degraded coatings allowed in containment is also performed.
- (2) RG 1.54, Revision 3, contains the most up-to-date NRC guidance on the selection, application, qualification, inspection, and maintenance of protective coatings applicable under GALL-SLR Report AMP XI.S8.
- (3) For an applicant to extend the inspection interval stated in the GALL-SLR Report (each refueling outage), an applicant must demonstrate that margin to the ECCS suction strainer operability limits for coating debris will be maintained during the subsequent

period of extended operation based on operating experience and trending of degraded/unqualified coatings.

If plant-specific operating experience identifies coating degradation mechanisms that indicate the potential to exceed the ECCS suction strainer debris margin, an applicant may not be able to extend the inspection intervals beyond each refueling outage.

Applicants that extend the inspection interval to longer than each refueling outage may need to provide trending of degraded and unqualified coatings and review operating experience for more than the previous two coating monitoring reports. This is because an extension of the inspection interval may result in periods of time without inspections that are longer than the time period covered by the previous two refueling outages. Additionally, an applicant may need to consider covering a time period greater than the proposed interval to provide margin for trending of coatings and to account for variations in degraded coatings recorded during a typical inspection.

- (4) RG 1.54, Revision 3, contains the most up-to-date NRC guidance on the selection, application, qualification, inspection, and maintenance of protective coatings applicable under GALL-SLR Report AMP XI.S8.

For an applicant to demonstrate that an inspection interval of longer than every refueling outage is appropriate, it is necessary to identify aging effects such as blistering, cracking, flaking, peeling, rusting, and physical damage and to demonstrate acceptable historical coating performance. This is because coating degradation mechanisms can cause large amounts of coatings to become degraded/unqualified in time periods of less than 6 years (the maximum interval). The applicant will need to account for aging effects such as blistering, cracking, flaking, peeling, rusting, and physical damage for the containment coatings to demonstrate that the coating will be able to perform its safety function during all inspection intervals through the subsequent period of extended operation.

## AMP Revisions

### **Program Description**

Proper maintenance of protective coatings inside containment (defined as Service Level I in the U.S. Nuclear Regulatory Commission (NRC) Regulatory Guide (RG) 1.54, Revision 1, or latest version) is essential to the operability of post-accident safety systems that rely on water recycled through the containment sump/drain system. Degradation of coatings can lead to clogging of Emergency Core Cooling System (ECCS) suction strainers, which reduces flow through the system and could cause unacceptable head loss for the pumps.

Maintenance of Service Level I coatings applied to carbon steel and concrete surfaces inside containment (e.g., steel liner, steel containment shell, structural steel, supports, penetrations, and concrete walls and floors) also serve to prevent or minimize loss of material due to corrosion of carbon steel components and aids in decontamination. Regulatory Position C4 in NRC RG 1.54, Revision 23, describes an acceptable technical basis for a Service Level I coatings monitoring and maintenance program that can be credited for managing the effects of corrosion for carbon steel elements inside containment. ASTM International (formerly American Society for Testing and Materials) standard (ASTM) D5163-08 and endorsed years of the standard in NRC RG 1.54 are acceptable and considered consistent with

~~NUREG-2191 the Generic Aging Lessons Learned for Subsequent License Renewal (GALL-SLR) Report.~~ In addition, Electric Power Research Institute Report 1019157, "Guideline on Nuclear Safety-Related Coatings," (December 2009) provides additional information on the ASTM standard guidelines.

A comparable program for monitoring and maintaining protective coatings inside containment, developed in accordance with NRC RG 1.54, Revision 23, is acceptable as an aging management program (AMP) for subsequent license renewal (SLR).

Service Level I coatings credited for preventing corrosion of steel containments and steel liners for concrete containments are subject to requirements specified by the American Society of Mechanical Engineers Boiler and Pressure Vessel Code, Section XI, Subsection IWE (GALL-SLR Report AMP XI.S1). However, this program (GALL-SLR Report AMP XI.S8) reviews Service Level I coatings to ensure that the protective coating monitoring and maintenance program is adequate for SLR.

### Evaluation and Technical Basis

1. **Scope of Program:** The minimum scope of the program is Service Level I coatings applied to steel and concrete surfaces inside containment (e.g., steel liner, steel containment shell, structural steel, supports, penetrations, and concrete walls and floors), defined in NRC RG 1.54, Revision 23, as follows: "Service Level I coatings are used in areas inside the reactor containment where the coating failure could adversely affect the operation of post-accident fluid systems and thereby impair safe shutdown." The scope of the program also should include any Service Level I coatings that are credited by the licensee for preventing loss of material due to corrosion in accordance with GALL-SLR Report AMP XI.S1.
2. **Preventive Action:** The program is a condition monitoring program and does not recommend any preventive actions. However, for plants that credit coatings to minimize loss of material, this program is a preventive action.
3. **Parameters Monitored or Inspected:** ASTM D-5163-08 provides guidelines that are acceptable to the NRC staff for establishing an inservice coatings monitoring program for Service Level I coating systems in operating nuclear power plants, and identifies the parameters monitored or inspected to be "any visible defects, such as blistering, cracking, flaking, peeling, rusting, and physical damage."
4. **Detection of Aging Effects:** ~~ASTM D-5163-08, paragraph 6, defines the inspection frequency to be each refueling outage or during other major maintenance outages, as needed. General visual inspections, as per ASTM D5163-08, will be performed on an interval not to exceed six years. The inspection interval will be based on station operating experience and trending of the total amount of degraded and unqualified coatings allowed in containment that demonstrates acceptable coating performance with respect to the ECCS sump strainer debris limits.~~ ASTM D5163-08, paragraph 9, discusses the qualifications for inspection personnel, the inspection coordinator, and the inspection results evaluator. ASTM D-5163-08, subparagraph 10.1, discusses development of the inspection plan and the inspection methods to be used. It states that a general visual inspection shall be conducted on all readily accessible coated surfaces during a walk-through. After a walk-through, or during the general visual inspection, thorough visual inspections shall be carried out on

previously designated areas and on areas noted as deficient during the walk-through. A thorough visual inspection shall also be carried out on all coatings near sumps or screens associated with the ECCS. This subparagraph also addresses field documentation of inspection results. ASTM D-5163-08, subparagraph 10.5, identifies instruments and equipment needed for inspection.

5. **Monitoring and Trending:** ASTM D-5163-08 identifies monitoring and trending activities in subparagraph 7.2, which specifies a pre-inspection review of the previous two monitoring reports, and in subparagraph 11.1.2, which specifies that the inspection report should prioritize repair areas as either needing repair during the same outage or as postponed to future outages, but under surveillance in the interim period. The assessment from periodic inspections and analysis of total amount of degraded coatings in the containment is compared with the total amount of permitted degraded coatings to provide reasonable assurance of post-accident operability of the ECCS.

An applicant that proposes to extend the inspection interval to greater than every refueling outage as discussed in Element 4, will need to provide information regarding the available margin for its ECCS suction strainers to accommodate coatings debris. The applicant will also demonstrate the ECCS suction strainer debris margin will be maintained for the length of the inspection intervals during the subsequent license renewal period given trending of degraded and unqualified coatings. Trending of degraded and unqualified coatings will be commensurate with the inspection interval (if greater than every refueling outage). This may result in trending of inspection reports from more than the two previous monitoring reports noted above.

6. **Acceptance Criteria:** ASTM D-5163-08, subparagraphs 10.2.1 through 10.2.6, 10.3, and 10.4, contains one acceptable method for the characterization, documentation, and testing of defective or deficient coating surfaces. Additional ASTM and other recognized test methods are available for use in characterizing the severity of observed defects and deficiencies. The evaluation covers blistering, cracking, flaking, peeling, delamination, and rusting. ASTM D-5163-08, paragraph 11, addresses evaluation. It specifies that the inspection report is to be evaluated by the responsible evaluation personnel, who prepare a summary of findings and recommendations for future surveillance or repair, and prioritization of repairs.
7. **Corrective Actions:** Results that do not meet the acceptance criteria are addressed in the applicant's corrective action program under those specific portions of the quality assurance (QA) program that are used to meet Criterion XVI, "Corrective Action," of Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, Appendix B. Appendix A of the GALL-SLR Report describes how an applicant may apply its 10 CFR Part 50, Appendix B, QA program to fulfill the corrective actions element of this AMP for both safety-related and nonsafety-related structures and components (SCs) within the scope of this program.

A recommended corrective action plan is required for major defective areas so that these areas can be repaired during the same outage, if appropriate.

8. **Confirmation Process:** The confirmation process is addressed through those specific portions of the QA program that are used to meet Criterion XVI, "Corrective Action," of 10 CFR Part 50, Appendix B. Appendix A of the GALL-SLR Report



- describes how an applicant may apply its 10 CFR Part 50, Appendix B, QA program to fulfill the confirmation process element of this AMP for both safety-related and nonsafety-related SCs within the scope of this program.
9. **Administrative Controls:** Administrative controls are addressed through the QA program that is used to meet the requirements of 10 CFR Part 50, Appendix B, associated with managing the effects of aging. Appendix A of the GALL-SLR Report describes how an applicant may apply its 10 CFR Part 50, Appendix B, QA program to fulfill the administrative controls element of this AMP for both safety-related and nonsafety-related SCs within the scope of this program.
  10. **Operating Experience:** NRC Information Notice 88-82, NRC Bulletin 96-03, NRC Generic Letter (GL) 04-02, and NRC GL 98-04 describe industry experience pertaining to coatings degradation inside containment and the consequential clogging of sump strainers. NRC RG 1.54, Revision ~~43~~, was issued in ~~July 2000~~ April 2017. Monitoring and maintenance of Service Level I coatings conducted in accordance with Regulatory Position C4 is expected to be an effective program for managing degradation of Service Level I coatings and, consequently, an effective means to manage loss of material due to corrosion of carbon steel structural elements inside containment.

The program is informed and enhanced when necessary through the systematic and ongoing review of both plant-specific and industry operating experience including research and development such that the effectiveness of the AMP is evaluated consistent with the discussion in Appendix B of the GALL-SLR Report.

## References

- 10 CFR Part 50, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants." Washington, DC: U.S. Nuclear Regulatory Commission. 2016.
- ASTM. ASTM D5163-05, "Guide for Establishing Procedures to Monitor the Performance of Coating Service Level I Coating Systems in an Operating Nuclear Power Plant." West Conshohocken, Pennsylvania: American Society for Testing and Materials. 2005.
- \_\_\_\_\_. ASTM D5163-08, "Standard Guide for Establishing a Program for Condition Assessment of Coating Service Level I Coating Systems in Nuclear Power Plants." West Conshohocken, Pennsylvania: American Society for Testing and Materials. 2008.
- \_\_\_\_\_. ASTM D5163-96, "Standard Guide for Establishing Procedures to Monitor the Performance of Safety Related Coatings in an Operating Nuclear Power Plant." West Conshohocken, Pennsylvania: American Society for Testing and Materials. 1996.
- EPRI. EPRI 1003102, "Guideline on Nuclear Safety-Related Coatings." Revision 1. (Formerly TR-109937). Palo Alto, California: Electric Power Research Institute. November 2001.
- \_\_\_\_\_. EPRI 1019157, "Guideline on Nuclear Safety-Related Coatings." Revision 2. (Formerly TR-109937 and 1003102). Palo Alto, California: Electric Power Research Institute. December 2009.

NRC. Bulletin 96-03, "Potential Plugging of Emergency Core Cooling Suction Strainers by Debris in Boiling-Water Reactors." Washington, DC: U.S. Nuclear Regulatory Commission. May 1996.

\_\_\_\_\_. Generic Letter 04-02, "Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents at Pressurized-Water Reactors." Washington, DC: U.S. Nuclear Regulatory Commission. September 2004.

\_\_\_\_\_. Generic Letter 98-04, "Potential for Degradation of the Emergency Core Cooling System and the Containment Spray System After a Loss-Of-Coolant Accident Because of Construction and Protective Coating Deficiencies and Foreign Material in Containment." Washington, DC: U.S. Nuclear Regulatory Commission. July 1998.

\_\_\_\_\_. Information Notice 88-82, "Torus Shells with Corrosion and Degraded Coatings in BWR Containments." Washington, DC: U.S. Nuclear Regulatory Commission. November 1988.

\_\_\_\_\_. Information Notice 97-13, "Deficient Conditions Associated With Protective Coatings at Nuclear Power Plants." Washington, DC: U.S. Nuclear Regulatory Commission. March 1997.

\_\_\_\_\_. Regulatory Guide 1.54, "Quality Assurance Requirements for Protective Coatings Applied to Water-Cooled Nuclear Power Plants." Revision 0. Washington, DC: U.S. Nuclear Regulatory Commission. June 1973.

\_\_\_\_\_. Regulatory Guide 1.54, "Service Level I, II, and III Protective Coatings Applied to Nuclear Power Plants." Revision 1. Washington, DC: U.S. Nuclear Regulatory Commission. July 2000.

\_\_\_\_\_. Regulatory Guide 1.54, "Service Level I, II, and III Protective Coatings Applied to Nuclear Power Plants." Revision 2. Washington, DC: U.S. Nuclear Regulatory Commission. October 2010.

\_\_\_\_\_. [Regulatory Guide 1.54, "Service Level I, II, III, and In-Scope License Renewal Protective Coatings Applied to Nuclear Power Plants," Revision 3: Washington, DC: U.S. Nuclear Regulatory Commission. April 2017. ADAMS Accession No. ML17031A288.](#)

#### Revisions to FSAR Supplement

None

#### Revisions to AMR Items

None

## APPENDIX C

### REVISIONS TO GALL-SLR REPORT CHAPTER II TO ALLOW PLANT-SPECIFIC AGING MANAGEMENT OPTIONS

#### Summary of Revisions

This appendix modifies NUREG-2191, "Generic Aging Lessons Learned for Subsequent License Renewal (GALL-SLR) Report, relevant aging management review (AMR) items to reflect the option of using, in lieu of recommended plant-specific aging management programs (AMPs), plant-specific enhancements to GALL-SLR Report AMPs (with modified inspection activities when required) essential to manage the effects of aging in concrete for the following:

- Reduction of strength and modulus of elasticity due to elevated temperature (greater than 66 degrees Celsius (150 degrees Fahrenheit) general; greater than 93 degrees Celsius (200 degrees Fahrenheit) local)
- loss of material (spalling, scaling) and cracking due to freeze-thaw
- cracking due to expansion from reaction with aggregates
- increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation

As discussed in Appendix A to this ISG, modify SRP-SLR Table 3.5-1 and the GALL-SLR Report AMR tables to provide the option to perform a further evaluation based on American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section III, Division 1, Subsection NE, fatigue waiver analysis for containment metallic pressure-retaining boundary components that are subject to cyclic loading but have no current licensing basis (CLB) fatigue analysis.

#### Basis for Revisions

Modifications to the GALL-SLR Report AMR items and SRP-SLR Table 3.5-1 line items (see Appendix E) with associated further evaluations provide the option to use plant-specific enhancements to GALL-SLR Report AMP XI.S2, "ASME Section XI, Subsection IWL," and/or GALL-SLR Report AMP XI.S6, "Structures Monitoring," in lieu of a plant-specific AMP. The option to use plant-specific enhancements increases the efficiency of subsequent license renewal application reviews by limiting the use of AMR "Note E" designations for plant-specific aging management activities when aging effects are managed through a plant-specific AMP.

Appendix A to this ISG provides the basis for revisions with regard to fatigue analysis.

#### AMP Revisions

None

#### Revisions to FSAR Supplement

None

Revisions to AMR Items

II CONTAINMENT STRUCTURES								
Table A1 Concrete Containments (Reinforced and Prestressed)								
New, Modified, Deleted, Edited Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	II.A1.CP-87	3.5-1, 016	Concrete (accessible areas): dome; wall; basemat; ring girders; buttresses	Concrete	Air – indoor uncontrolled, air – outdoor	Increase in porosity and permeability; cracking; loss of material (spalling, scaling) due to aggressive chemical attack	AMP XI.S2, "ASME Section XI, Subsection IWL"	No
	II.A1.CP-31	3.5-1, 018	Concrete (accessible areas): dome; wall; basemat; ring girders; buttresses	Concrete	Air – outdoor	Loss of material (spalling, scaling) and cracking due to freeze-thaw	AMP XI.S2, "ASME Section XI, Subsection IWL"	No
M	II.A1.CP-33	3.5-1, 019	Concrete (accessible areas): dome; wall; basemat; ring girders; buttresses	Concrete	Any	Cracking due to expansion from reaction with aggregates	AMP XI.S2, "ASME Section XI, Subsection IWL"	No
	II.A1.CP-32	3.5-1, 020	Concrete (accessible areas): dome; wall; basemat; ring girders; buttresses	Concrete	Water – flowing	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	AMP XI.S2, "ASME Section XI, Subsection IWL"	No
M	II.A1.CP-68	3.5-1, 021	Concrete (accessible areas): dome; wall; basemat; ring girders; buttresses; reinforcing steel	Concrete	Air – indoor uncontrolled, air – outdoor	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	AMP XI.S2, "ASME Section XI, Subsection IWL"	No

II CONTAINMENT STRUCTURES								
Table A1 Concrete Containments (Reinforced and Prestressed)								
New, Modified, Deleted, Edited Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	II.A1.CP-100	3.5-1, 024	Concrete (inaccessible areas): dome; wall; basemat; ring girders; buttresses	Concrete	Air – indoor uncontrolled, air – outdoor, groundwater/soil	Increase in porosity and permeability; cracking; loss of material (spalling, scaling) due to aggressive chemical attack	AMP XI.S2, "ASME Section XI, Subsection IWL," and supplemented, as necessary, by AMP XI.S6, "Structures Monitoring"	No
<a href="#">EM</a>	II.A1.CP-147	3.5-1, 011	Concrete (inaccessible areas): dome; wall; basemat; ring girders; buttresses	Concrete	Air – outdoor, groundwater/soil	Loss of material (spalling, scaling) and cracking due to freeze-thaw	Plant-specific aging management program to be evaluated for plants in moderate to severe weathering conditions, <a href="#">or AMP XI.S2, "ASME Section XI, Subsection IWL," and/or AMP XI.S6, "Structures Monitoring," enhanced as necessary</a>	Yes

<b>II CONTAINMENT STRUCTURES</b>								
<b>Table A1 Concrete Containments (Reinforced and Prestressed)</b>								
<b>New, Modified, Deleted, Edited Item</b>	<b>Item</b>	<b>SRP Item (Table, ID)</b>	<b>Structure and/or Component</b>	<b>Material</b>	<b>Environment</b>	<b>Aging Effect/Mechanism</b>	<b>Aging Management Program (AMP)/TLAA</b>	<b>Further Evaluation</b>
M	II.A1.CP-67	3.5-1, 012	Concrete (inaccessible areas): dome; wall; basemat; ring girders; buttresses	Concrete	Any	Cracking due to expansion from reaction with aggregates	Plant-specific aging management program, <u>or</u> <a href="#">AMP XI.S2</a> , "ASME <a href="#">Section XI, Subsection IWL</a> ," and/or <a href="#">AMP XI.S6</a> , "Structures <a href="#">Monitoring</a> ," <u>enhanced as necessary</u>	Yes
M	II.A1.CP-102	3.5-1, 014	Concrete (inaccessible areas): dome; wall; basemat; ring girders; buttresses	Concrete	Water – flowing	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	Plant-specific aging management program, <u>or</u> <a href="#">AMP XI.S2</a> , "ASME <a href="#">Section XI, Subsection IWL</a> ," and/or <a href="#">AMP XI.S6</a> , "Structures <a href="#">Monitoring</a> ," <u>enhanced as necessary</u>	Yes
M	II.A1.CP-97	3.5-1, 023	Concrete (inaccessible areas): dome; wall; basemat; ring girders; buttresses; reinforcing steel	Concrete	Any	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	AMP XI.S2, "ASME <a href="#">Section XI, Subsection IWL</a> ," and supplemented, as necessary, by AMP XI.S6, "Structures <a href="#">Monitoring</a> "	No

II CONTAINMENT STRUCTURES								
Table A1 Concrete Containments (Reinforced and Prestressed)								
New, Modified, Deleted, Edited Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
<u>EM</u>	II.A1.CP-34	3.5-1, 003	Concrete: dome; wall; basemat; ring girders; buttresses	Concrete	Air – indoor uncontrolled, air – outdoor	Reduction of strength and modulus due to elevated temperature (>150°F general; >200°F local)	Plant-specific aging management program to be evaluated if temperature limits exceeded, <u>or AMP XI.S2, "ASME Section XI, Subsection IWL," and/or AMP XI.S6, "Structures Monitoring," enhanced as necessary</u>	Yes
E	II.A1.CP-101	3.5-1, 001	Concrete: dome; wall; basemat; ring girders; buttresses	Concrete	Soil	Cracking and distortion due to increased stress levels from settlement	AMP XI.S2, "ASME Section XI, Subsection IWL," and supplemented, as necessary, by AMP XI.S6, "Structures Monitoring"	Yes
E	II.A1.C-07	3.5-1, 002	Concrete: foundation; subfoundation	Concrete; porous concrete	Water – flowing	Reduction of foundation strength and cracking due to differential settlement and erosion of porous concrete subfoundation	AMP XI.S6, "Structures Monitoring"	Yes

<b>II CONTAINMENT STRUCTURES</b>								
<b>Table A1 Concrete Containments (Reinforced and Prestressed)</b>								
<b>New, Modified, Deleted, Edited Item</b>	<b>Item</b>	<b>SRP Item (Table, ID)</b>	<b>Structure and/or Component</b>	<b>Material</b>	<b>Environment</b>	<b>Aging Effect/Mechanism</b>	<b>Aging Management Program (AMP)/TLAA</b>	<b>Further Evaluation</b>
M	II.A1.C-11	3.5-1, 008	Prestressing system: tendons	Steel	Air – indoor uncontrolled, air – outdoor	Loss of prestress due to relaxation; shrinkage; creep; elevated temperature	TLAA, SRP-SLR Section 4.5, "Concrete Containment Tendon Prestress," and/or SRP-SLR Section 4.7, "Other Plant-Specific Time-Limited Aging Analyses"	Yes
	II.A1.C-10	3.5-1, 032	Prestressing system: tendons; anchorage components	Steel	Air – indoor uncontrolled, air – outdoor	Loss of material due to corrosion	AMP XI.S2, "ASME Section XI, Subsection IWL"	No
M	II.A1.CP-35	3.5-1, 035	Steel elements (accessible areas): liner; liner anchors; integral attachments	Steel	Air – indoor uncontrolled	Loss of material due to general, pitting, crevice corrosion	AMP XI.S1, "ASME Section XI, Subsection IWE," and AMP XI.S4, "10 CFR Part 50, Appendix J"	Yes
E	II.A1.CP-98	3.5-1, 005	Steel elements (inaccessible areas): liner; liner anchors; integral attachments	Steel	Air – indoor uncontrolled	Loss of material due to general, pitting, crevice corrosion	AMP XI.S1, "ASME Section XI, Subsection IWE," and AMP XI.S4, "10 CFR Part 50, Appendix J"	Yes



<b>II CONTAINMENT STRUCTURES</b>								
<b>Table A2 Steel Containments</b>								
<b>New, Modified, Deleted, Edited Item</b>	<b>Item</b>	<b>SRP Item (Table, ID)</b>	<b>Structure and/or Component</b>	<b>Material</b>	<b>Environment</b>	<b>Aging Effect/Mechanism</b>	<b>Aging Management Program (AMP)/TLAA</b>	<b>Further Evaluation</b>
	II.A2.CP-51	3.5-1, 018	Concrete (accessible areas): basemat	Concrete	Air – outdoor	Loss of material (spalling, scaling) and cracking due to freeze-thaw	AMP XI.S2, "ASME Section XI, Subsection IWL," or AMP XI.S6, "Structures Monitoring"	No
M	II.A2.CP-58	3.5-1, 019	Concrete (accessible areas): basemat	Concrete	Any	Cracking due to expansion from reaction with aggregates	AMP XI.S2, "ASME Section XI, Subsection IWL," or AMP XI.S6, "Structures Monitoring"	No
	II.A2.CP-72	3.5-1, 016	Concrete (accessible areas): basemat	Concrete	Groundwater/soil	Increase in porosity and permeability; cracking; loss of material (spalling, scaling) due to aggressive chemical attack	AMP XI.S2, "ASME Section XI, Subsection IWL," or AMP XI.S6, "Structures Monitoring"	No
	II.A2.CP-155	3.5-1, 020	Concrete (accessible areas): basemat	Concrete	Water – flowing	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	AMP XI.S2, "ASME Section XI, Subsection IWL," or AMP XI.S6, "Structures Monitoring"	No

II CONTAINMENT STRUCTURES								
Table A2 Steel Containments								
New, Modified, Deleted, Edited Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	II.A2.CP-74	3.5-1, 021	Concrete (accessible areas): basemat; reinforcing steel	Concrete	Air – indoor uncontrolled, air – outdoor	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	AMP XI.S2, "ASME Section XI, Subsection IWL," or AMP XI.S6, "Structures Monitoring"	No
<u>EM</u>	II.A2.CP-70	3.5-1, 011	Concrete (inaccessible areas): basemat	Concrete	Air – outdoor, groundwater/soil	Loss of material (spalling, scaling) and cracking due to freeze-thaw	Plant-specific aging management program to be evaluated for plants in moderate to severe weathering conditions, <u>or AMP XI.S2, "ASME Section XI, Subsection IWL," and/or AMP XI.S6, "Structures Monitoring," enhanced as necessary.</u>	Yes

II CONTAINMENT STRUCTURES								
Table A2 Steel Containments								
New, Modified, Deleted, Edited Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	II.A2.CP-104	3.5-1, 012	Concrete (inaccessible areas): basemat	Concrete	Any	Cracking due to expansion from reaction with aggregates	Plant-specific aging management program, or <a href="#">AMP XI.S2</a> , "ASME Section XI, Subsection IWL," and/or <a href="#">AMP XI.S6</a> , "Structures Monitoring," enhanced as necessary	Yes
	II.A2.CP-71	3.5-1, 024	Concrete (inaccessible areas): basemat	Concrete	Groundwater/soil	Increase in porosity and permeability; cracking; loss of material (spalling, scaling) due to aggressive chemical attack	AMP XI.S2, "ASME Section XI, Subsection IWL," or AMP XI.S6, "Structures Monitoring"	No
M	II.A2.CP-53	3.5-1, 014	Concrete (inaccessible areas): basemat	Concrete	Water – flowing	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	Plant-specific aging management program, or <a href="#">AMP XI.S2</a> , "ASME Section XI, Subsection IWL," and/or <a href="#">AMP XI.S6</a> , "Structures Monitoring," enhanced as necessary	Yes

<b>II CONTAINMENT STRUCTURES</b>								
<b>Table A2 Steel Containments</b>								
<b>New, Modified, Deleted, Edited Item</b>	<b>Item</b>	<b>SRP Item (Table, ID)</b>	<b>Structure and/or Component</b>	<b>Material</b>	<b>Environment</b>	<b>Aging Effect/Mechanism</b>	<b>Aging Management Program (AMP)/TLAA</b>	<b>Further Evaluation</b>
M	II.A2.CP-75	3.5-1, 023	Concrete (inaccessible areas): basemat; reinforcing steel	Concrete	Any	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	AMP XI.S2, "ASME Section XI, Subsection IWL," or AMP XI.S6, "Structures Monitoring"	No
E	II.A2.CP-69	3.5-1, 001	Concrete: basemat	Concrete	Soil	Cracking and distortion due to increased stress levels from settlement	AMP XI.S2, "ASME Section XI, Subsection IWL," or AMP XI.S6, "Structures Monitoring"	Yes
E	II.A2.C-07	3.5-1, 002	Concrete: foundation; subfoundation	Concrete; porous concrete	Water – flowing	Reduction of foundation strength and cracking due to differential settlement and erosion of porous concrete subfoundation	AMP XI.S6, "Structures Monitoring"	Yes
M	II.A2.CP-35	3.5-1, 035	Steel elements (accessible areas): liner; liner anchors; integral attachments	Steel	Air – indoor uncontrolled	Loss of material due to general, pitting, crevice corrosion	AMP XI.S1, "ASME Section XI, Subsection IWE," and AMP XI.S4, "10 CFR Part 50, Appendix J"	Yes

II CONTAINMENT STRUCTURES								
Table A2 Steel Containments								
New, Modified, Deleted, Edited Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
E	II.A2.CP-98	3.5-1, 005	Steel elements (inaccessible areas): liner; liner anchors; integral attachments	Steel	Air – indoor uncontrolled	Loss of material due to general, pitting, crevice corrosion	AMP XI.S1, "ASME Section XI, Subsection IWE," and AMP XI.S4, "10 CFR Part 50, Appendix J"	Yes

II CONTAINMENT STRUCTURES								
Table A3 Common Components								
New, Modified, Deleted, Edited Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	II.A3.CP-37	3.5-1, 027	Metal liner, metal plate, airlock, equipment hatch, CRD hatch; penetration sleeves; penetration bellows	Steel; stainless steel; dissimilar metal welds	Air – indoor uncontrolled, air – outdoor	Cracking due to cyclic loading (CLB fatigue analysis does not exist)	AMP XI.S1, "ASME Section XI, Subsection IWE," and AMP XI.S4, "10 CFR Part 50, Appendix J"	<del>No</del> Yes
M	II.A3.C-13	3.5-1, 009	Metal liner, metal plate, personnel airlock, equipment hatch, CRD hatch, penetration sleeves; penetration bellows	Steel; stainless steel; dissimilar metal welds	Air – indoor uncontrolled, air – outdoor	Cumulative fatigue damage due to fatigue (Only if CLB fatigue analysis exists)	TLAA, SRP-SLR Section 4.6, "Containment Liner Plate and Penetration Fatigue Analysis"	Yes

<b>II CONTAINMENT STRUCTURES</b>								
<b>Table A3 Common Components</b>								
<b>New, Modified, Deleted, Edited Item</b>	<b>Item</b>	<b>SRP Item (Table, ID)</b>	<b>Structure and/or Component</b>	<b>Material</b>	<b>Environment</b>	<b>Aging Effect/Mechanism</b>	<b>Aging Management Program (AMP)/TLAA</b>	<b>Further Evaluation</b>
	II.A3.CP-40	3.5-1, 026	Moisture barriers (caulking, flashing, other sealants)	Elastomer, rubber and other similar materials	Air – indoor uncontrolled	Loss of sealing due to wear, damage, erosion, tear, surface cracks, other defects	AMP XI.S1, "ASME Section XI, Subsection IWE"	No
M	II.A3.CP-36	3.5-1, 035	Penetration sleeves	Steel; dissimilar metal welds	Air – indoor uncontrolled, air – outdoor	Loss of material due to general, pitting, crevice corrosion	AMP XI.S1, "ASME Section XI, Subsection IWE," and AMP XI.S4, "10 CFR Part 50, Appendix J"	Yes
E	II.A3.CP-38	3.5-1, 010	Penetration sleeves; penetration bellows	Stainless steel; dissimilar metal welds	Air – indoor uncontrolled, air – outdoor	Cracking due to SCC	AMP XI.S1, "ASME Section XI, Subsection IWE," and AMP XI.S4, "10 CFR Part 50, Appendix J"	Yes
	II.A3.C-16	3.5-1, 028	Personnel airlock, equipment hatch, CRD hatch	Steel	Air – indoor uncontrolled, air – outdoor	Loss of material due to general, pitting, crevice corrosion	AMP XI.S1, "ASME Section XI, Subsection IWE," and AMP XI.S4, "10 CFR Part 50, Appendix J"	No
M	II.A3.CP-39	3.5-1, 029	Personnel airlock, equipment hatch, CRD hatch: locks, hinges, closure mechanisms	Steel	Air – indoor uncontrolled, air – outdoor	Loss of leak tightness due to mechanical wear	AMP XI.S1, "ASME Section XI, Subsection IWE," and AMP XI.S4, "10 CFR Part 50, Appendix J"	No
	II.A3.CP-148	3.5-1, 031	Pressure-retaining bolting	Steel	Air – indoor uncontrolled, air – outdoor	Loss of material due to general, pitting, crevice corrosion	AMP XI.S1, "ASME Section XI, Subsection IWE"	No

II CONTAINMENT STRUCTURES								
Table A3 Common Components								
New, Modified, Deleted, Edited Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	II.A3.CP-150	3.5-1, 030	Pressure-retaining bolting	Steel	Any	Loss of preload due to self-loosening	AMP XI.S1, "ASME Section XI, Subsection IWE," and AMP XI.S4, "10 CFR Part 50, Appendix J"	No
	II.A3.CP-41	3.5-1, 033	Seals and gaskets	Elastomer, rubber and other similar materials	Air – indoor uncontrolled, air – outdoor	Loss of sealing due to wear, damage, erosion, tear, surface cracks, other defects	AMP XI.S4, "10 CFR Part 50, Appendix J"	No
M	II.A3.CP-152	3.5-1, 034	Service Level I coatings	Coatings	Air – indoor uncontrolled, treated water	Loss of coating or lining integrity due to blistering, cracking, flaking, peeling, delamination, rusting, physical damage	AMP XI.S8, "Protective Coating Monitoring and Maintenance"	No

II CONTAINMENT STRUCTURES								
Table B1.1 Mark I Steel Containments								
New, Modified, Deleted, Edited Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	II.B1.1.CP-43	3.5-1, 035	Steel elements (accessible areas): drywell shell; drywell head; drywell shell in sand pocket regions	Steel	Air – indoor uncontrolled	Loss of material due to general, pitting, crevice corrosion	AMP XI.S1, "ASME Section XI, Subsection IWE," and AMP XI.S4, "10 CFR Part 50, Appendix J"	Yes

II CONTAINMENT STRUCTURES								
Table B1.1		Mark I Steel Containments						
New, Modified, Deleted, Edited Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
E	II.B1.1.C-23	3.5-1, 036	Steel elements: drywell head; downcomers	Steel	Air – indoor uncontrolled	Loss of material due to mechanical wear, including fretting	AMP XI.S1, "ASME Section XI, Subsection IWE"	No
	II.B1.1.CP-44	3.5-1, 041	Steel elements: drywell support skirt	Steel	Concrete	None	None	No
E	II.B1.1.CP-109	3.5-1, 007	Steel elements: torus ring girders; downcomers;	Steel	Air – indoor uncontrolled, treated water	Loss of material due to general, pitting, crevice corrosion	AMP XI.S1, "ASME Section XI, Subsection IWE"	Yes
M	II.B1.1.CP-48	3.5-1, 006	Steel elements: torus shell	Steel	Air – indoor uncontrolled, treated water	Loss of material due to general, pitting, crevice corrosion	AMP XI.S1, "ASME Section XI, Subsection IWE," and AMP XI.S4, "10 CFR Part 50, Appendix J"	Yes
<u>M</u>	II.B1.1.CP-49	3.5-1, 027	Steel elements: torus; vent line; vent header; vent line bellows; downcomers	Steel; stainless steel	Air – indoor uncontrolled	Cracking due to cyclic loading (CLB fatigue analysis does not exist)	AMP XI.S1, "ASME Section XI, Subsection IWE," and AMP XI.S4, "10 CFR Part 50, Appendix J"	<u>No</u> <u>Yes</u>
E	II.B1.1.C-21	3.5-1, 009	Steel elements: torus; vent line; vent header; vent line bellows; downcomers	Steel; stainless steel	Air – indoor uncontrolled	Cumulative fatigue damage due to fatigue (Only if CLB fatigue analysis exists)	TLAA, SRP-SLR Section 4.6, "Containment Liner Plate and Penetration Fatigue Analysis"	Yes
M	II.B1.1.CP-50	3.5-1, 039	Steel elements: vent line bellows	Stainless steel	Air – indoor uncontrolled	Cracking due to SCC	AMP XI.S1, "ASME Section XI, Subsection IWE," and AMP XI.S4, "10 CFR Part 50, Appendix J"	Yes



II CONTAINMENT STRUCTURES								
Table B1.2 Mark I Concrete Containments								
New, Modified, Deleted, Edited Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	II.B1.2.CP-79	3.5-1, 021	Concrete (accessible areas): basemat; reinforcing steel	Concrete	Air – indoor uncontrolled, air – outdoor	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	AMP XI.S2, "ASME Section XI, Subsection IWL"	No
E	II.B1.2.CP-59	3.5-1, 019	Concrete (accessible areas): containment; wall; basemat	Concrete	Any	Cracking due to expansion from reaction with aggregates	AMP XI.S2, "ASME Section XI, Subsection IWL"	No
	II.B1.2.CP-54	3.5-1, 020	Concrete (accessible areas): containment; wall; basemat	Concrete	Water – flowing	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	AMP XI.S2, "ASME Section XI, Subsection IWL"	No
M	II.B1.2.CP-80	3.5-1, 023	Concrete (inaccessible areas): basemat; reinforcing steel	Concrete	Any	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	AMP XI.S2, "ASME Section XI, Subsection IWL," and supplemented, as necessary, by AMP XI.S6, "Structures Monitoring"	No
M	II.B1.2.CP-99	3.5-1, 012	Concrete (inaccessible areas): containment; wall; basemat	Concrete	Any	Cracking due to expansion from reaction with aggregates	Plant-specific aging management program, <u>or AMP XI.S2, "ASME Section XI, Subsection IWL," and/or AMP XI.S6, "Structures Monitoring," enhanced as necessary</u>	Yes

II CONTAINMENT STRUCTURES								
Table B1.2		Mark I Concrete Containments						
New, Modified, Deleted, Edited Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	II.B1.2.CP-110	3.5-1, 014	Concrete (inaccessible areas): containment; wall; basemat	Concrete	Water – flowing	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	Plant-specific aging management program, <u>or AMP XI.S2, "ASME Section XI, Subsection IWL," and/or AMP XI.S6, "Structures Monitoring," enhanced as necessary</u>	Yes
E	II.B1.2.CP-105	3.5-1, 001	Concrete elements: all	Concrete	Soil	Cracking and distortion due to increased stress levels from settlement	AMP XI.S2, "ASME Section XI, Subsection IWL," and supplemented, as necessary, by AMP XI.S6, "Structures Monitoring"	Yes
<u>EM</u>	II.B1.2.CP-57	3.5-1, 003	Concrete: containment; wall; basemat	Concrete	Air – indoor uncontrolled, air – outdoor	Reduction of strength and modulus due to elevated temperature (>150°F general; >200°F local)	Plant-specific aging management program to be evaluated if temperature limits exceeded, <u>or AMP XI.S2, "ASME Section XI, Subsection IWL," and/or AMP XI.S6, "Structures Monitoring," enhanced as necessary</u>	Yes

<b>II CONTAINMENT STRUCTURES</b>								
<b>Table B1.2</b>		<b>Mark I Concrete Containments</b>						
<b>New, Modified, Deleted, Edited Item</b>	<b>Item</b>	<b>SRP Item (Table, ID)</b>	<b>Structure and/or Component</b>	<b>Material</b>	<b>Environment</b>	<b>Aging Effect/Mechanism</b>	<b>Aging Management Program (AMP)/TLAA</b>	<b>Further Evaluation</b>
M	II.B1.2.CP-106	3.5-1, 016	Concrete: containment; wall; basemat	Concrete	Air – indoor uncontrolled, air – outdoor, groundwater/soil	Increase in porosity and permeability; cracking; loss of material (spalling, scaling) due to aggressive chemical attack	AMP XI.S2, "ASME Section XI, Subsection IWL," or AMP XI.S6, "Structures Monitoring"	No
E	II.B1.2.C-07	3.5-1, 002	Concrete: foundation; subfoundation	Concrete; porous concrete	Water – flowing	Reduction of foundation strength and cracking due to differential settlement and erosion of porous concrete subfoundation	AMP XI.S6, "Structures Monitoring"	Yes
M	II.B1.2.CP-46	3.5-1, 035	Steel elements (accessible areas): suppression chamber; drywell; drywell head; embedded shell; region shielded by diaphragm floor (as applicable)	Steel	Air – indoor uncontrolled, treated water	Loss of material due to general, pitting, crevice corrosion	AMP XI.S1, "ASME Section XI, Subsection IWE," and AMP XI.S4, "10 CFR Part 50, Appendix J"	Yes
	II.B1.2.CP-114	3.5-1, 041	Steel elements (inaccessible areas): support skirt	Steel	Concrete	None	None	No

<b>II CONTAINMENT STRUCTURES</b>								
<b>Table B1.2</b>		<b>Mark I Concrete Containments</b>						
<b>New, Modified, Deleted, Edited Item</b>	<b>Item</b>	<b>SRP Item (Table, ID)</b>	<b>Structure and/or Component</b>	<b>Material</b>	<b>Environment</b>	<b>Aging Effect/Mechanism</b>	<b>Aging Management Program (AMP)/TLAA</b>	<b>Further Evaluation</b>
E	II.B1.2.CP-63	3.5-1, 005	Steel elements (inaccessible areas): suppression chamber; drywell; drywell head; embedded shell; region shielded by diaphragm floor (as applicable)	Steel	Air – indoor uncontrolled, treated water	Loss of material due to general, pitting, crevice corrosion	AMP XI.S1, "ASME Section XI, Subsection IWE," and AMP XI.S4, "10 CFR Part 50, Appendix J"	Yes
	II.B1.2.CP-117	3.5-1, 031	Steel elements: downcomer pipes	Steel	Air – indoor uncontrolled, treated water	Loss of material due to general, pitting, crevice corrosion	AMP XI.S1, "ASME Section XI, Subsection IWE"	No
E	II.B1.2.C-23	3.5-1, 036	Steel elements: drywell head; downcomers	Steel	Air – indoor uncontrolled	Loss of material due to mechanical wear, including fretting	AMP XI.S1, "ASME Section XI, Subsection IWE"	No
	II.B1.2.C-49	3.5-1, 037	Steel elements: suppression chamber (torus) liner (interior surface)	Steel; stainless steel	Air – indoor uncontrolled, treated water	Loss of material due to general (steel only), pitting, crevice corrosion	AMP XI.S1, "ASME Section XI, Subsection IWE," and AMP XI.S4, "10 CFR Part 50, Appendix J"	No

<b>II CONTAINMENT STRUCTURES</b>								
<b>Table B2.1</b>		<b>Mark II Steel Containments</b>						
<b>New, Modified, Deleted, Edited Item</b>	<b>Item</b>	<b>SRP Item (Table, ID)</b>	<b>Structure and/or Component</b>	<b>Material</b>	<b>Environment</b>	<b>Aging Effect/Mechanism</b>	<b>Aging Management Program (AMP)/TLAA</b>	<b>Further Evaluation</b>
M	II.B2.1.CP-46	3.5-1, 035	Steel elements (accessible areas): suppression chamber; drywell; drywell head; embedded shell; region shielded by diaphragm floor (as applicable)	Steel	Air – indoor uncontrolled, treated water	Loss of material due to general, pitting, crevice corrosion	AMP XI.S1, "ASME Section XI, Subsection IWE," and AMP XI.S4, "10 CFR Part 50, Appendix J"	Yes
	II.B2.1.CP-114	3.5-1, 041	Steel elements (inaccessible areas): support skirt	Steel	Concrete	None	None	No
E	II.B2.1.CP-63	3.5-1, 005	Steel elements (inaccessible areas): suppression chamber; drywell; drywell head; embedded shell; region shielded by diaphragm floor (as applicable)	Steel	Air – indoor uncontrolled, treated water	Loss of material due to general, pitting, crevice corrosion	AMP XI.S1, "ASME Section XI, Subsection IWE," and AMP XI.S4, "10 CFR Part 50, Appendix J"	Yes
	II.B2.1.CP-117	3.5-1, 031	Steel elements: downcomer pipes	Steel	Air – indoor uncontrolled, treated water	Loss of material due to general, pitting, crevice corrosion	AMP XI.S1, "ASME Section XI, Subsection IWE"	No
E	II.B2.1.C-23	3.5-1, 036	Steel elements: drywell head; downcomers	Steel	Air – indoor uncontrolled	Loss of material due to mechanical wear, including fretting	AMP XI.S1, "ASME Section XI, Subsection IWE"	No
<u>M</u>	II.B2.1.CP-107	3.5-1, 027	Suppression pool shell	Steel; stainless steel; dissimilar metal welds	Air – indoor uncontrolled, treated water	Cracking due to cyclic loading (CLB fatigue analysis does not exist)	AMP XI.S1, "ASME Section XI, Subsection IWE," and AMP XI.S4, "10 CFR Part 50, Appendix J"	<del>No</del> Yes

II CONTAINMENT STRUCTURES								
Table B2.1 Mark II Steel Containments								
New, Modified, Deleted, Edited Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	II.B2.1.C-45	3.5-1, 009	Suppression pool shell; unbraced downcomers	Steel; stainless steel; dissimilar metal welds	Air – indoor uncontrolled, treated water	Cumulative fatigue damage due to fatigue (Only if CLB fatigue analysis exists)	TLAA, SRP-SLR Section 4.6, "Containment Liner Plate and Penetration Fatigue Analysis"	Yes
<u>M</u>	II.B2.1.CP-142	3.5-1, 040	Unbraced downcomers	Steel; stainless steel; dissimilar metal welds	Air – indoor uncontrolled, treated water	Cracking due to cyclic loading (CLB fatigue analysis does not exist)	AMP XI.S1, "ASME Section XI, Subsection IWE"	<del>No</del> Yes

II CONTAINMENT STRUCTURES								
Table B2.2 Mark II Concrete Containments								
New, Modified, Deleted, Edited Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	II.B2.2.CP-79	3.5-1, 021	Concrete (accessible areas): basemat; reinforcing steel	Concrete	Air – indoor uncontrolled, air – outdoor	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	AMP XI.S2, "ASME Section XI, Subsection IWL"	No
E	II.B2.2.CP-59	3.5-1, 019	Concrete (accessible areas): containment; wall; basemat	Concrete	Any	Cracking due to expansion from reaction with aggregates	AMP XI.S2, "ASME Section XI, Subsection IWL"	No

<b>II CONTAINMENT STRUCTURES</b>								
<b>Table B2.2 Mark II Concrete Containments</b>								
<b>New, Modified, Deleted, Edited Item</b>	<b>Item</b>	<b>SRP Item (Table, ID)</b>	<b>Structure and/or Component</b>	<b>Material</b>	<b>Environment</b>	<b>Aging Effect/Mechanism</b>	<b>Aging Management Program (AMP)/TLAA</b>	<b>Further Evaluation</b>
	II.B2.2.CP-54	3.5-1, 020	Concrete (accessible areas): containment; wall; basemat	Concrete	Water – flowing	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	AMP XI.S2, "ASME Section XI, Subsection IWL"	No
M	II.B2.2.CP-80	3.5-1, 023	Concrete (inaccessible areas): basemat; reinforcing steel	Concrete	Any	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	AMP XI.S2, "ASME Section XI, Subsection IWL," and supplemented, as necessary, by AMP XI.S6, "Structures Monitoring"	No
M	II.B2.2.CP-99	3.5-1, 012	Concrete (inaccessible areas): containment; wall; basemat	Concrete	Any	Cracking due to expansion from reaction with aggregates	Plant-specific aging management program, <u>or AMP XI.S2, "ASME Section XI, Subsection IWL," and/or AMP XI.S6, "Structures Monitoring," enhanced as necessary.</u>	Yes
M	II.B2.2.CP-110	3.5-1, 014	Concrete (inaccessible areas): containment; wall; basemat	Concrete	Water – flowing	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	Plant-specific aging management program, <u>or AMP XI.S2, "ASME Section XI, Subsection IWL," and/or AMP XI.S6, "Structures Monitoring," enhanced as necessary.</u>	Yes

II CONTAINMENT STRUCTURES								
Table B.2.2 Mark II Concrete Containments								
New, Modified, Deleted, Edited Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
E	II.B2.2.CP-105	3.5-1, 001	Concrete elements: all	Concrete	Soil	Cracking and distortion due to increased stress levels from settlement	AMP XI.S2, "ASME Section XI, Subsection IWL," and supplemented, as necessary, by AMP XI.S6, "Structures Monitoring"	Yes
<u>EM</u>	II.B2.2.CP-57	3.5-1, 003	Concrete: containment; wall; basemat	Concrete	Air – indoor uncontrolled, air – outdoor	Reduction of strength and modulus due to elevated temperature (>150°F general; >200°F local)	Plant-specific aging management program to be evaluated if temperature limits exceeded, <u>or AMP XI.S2, "ASME Section XI, Subsection IWL," and/or AMP XI.S6, "Structures Monitoring," enhanced as necessary</u>	Yes
M	II.B2.2.CP-106	3.5-1, 016	Concrete: containment; wall; basemat	Concrete	Air – indoor uncontrolled, air – outdoor, groundwater/soil	Increase in porosity and permeability; cracking; loss of material (spalling, scaling) due to aggressive chemical attack	AMP XI.S2, "ASME Section XI, Subsection IWL," and supplemented, as necessary, by AMP XI.S6, "Structures Monitoring"	No
E	II.B2.2.C-07	3.5-1, 002	Concrete: foundation; subfoundation	Concrete; porous concrete	Water – flowing	Reduction of foundation strength and cracking due to differential settlement and erosion of porous concrete subfoundation	AMP XI.S6, "Structures Monitoring"	Yes



<b>II CONTAINMENT STRUCTURES</b>								
<b>Table B2.2 Mark II Concrete Containments</b>								
<b>New, Modified, Deleted, Edited Item</b>	<b>Item</b>	<b>SRP Item (Table, ID)</b>	<b>Structure and/or Component</b>	<b>Material</b>	<b>Environment</b>	<b>Aging Effect/Mechanism</b>	<b>Aging Management Program (AMP)/TLAA</b>	<b>Further Evaluation</b>
M	II.B2.2.C-11	3.5-1, 008	Prestressing system: tendons	Steel	Air – indoor uncontrolled, air – outdoor	Loss of prestress due to relaxation; shrinkage; creep; elevated temperature	TLAA, SRP-SLR Section 4.5, "Concrete Containment Tendon Prestress," and/or SRP-SLR Section 4.7, "Other Plant-Specific Time-Limited Aging Analyses"	Yes
	II.B2.2.C-10	3.5-1, 032	Prestressing system: tendons; anchorage components	Steel	Air – indoor uncontrolled, air – outdoor	Loss of material due to corrosion	AMP XI.S2, "ASME Section XI, Subsection IWL"	No
M	II.B2.2.CP-46	3.5-1, 035	Steel elements (accessible areas): suppression chamber; drywell; drywell head; embedded shell; region shielded by diaphragm floor (as applicable)	Steel	Air – indoor uncontrolled, treated water	Loss of material due to general, pitting, crevice corrosion	AMP XI.S1, "ASME Section XI, Subsection IWE," and AMP XI.S4, "10 CFR Part 50, Appendix J"	Yes
	II.B2.2.CP-114	3.5-1, 041	Steel elements (inaccessible areas): support skirt	Steel	Concrete	None	None	No

<b>II CONTAINMENT STRUCTURES</b>								
<b>Table B2.2 Mark II Concrete Containments</b>								
<b>New, Modified, Deleted, Edited Item</b>	<b>Item</b>	<b>SRP Item (Table, ID)</b>	<b>Structure and/or Component</b>	<b>Material</b>	<b>Environment</b>	<b>Aging Effect/Mechanism</b>	<b>Aging Management Program (AMP)/TLAA</b>	<b>Further Evaluation</b>
E	II.B2.2.CP-63	3.5-1, 005	Steel elements (inaccessible areas): suppression chamber; drywell; drywell head; embedded shell; region shielded by diaphragm floor (as applicable)	Steel	Air – indoor uncontrolled, treated water	Loss of material due to general, pitting, crevice corrosion	AMP XI.S1, "ASME Section XI, Subsection IWE," and AMP XI.S4, "10 CFR Part 50, Appendix J"	Yes
	II.B2.2.CP-117	3.5-1, 031	Steel elements: downcomer pipes	Steel	Air – indoor uncontrolled, treated water	Loss of material due to general, pitting, crevice corrosion	AMP XI.S1, "ASME Section XI, Subsection IWE"	No
E	II.B2.2.C-23	3.5-1, 036	Steel elements: drywell head; downcomers	Steel	Air – indoor uncontrolled	Loss of material due to mechanical wear, including fretting	AMP XI.S1, "ASME Section XI, Subsection IWE"	No
	II.B2.2.C-49	3.5-1, 037	Steel elements: suppression chamber (torus) liner (interior surface)	Steel; stainless steel	Air – indoor uncontrolled, treated water	Loss of material due to general (steel only), pitting, crevice corrosion	AMP XI.S1, "ASME Section XI, Subsection IWE," and AMP XI.S4, "10 CFR Part 50, Appendix J"	No
<b>EM</b>	II.B2.2.CP-64	3.5-1, 040	Steel elements: vent header; downcomers	Steel; stainless steel	Air – indoor uncontrolled, treated water	Cracking due to cyclic loading (CLB fatigue analysis does not exist)	AMP XI.S1, "ASME Section XI, Subsection IWE"	<b>NoYes</b>
E	II.B2.2.C-48	3.5-1, 009	Steel elements: vent header; downcomers	Steel; stainless steel	Air – indoor uncontrolled, treated water	Cumulative fatigue damage due to fatigue (Only if CLB fatigue analysis exists)	TLAA, SRP-SLR Section 4.6, "Containment Liner Plate and Penetration Fatigue Analysis"	Yes

<b>II CONTAINMENT STRUCTURES</b>								
<b>Table B3.1 Mark III Steel Containments</b>								
<b>New, Modified, Deleted, Edited Item</b>	<b>Item</b>	<b>SRP Item (Table, ID)</b>	<b>Structure and/or Component</b>	<b>Material</b>	<b>Environment</b>	<b>Aging Effect/Mechanism</b>	<b>Aging Management Program (AMP)/TLAA</b>	<b>Further Evaluation</b>
	II.B3.1.CP-72	3.5-1, 016	Concrete (accessible areas): basemat	Concrete	Groundwater/soil	Increase in porosity and permeability; cracking; loss of material (spalling, scaling) due to aggressive chemical attack	AMP XI.S2, "ASME Section XI, Subsection IWL," or AMP XI.S6, "Structures Monitoring"	No
	II.B3.1.CP-156	3.5-1, 020	Concrete (accessible areas): basemat	Concrete	Water – flowing	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	AMP XI.S2, "ASME Section XI, Subsection IWL," or AMP XI.S6, "Structures Monitoring"	No
E	II.B3.1.CP-66	3.5-1, 019	Concrete (accessible areas): basemat, concrete fill-in annulus	Concrete	Any	Cracking due to expansion from reaction with aggregates	AMP XI.S2, "ASME Section XI, Subsection IWL," or AMP XI.S6, "Structures Monitoring"	No
M	II.B3.1.CP-74	3.5-1, 021	Concrete (accessible areas): basemat; reinforcing steel	Concrete	Air – indoor uncontrolled, air – outdoor	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	AMP XI.S2, "ASME Section XI, Subsection IWL," or AMP XI.S6, "Structures Monitoring"	No
	II.B3.1.CP-71	3.5-1, 024	Concrete (inaccessible areas): basemat	Concrete	Groundwater/soil	Increase in porosity and permeability; cracking; loss of material (spalling, scaling) due to aggressive chemical attack	AMP XI.S2, "ASME Section XI, Subsection IWL," or AMP XI.S6, "Structures Monitoring"	No

<b>II CONTAINMENT STRUCTURES</b>								
<b>Table B3.1 Mark III Steel Containments</b>								
<b>New, Modified, Deleted, Edited Item</b>	<b>Item</b>	<b>SRP Item (Table, ID)</b>	<b>Structure and/or Component</b>	<b>Material</b>	<b>Environment</b>	<b>Aging Effect/Mechanism</b>	<b>Aging Management Program (AMP)/TLAA</b>	<b>Further Evaluation</b>
M	II.B3.1.CP-53	3.5-1, 014	Concrete (inaccessible areas): basemat	Concrete	Water – flowing	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	Plant-specific aging management program, <u>or AMP XI.S2, "ASME Section XI, Subsection IWL," and/or AMP XI.S6, "Structures Monitoring," enhanced as necessary</u>	Yes
M	II.B3.1.CP-83	3.5-1, 012	Concrete (inaccessible areas): basemat, concrete fill-in annulus	Concrete	Any	Cracking due to expansion from reaction with aggregates	Plant-specific aging management program, <u>or AMP XI.S2, "ASME Section XI, Subsection IWL," and/or AMP XI.S6, "Structures Monitoring," enhanced as necessary</u>	Yes
M	II.B3.1.CP-75	3.5-1, 023	Concrete (inaccessible areas): basemat; reinforcing steel	Concrete	Any	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	AMP XI.S2, "ASME Section XI, Subsection IWL," or AMP XI.S6, "Structures Monitoring"	No

II CONTAINMENT STRUCTURES								
Table B3.1 Mark III Steel Containments								
New, Modified, Deleted, Edited Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
E	II.B3.1.CP-69	3.5-1, 001	Concrete: basemat	Concrete	Soil	Cracking and distortion due to increased stress levels from settlement	AMP XI.S2, "ASME Section XI, Subsection IWL," or AMP XI.S6, "Structures Monitoring"	Yes
<u>EM</u>	II.B3.1.CP-65	3.5-1, 003	Concrete: basemat, concrete fill-in annulus	Concrete	Air – indoor uncontrolled, air – outdoor	Reduction of strength and modulus due to elevated temperature (>150°F general; >200°F local)	Plant-specific aging management program to be evaluated if temperature limits exceeded, <u>or AMP XI.S2, "ASME Section XI, Subsection IWL," and/or AMP XI.S6, "Structures Monitoring," enhanced as necessary</u>	Yes
E	II.B3.1.C-07	3.5-1, 002	Concrete: foundation; subfoundation	Concrete; porous concrete	Water – flowing	Reduction of foundation strength and cracking due to differential settlement and erosion of porous concrete subfoundation	AMP XI.S6, "Structures Monitoring"	Yes
M	II.B3.1.CP-43	3.5-1, 035	Steel elements (accessible areas): drywell shell; drywell head	Steel	Air – indoor uncontrolled	Loss of material due to general, pitting, crevice corrosion	AMP XI.S1, "ASME Section XI, Subsection IWE," and AMP XI.S4, "10 CFR Part 50, Appendix J"	Yes

<b>II CONTAINMENT STRUCTURES</b>								
<b>Table B3.1 Mark III Steel Containments</b>								
<b>New, Modified, Deleted, Edited Item</b>	<b>Item</b>	<b>SRP Item (Table, ID)</b>	<b>Structure and/or Component</b>	<b>Material</b>	<b>Environment</b>	<b>Aging Effect/Mechanism</b>	<b>Aging Management Program (AMP)/TLAA</b>	<b>Further Evaluation</b>
E	II.B3.1.CP-113	3.5-1, 004	Steel elements (inaccessible areas): drywell shell; drywell head	Steel	Air – indoor uncontrolled, concrete	Loss of material due to general, pitting, crevice corrosion	AMP XI.S1, "ASME Section XI, Subsection IWE," and AMP XI.S4, "10 CFR Part 50, Appendix J"	Yes
M	II.B3.1.C-24	3.5-1, 038	Steel elements: suppression chamber shell (interior surface)	Stainless steel	Air – indoor uncontrolled	Cracking due to SCC	AMP XI.S1, "ASME Section XI, Subsection IWE," and AMP XI.S4, "10 CFR Part 50, Appendix J"	Yes
E	II.B3.1.CP-158	3.5-1, 007	Steel elements: suppression chamber shell (interior surface)	Steel	Air – indoor uncontrolled, treated water	Loss of material due to general, pitting, crevice corrosion	AMP XI.S1, "ASME Section XI, Subsection IWE"	Yes

<b>II CONTAINMENT STRUCTURES</b>								
<b>Table B3.2</b>		<b>Mark III Concrete Containments</b>						
<b>New, Modified, Deleted, Edited Item</b>	<b>Item</b>	<b>SRP Item (Table, ID)</b>	<b>Structure and/or Component</b>	<b>Material</b>	<b>Environment</b>	<b>Aging Effect/Mechanism</b>	<b>Aging Management Program (AMP)/TLAA</b>	<b>Further Evaluation</b>
	II.B3.2.CP-84	3.5-1, 024	Concrete (accessible areas): dome; wall; basemat	Concrete	Air – indoor uncontrolled, air – outdoor, groundwater/soil	Increase in porosity and permeability; cracking; loss of material (spalling, scaling) due to aggressive chemical attack	AMP XI.S2, "ASME Section XI, Subsection IWL," and supplemented, as necessary, by AMP XI.S6, "Structures Monitoring"	No
	II.B3.2.CP-52	3.5-1, 018	Concrete (accessible areas): dome; wall; basemat	Concrete	Air – outdoor, groundwater/soil	Loss of material (spalling, scaling) and cracking due to freeze-thaw	AMP XI.S2, "ASME Section XI, Subsection IWL"	No
E	II.B3.2.CP-60	3.5-1, 019	Concrete (accessible areas): dome; wall; basemat	Concrete	Any	Cracking due to expansion from reaction with aggregates	AMP XI.S2, "ASME Section XI, Subsection IWL"	No
	II.B3.2.CP-55	3.5-1, 020	Concrete (accessible areas): dome; wall; basemat	Concrete	Water – flowing	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	AMP XI.S2, "ASME Section XI, Subsection IWL"	No
M	II.B3.2.CP-88	3.5-1, 021	Concrete (accessible areas): dome; wall; basemat; reinforcing steel	Concrete	Air – indoor uncontrolled, air – outdoor	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	AMP XI.S2, "ASME Section XI, Subsection IWL"	No
	II.B3.2.CP-73	3.5-1, 024	Concrete (inaccessible areas): dome; wall; basemat	Concrete	Air – indoor uncontrolled, air – outdoor, groundwater/soil	Increase in porosity and permeability; cracking; loss of material (spalling, scaling) due to aggressive chemical attack	AMP XI.S2, "ASME Section XI, Subsection IWL," and supplemented, as necessary, by AMP XI.S6, "Structures Monitoring"	No

<b>II CONTAINMENT STRUCTURES</b>								
<b>Table B3.2 Mark III Concrete Containments</b>								
<b>New, Modified, Deleted, Edited Item</b>	<b>Item</b>	<b>SRP Item (Table, ID)</b>	<b>Structure and/or Component</b>	<b>Material</b>	<b>Environment</b>	<b>Aging Effect/Mechanism</b>	<b>Aging Management Program (AMP)/TLAA</b>	<b>Further Evaluation</b>
<u>EM</u>	II.B3.2.CP-135	3.5-1, 011	Concrete (inaccessible areas): dome; wall; basemat	Concrete	Air – outdoor, groundwater/soil	Loss of material (spalling, scaling) and cracking due to freeze-thaw	Plant-specific aging management program to be evaluated for plants in moderate to severe weathering conditions, <u>or AMP XI.S2, “ASME Section XI, Subsection IWL,” and/or AMP XI.S6, “Structures Monitoring,” enhanced as necessary</u>	Yes
M	II.B3.2.CP-121	3.5-1, 012	Concrete (inaccessible areas): dome; wall; basemat	Concrete	Any	Cracking due to expansion from reaction with aggregates	Plant-specific aging management program significant if it is demonstrated that the in-place concrete can perform its intended function, <u>or AMP XI.S2, “ASME Section XI, Subsection IWL,” and/or AMP XI.S6, “Structures Monitoring,” enhanced as necessary</u>	Yes
M	II.B3.2.CP-122	3.5-1, 014	Concrete (inaccessible areas): dome; wall; basemat	Concrete	Water – flowing	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	Plant-specific aging management program, <u>or AMP XI.S2, “ASME Section XI, Subsection IWL,” and/or AMP XI.S6, “Structures Monitoring,” enhanced as necessary</u>	Yes



<b>II CONTAINMENT STRUCTURES</b>								
<b>Table B3.2 Mark III Concrete Containments</b>								
<b>New, Modified, Deleted, Edited Item</b>	<b>Item</b>	<b>SRP Item (Table, ID)</b>	<b>Structure and/or Component</b>	<b>Material</b>	<b>Environment</b>	<b>Aging Effect/Mechanism</b>	<b>Aging Management Program (AMP)/TLAA</b>	<b>Further Evaluation</b>
M	II.B3.2.CP-89	3.5-1, 023	Concrete (inaccessible areas): dome; wall; basemat; reinforcing steel	Concrete	Any	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	AMP XI.S2, "ASME Section XI, Subsection IWL," and supplemented, as necessary, by AMP XI.S6, "Structures Monitoring"	No
E	II.B3.2.CP-105	3.5-1, 001	Concrete elements: all	Concrete	Soil	Cracking and distortion due to increased stress levels from settlement	AMP XI.S2, "ASME Section XI, Subsection IWL," and supplemented, as necessary, by AMP XI.S6, "Structures Monitoring"	Yes
<u>EM</u>	II.B3.2.CP-108	3.5-1, 003	Concrete: dome; wall; basemat	Concrete	Air – indoor uncontrolled, air – outdoor	Reduction of strength and modulus due to elevated temperature (>150°F general; >200°F local)	Plant-specific aging management program to be evaluated if temperature limits exceeded, <u>or AMP XI.S2, "ASME Section XI, Subsection IWL," and/or AMP XI.S6, "Structures Monitoring," enhanced as necessary</u>	Yes
E	II.B3.2.C-07	3.5-1, 002	Concrete: foundation; subfoundation	Concrete; porous concrete	Water – flowing	Reduction of foundation strength and cracking due to differential settlement and erosion of porous concrete subfoundation	AMP XI.S6, "Structures Monitoring"	Yes

II CONTAINMENT STRUCTURES								
Table B3.2 Mark III Concrete Containments								
New, Modified, Deleted, Edited Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	II.B3.2.CP-35	3.5-1, 035	Steel elements (accessible areas): liner; liner anchors; integral attachments	Steel	Air – indoor uncontrolled	Loss of material due to general, pitting, crevice corrosion	AMP XI.S1, "ASME Section XI, Subsection IWE," and AMP XI.S4, "10 CFR Part 50, Appendix J"	Yes
E	II.B3.2.CP-98	3.5-1, 005	Steel elements (inaccessible areas): liner; liner anchors; integral attachments	Steel	Air – indoor uncontrolled	Loss of material due to general, pitting, crevice corrosion	AMP XI.S1, "ASME Section XI, Subsection IWE," and AMP XI.S4, "10 CFR Part 50, Appendix J"	Yes
M	II.B3.2.C-24	3.5-1, 038	Steel elements: suppression chamber shell (interior surface)	Stainless steel	Air – indoor uncontrolled	Cracking due to SCC	AMP XI.S1, "ASME Section XI, Subsection IWE," and AMP XI.S4, "10 CFR Part 50, Appendix J"	Yes

II CONTAINMENT STRUCTURES								
Table B4 Common Components								
New, Modified, Deleted, Edited Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	II.B4.CP-37	3.5-1, 027	Metal liner, metal plate, airlock, equipment hatch, CRD hatch; penetration sleeves; penetration bellows	Steel; stainless steel; dissimilar metal welds	Air – indoor uncontrolled, air – outdoor	Cracking due to cyclic loading (CLB fatigue analysis does not exist)	AMP XI.S1, "ASME Section XI, Subsection IWE," and AMP XI.S4, "10 CFR Part 50, Appendix J"	<del>Yes</del>

<b>II CONTAINMENT STRUCTURES</b>								
<b>Table B4 Common Components</b>								
<b>New, Modified, Deleted, Edited Item</b>	<b>Item</b>	<b>SRP Item (Table, ID)</b>	<b>Structure and/or Component</b>	<b>Material</b>	<b>Environment</b>	<b>Aging Effect/Mechanism</b>	<b>Aging Management Program (AMP)/TLAA</b>	<b>Further Evaluation</b>
M	II.B4.C-13	3.5-1, 009	Metal liner, metal plate, personnel airlock, equipment hatch, CRD hatch, penetration sleeves; penetration bellows	Steel; stainless steel; dissimilar metal welds	Air – indoor uncontrolled, air – outdoor	Cumulative fatigue damage due to fatigue (Only if CLB fatigue analysis exists)	TLAA, SRP-SLR Section 4.6, "Containment Liner Plate and Penetration Fatigue Analysis"	Yes
	II.B4.CP-40	3.5-1, 026	Moisture barriers (caulking, flashing, other sealants)	Elastomer, rubber and other similar materials	Air – indoor uncontrolled	Loss of sealing due to wear, damage, erosion, tear, surface cracks, other defects	AMP XI.S1, "ASME Section XI, Subsection IWE"	No
M	II.B4.CP-36	3.5-1, 035	Penetration sleeves	Steel; dissimilar metal welds	Air – indoor uncontrolled, air – outdoor	Loss of material due to general, pitting, crevice corrosion	AMP XI.S1, "ASME Section XI, Subsection IWE," and AMP XI.S4, "10 CFR Part 50, Appendix J"	Yes
E	II.B4.CP-38	3.5-1, 010	Penetration sleeves; penetration bellows	Stainless steel; dissimilar metal welds	Air – indoor uncontrolled, air – outdoor	Cracking due to SCC	AMP XI.S1, "ASME Section XI, Subsection IWE," and AMP XI.S4, "10 CFR Part 50, Appendix J"	Yes
	II.B4.C-16	3.5-1, 028	Personnel airlock, equipment hatch, CRD hatch	Steel	Air – indoor uncontrolled, air – outdoor	Loss of material due to general, pitting, crevice corrosion	AMP XI.S1, "ASME Section XI, Subsection IWE," and AMP XI.S4, "10 CFR Part 50, Appendix J"	No

<b>II CONTAINMENT STRUCTURES</b>								
<b>Table B4 Common Components</b>								
<b>New, Modified, Deleted, Edited Item</b>	<b>Item</b>	<b>SRP Item (Table, ID)</b>	<b>Structure and/or Component</b>	<b>Material</b>	<b>Environment</b>	<b>Aging Effect/Mechanism</b>	<b>Aging Management Program (AMP)/TLAA</b>	<b>Further Evaluation</b>
M	II.B4.CP-39	3.5-1, 029	Personnel airlock, equipment hatch, CRD hatch: locks, hinges, closure mechanisms	Steel	Air – indoor uncontrolled, air – outdoor	Loss of leak tightness due to mechanical wear	AMP XI.S1, "ASME Section XI, Subsection IWE," and AMP XI.S4, "10 CFR Part 50, Appendix J"	No
	II.B4.CP-148	3.5-1, 031	Pressure-retaining bolting	Steel	Air – indoor uncontrolled, air – outdoor	Loss of material due to general, pitting, crevice corrosion	AMP XI.S1, "ASME Section XI, Subsection IWE"	No
M	II.B4.CP-150	3.5-1, 030	Pressure-retaining bolting	Steel	Any	Loss of preload due to self-loosening	AMP XI.S1, "ASME Section XI, Subsection IWE," and AMP XI.S4, "10 CFR Part 50, Appendix J"	No
	II.B4.CP-41	3.5-1, 033	Seals and gaskets	Elastomer, rubber and other similar materials	Air – indoor uncontrolled, air – outdoor	Loss of sealing due to wear, damage, erosion, tear, surface cracks, other defects	AMP XI.S4, "10 CFR Part 50, Appendix J"	No
M	II.B4.CP-152	3.5-1, 034	Service Level I coatings	Coatings	Air – indoor uncontrolled, treated water	Loss of coating or lining integrity due to blistering, cracking, flaking, peeling, delamination, rusting, physical damage	AMP XI.S8, "Protective Coating Monitoring and Maintenance"	No

## APPENDIX D

### REVISIONS TO GALL-SLR REPORT CHAPTER III TO ALLOW PLANT-SPECIFIC AGING MANAGEMENT OPTIONS

#### Summary of Revisions

This appendix modifies NUREG-2191, "Generic Aging Lessons Learned for Subsequent License Renewal (GALL-SLR) Report," relevant aging management review (AMR) items to reflect the option of using, in lieu of recommended plant-specific aging management programs (AMPs), plant-specific enhancements to GALL-SLR Report AMPs (with modified inspection activities when required) to manage the effects of aging in concrete for the following:

- reduction of strength and modulus of elasticity due to elevated temperature (greater than 66 degrees Celsius (150 degrees Fahrenheit) general: greater than 93 degrees Celsius (200 degrees Fahrenheit) local)
- loss of material (spalling, scaling) and cracking due to freeze-thaw
- cracking due to expansion from reaction with aggregates
- increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation
- reduction of strength; loss of mechanical properties due to irradiation (i.e., radiation interactions with material and radiation-induced heating) for boiling-water reactor (BWR) and pressurized-water reactor (PWR) components in question, including those located in inaccessible areas

#### Basis for Revisions

Modifications to GALL-SLR Report AMR items and SRP-SLR Table 3.5-1 line items (see Appendix E) with associated further evaluations provide the option to use, in lieu of a plant-specific AMP, plant-specific enhancements to GALL-SLR Report AMP XI.S6, "Structures Monitoring," or other selected AMPs. The option to use plant-specific enhancements increases the efficiency of subsequent license renewal applications reviews by limiting the use of AMR "Note E" to plant-specific aging management activities when aging effects are managed through a plant-specific AMP.

#### AMP Revisions

None

#### Revisions to FSAR Supplement

None

Revisions to AMR Items

III STRUCTURES AND COMPONENT SUPPORTS								
Table A1 Group 1 Structures (BWR Reactor Bldg., PWR Shield Bldg., Control Room/Bldg.)								
New, Modified, Deleted, Edited Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
E	III.A1.TP-25	3.5-1, 054	Concrete (accessible areas): all	Concrete	Any	Cracking due to expansion from reaction with aggregates	AMP XI.S6, "Structures Monitoring"	No
	III.A1.TP-27	3.5-1, 065	Concrete (accessible areas): below-grade exterior; foundation	Concrete	Groundwater/soil	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	AMP XI.S6, "Structures Monitoring"	No
	III.A1.TP-23	3.5-1, 064	Concrete (accessible areas): exterior above- and below-grade; foundation	Concrete	Air – outdoor	Loss of material (spalling, scaling) and cracking due to freeze-thaw	AMP XI.S6, "Structures Monitoring"	No
	III.A1.TP-24	3.5-1, 063	Concrete (accessible areas): exterior above- and below-grade; foundation	Concrete	Water – flowing	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	AMP XI.S6, "Structures Monitoring"	No
	III.A1.TP-26	3.5-1, 066	Concrete (accessible areas): interior and above-grade exterior	Concrete	Air – indoor uncontrolled, air – outdoor	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	AMP XI.S6, "Structures Monitoring"	No
M	III.A1.TP-204	3.5-1, 043	Concrete (inaccessible areas): all	Concrete	Any	Cracking due to expansion from reaction with aggregates	Plant-specific aging management program <u>or AMP XI.S6, "Structures Monitoring," enhanced as necessary</u>	Yes

III STRUCTURES AND COMPONENT SUPPORTS								
Table A1 Group 1 Structures (BWR Reactor Bldg., PWR Shield Bldg., Control Room/Bldg.)								
New, Modified, Deleted, Edited Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	III.A1.TP-212	3.5-1, 065	Concrete (inaccessible areas): below-grade exterior; foundation	Concrete	Groundwater/soil	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	AMP XI.S6, "Structures Monitoring"	No
	III.A1.TP-29	3.5-1, 067	Concrete (inaccessible areas): below-grade exterior; foundation	Concrete	Groundwater/soil	Increase in porosity and permeability; cracking; loss of material (spalling, scaling) due to aggressive chemical attack	AMP XI.S6, "Structures Monitoring"	No
M	III.A1.TP-67	3.5-1, 047	Concrete (inaccessible areas): exterior above- and below-grade; foundation	Concrete	Water – flowing	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	Plant-specific aging management program <u>or AMP XI.S6, "Structures Monitoring," enhanced as necessary</u>	Yes
M	III.A1.TP-108	3.5-1, 042	Concrete (inaccessible areas): foundation	Concrete	Air – outdoor, groundwater/soil	Loss of material (spalling, scaling) and cracking due to freeze-thaw	Plant-specific aging management program to be evaluated for plants in moderate to severe weathering <u>conditions or AMP XI.S6, "Structures Monitoring," enhanced as necessary</u>	Yes

III STRUCTURES AND COMPONENT SUPPORTS								
Table A1 Group 1 Structures (BWR Reactor Bldg., PWR Shield Bldg., Control Room/Bldg.)								
New, Modified, Deleted, Edited Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
EM	III.A1.TP-114	3.5-1, 048	Concrete: all	Concrete	Air – indoor uncontrolled	Reduction of strength and modulus due to elevated temperature (>150°F general; >200°F local)	Plant-specific aging management program to be evaluated if temperature limits exceeded <u>or AMP XI.S6, "Structures Monitoring," enhanced as necessary.</u>	Yes
E	III.A1.TP-30	3.5-1, 044	Concrete: all	Concrete	Soil	Cracking and distortion due to increased stress levels from settlement	AMP XI.S6, "Structures Monitoring"	Yes
E	III.A1.TP-31	3.5-1, 046	Concrete: foundation; subfoundation	Concrete; porous concrete	Water – flowing	Reduction of foundation strength and cracking due to differential settlement and erosion of porous concrete subfoundation	AMP XI.S6, "Structures Monitoring"	Yes
	III.A1.TP-28	3.5-1, 067	Concrete: interior; above-grade exterior	Concrete	Air – indoor uncontrolled, air – outdoor	Increase in porosity and permeability; cracking; loss of material (spalling, scaling) due to aggressive chemical attack	AMP XI.S6, "Structures Monitoring"	No
	III.A1.T-12	3.5-1, 070	Masonry walls: all	Concrete block	Air – indoor uncontrolled, air – outdoor	Cracking due to restraint shrinkage, creep, and aggressive environment	AMP XI.S5, "Masonry Walls"	No
N	III.A1.TP-34	3.5-1, 071	Masonry walls: all	Concrete block	Air – outdoor	Loss of material (spalling, scaling) and cracking due to freeze-thaw	AMP XI.S5, "Masonry Walls"	No



III STRUCTURES AND COMPONENT SUPPORTS								
Table A1 Group 1 Structures (BWR Reactor Bldg., PWR Shield Bldg., Control Room/Bldg.)								
New, Modified, Deleted, Edited Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
E	III.A1.TP-302	3.5-1, 077	Steel components: all structural steel	Steel	Air – indoor uncontrolled, air – outdoor	Loss of material due to corrosion	AMP XI.S6, "Structures Monitoring"	No
E	III.A1.TP-261	3.5-1, 088	Structural bolting	Any	Any	Loss of preload due to self-loosening	AMP XI.S6, "Structures Monitoring"	No
M	III.A1.TP-248	3.5-1, 080	Structural bolting	Steel	Air – indoor uncontrolled, air – outdoor	Loss of material due to general, pitting, crevice corrosion	AMP XI.S6, "Structures Monitoring"	No
	III.A1.TP-274	3.5-1, 082	Structural bolting	Steel; galvanized steel	Air – outdoor	Loss of material due to general, pitting, crevice corrosion	AMP XI.S6, "Structures Monitoring"	No
D	III.A1.TP-300							

III STRUCTURES AND COMPONENT SUPPORTS								
Table A2 Group 2 Structures (BWR Reactor Bldg. With Steel Superstructure)								
New, Modified, Deleted, Edited Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
E	III.A2.TP-25	3.5-1, 054	Concrete (accessible areas): all	Concrete	Any	Cracking due to expansion from reaction with aggregates	AMP XI.S6, "Structures Monitoring"	No
	III.A2.TP-27	3.5-1, 065	Concrete (accessible areas): below-grade exterior; foundation	Concrete	Groundwater/soil	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	AMP XI.S6, "Structures Monitoring"	No

III STRUCTURES AND COMPONENT SUPPORTS								
Table A2 Group 2 Structures (BWR Reactor Bldg. With Steel Superstructure)								
New, Modified, Deleted, Edited Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	III.A2.TP-23	3.5-1, 064	Concrete (accessible areas): exterior above- and below-grade; foundation	Concrete	Air – outdoor	Loss of material (spalling, scaling) and cracking due to freeze-thaw	AMP XI.S6, "Structures Monitoring"	No
	III.A2.TP-24	3.5-1, 063	Concrete (accessible areas): exterior above- and below-grade; foundation	Concrete	Water – flowing	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	AMP XI.S6, "Structures Monitoring"	No
	III.A2.TP-26	3.5-1, 066	Concrete (accessible areas): interior and above-grade exterior	Concrete	Air – indoor uncontrolled, air – outdoor	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	AMP XI.S6, "Structures Monitoring"	No
M	III.A2.TP-204	3.5-1, 043	Concrete (inaccessible areas): all	Concrete	Any	Cracking due to expansion from reaction with aggregates	Plant-specific aging management program <u>or AMP XI.S6, "Structures Monitoring," enhanced as necessary</u>	Yes
	III.A2.TP-212	3.5-1, 065	Concrete (inaccessible areas): below-grade exterior; foundation	Concrete	Groundwater/soil	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	AMP XI.S6, "Structures Monitoring"	No

III STRUCTURES AND COMPONENT SUPPORTS								
Table A2 Group 2 Structures (BWR Reactor Bldg. With Steel Superstructure)								
New, Modified, Deleted, Edited Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	III.A2.TP-29	3.5-1, 067	Concrete (inaccessible areas): below-grade exterior; foundation	Concrete	Groundwater/soil	Increase in porosity and permeability; cracking; loss of material (spalling, scaling) due to aggressive chemical attack	AMP XI.S6, "Structures Monitoring"	No
M	III.A2.TP-67	3.5-1, 047	Concrete (inaccessible areas): exterior above- and below-grade; foundation	Concrete	Water – flowing	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	Plant-specific aging management program <u>or AMP XI.S6, "Structures Monitoring," enhanced as necessary</u>	Yes
M	III.A2.TP-108	3.5-1, 042	Concrete (inaccessible areas): foundation	Concrete	Air – outdoor, groundwater/soil	Loss of material (spalling, scaling) and cracking due to freeze-thaw	Plant-specific aging management program to be evaluated for plants in moderate to severe weathering conditions <u>or AMP XI.S6, "Structures Monitoring," enhanced as necessary</u>	Yes
<u>EM</u>	III.A2.TP-114	3.5-1, 048	Concrete: all	Concrete	Air – indoor uncontrolled	Reduction of strength and modulus due to elevated temperature (>150°F general; >200°F local)	Plant-specific aging management program to be evaluated if temperature limits exceeded <u>or AMP XI.S6, "Structures Monitoring," enhanced as necessary</u>	Yes
E	III.A2.TP-30	3.5-1, 044	Concrete: all	Concrete	Soil	Cracking and distortion due to increased stress levels from settlement	AMP XI.S6, "Structures Monitoring"	Yes

III STRUCTURES AND COMPONENT SUPPORTS								
Table A2 Group 2 Structures (BWR Reactor Bldg. With Steel Superstructure)								
New, Modified, Deleted, Edited Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
E	III.A2.TP-31	3.5-1, 046	Concrete: foundation; subfoundation	Concrete; porous concrete	Water – flowing	Reduction of foundation strength and cracking due to differential settlement and erosion of porous concrete subfoundation	AMP XI.S6, "Structures Monitoring"	Yes
	III.A2.TP-28	3.5-1, 067	Concrete: interior; above-grade exterior	Concrete	Air – indoor uncontrolled, air – outdoor	Increase in porosity and permeability; cracking; loss of material (spalling, scaling) due to aggressive chemical attack	AMP XI.S6, "Structures Monitoring"	No
	III.A2.T-12	3.5-1, 070	Masonry walls: all	Concrete block	Air – indoor uncontrolled, air – outdoor	Cracking due to restraint shrinkage, creep, and aggressive environment	AMP XI.S5, "Masonry Walls"	No
N	III.A2.TP-34	3.5-1, 071	Masonry walls: all	Concrete block	Air – outdoor	Loss of material (spalling, scaling) and cracking due to freeze-thaw	AMP XI.S5, "Masonry Walls"	No
E	III.A2.TP-302	3.5-1, 077	Steel components: all structural steel	Steel	Air – indoor uncontrolled, air – outdoor	Loss of material due to corrosion	AMP XI.S6, "Structures Monitoring"	No
E	III.A2.TP-261	3.5-1, 088	Structural bolting	Any	Any	Loss of preload due to self-loosening	AMP XI.S6, "Structures Monitoring"	No
M	III.A2.TP-248	3.5-1, 080	Structural bolting	Steel	Air – indoor uncontrolled, air – outdoor	Loss of material due to general, pitting, crevice corrosion	AMP XI.S6, "Structures Monitoring"	No
	III.A2.TP-274	3.5-1, 082	Structural bolting	Steel; galvanized steel	Air – outdoor	Loss of material due to general, pitting, crevice corrosion	AMP XI.S6, "Structures Monitoring"	No
D	III.A2.TP-300							

<b>III Table A3 STRUCTURES AND COMPONENT SUPPORTS</b> <b>Group 3 Structures (Auxiliary Bldg., Diesel Generator Bldg., Radwaste Bldg., Turbine Bldg., Switchgear Rm., Yard Structures Such As AFW Pumphouse, Utility/Piping Tunnels, Security/Lighting Poles, Manholes, Duct Banks; SBO Structures Such As Transmission Towers, Startup Tower Circuit Breaker Foundation, Electrical Enclosure)</b>								
<b>New, Modified, Deleted, Edited Item</b>	<b>Item</b>	<b>SRP Item (Table, ID)</b>	<b>Structure and/or Component</b>	<b>Material</b>	<b>Environment</b>	<b>Aging Effect/Mechanism</b>	<b>Aging Management Program (AMP)/TLAA</b>	<b>Further Evaluation</b>
E	III.A3.TP-25	3.5-1, 054	Concrete (accessible areas): all	Concrete	Any	Cracking due to expansion from reaction with aggregates	AMP XI.S6, "Structures Monitoring"	No
	III.A3.TP-27	3.5-1, 065	Concrete (accessible areas): below-grade exterior; foundation	Concrete	Groundwater/soil	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	AMP XI.S6, "Structures Monitoring"	No
	III.A3.TP-23	3.5-1, 064	Concrete (accessible areas): exterior above- and below-grade; foundation	Concrete	Air – outdoor	Loss of material (spalling, scaling) and cracking due to freeze-thaw	AMP XI.S6, "Structures Monitoring"	No
	III.A3.TP-24	3.5-1, 063	Concrete (accessible areas): exterior above- and below-grade; foundation	Concrete	Water – flowing	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	AMP XI.S6, "Structures Monitoring"	No
	III.A3.TP-26	3.5-1, 066	Concrete (accessible areas): interior and above-grade exterior	Concrete	Air – indoor uncontrolled, air – outdoor	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	AMP XI.S6, "Structures Monitoring"	No

III Table A3 <b>STRUCTURES AND COMPONENT SUPPORTS</b> Group 3 Structures (Auxiliary Bldg., Diesel Generator Bldg., Radwaste Bldg., Turbine Bldg., Switchgear Rm., Yard Structures Such As AFW Pumphouse, Utility/Piping Tunnels, Security/Lighting Poles, Manholes, Duct Banks; SBO Structures Such As Transmission Towers, Startup Tower Circuit Breaker Foundation, Electrical Enclosure)								
New, Modified, Deleted, Edited Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	III.A3.TP-204	3.5-1, 043	Concrete (inaccessible areas): all	Concrete	Any	Cracking due to expansion from reaction with aggregates	Plant-specific aging management program <u>or AMP XI.S6, "Structures Monitoring," enhanced as necessary</u>	Yes
	III.A3.TP-212	3.5-1, 065	Concrete (inaccessible areas): below-grade exterior; foundation	Concrete	Groundwater/soil	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	AMP XI.S6, "Structures Monitoring"	No
	III.A3.TP-29	3.5-1, 067	Concrete (inaccessible areas): below-grade exterior; foundation	Concrete	Groundwater/soil	Increase in porosity and permeability; cracking; loss of material (spalling, scaling) due to aggressive chemical attack	AMP XI.S6, "Structures Monitoring"	No
M	III.A3.TP-67	3.5-1, 047	Concrete (inaccessible areas): exterior above- and below-grade; foundation	Concrete	Water – flowing	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	Plant-specific aging management program <u>or AMP XI.S6, "Structures Monitoring," enhanced as necessary</u>	Yes
M	III.A3.TP-108	3.5-1, 042	Concrete (inaccessible areas): foundation	Concrete	Air – outdoor, groundwater/soil	Loss of material (spalling, scaling) and cracking due to freeze-thaw	Plant-specific aging management program to be evaluated for plants in moderate to severe weathering conditions <u>or AMP XI.S6, "Structures Monitoring," enhanced as necessary</u>	Yes

III Table A3 <b>STRUCTURES AND COMPONENT SUPPORTS</b> Group 3 Structures (Auxiliary Bldg., Diesel Generator Bldg., Radwaste Bldg., Turbine Bldg., Switchgear Rm., Yard Structures Such As AFW Pumphouse, Utility/Piping Tunnels, Security/Lighting Poles, Manholes, Duct Banks; SBO Structures Such As Transmission Towers, Startup Tower Circuit Breaker Foundation, Electrical Enclosure)								
New, Modified, Deleted, Edited Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
EM	III.A3.TP-114	3.5-1, 048	Concrete: all	Concrete	Air – indoor uncontrolled	Reduction of strength and modulus due to elevated temperature (>150°F general; >200°F local)	Plant-specific aging management program to be evaluated if temperature limits exceeded <u>or AMP XI.S6, "Structures Monitoring," enhanced as necessary</u>	Yes
E	III.A3.TP-30	3.5-1, 044	Concrete: all	Concrete	Soil	Cracking and distortion due to increased stress levels from settlement	AMP XI.S6, "Structures Monitoring"	Yes
E	III.A3.TP-31	3.5-1, 046	Concrete: foundation; subfoundation	Concrete; porous concrete	Water – flowing	Reduction of foundation strength and cracking due to differential settlement and erosion of porous concrete subfoundation	AMP XI.S6, "Structures Monitoring"	Yes
	III.A3.TP-28	3.5-1, 067	Concrete: interior; above-grade exterior	Concrete	Air – indoor uncontrolled, air – outdoor	Increase in porosity and permeability; cracking; loss of material (spalling, scaling) due to aggressive chemical attack	AMP XI.S6, "Structures Monitoring"	No
	III.A3.T-12	3.5-1, 070	Masonry walls: all	Concrete block	Air – indoor uncontrolled, air – outdoor	Cracking due to restraint shrinkage, creep, and aggressive environment	AMP XI.S5, "Masonry Walls"	No

<b>III STRUCTURES AND COMPONENT SUPPORTS</b>								
<b>Table A3 Group 3 Structures (Auxiliary Bldg., Diesel Generator Bldg., Radwaste Bldg., Turbine Bldg., Switchgear Rm., Yard Structures Such As AFW Pumphouse, Utility/Piping Tunnels, Security/Lighting Poles, Manholes, Duct Banks; SBO Structures Such As Transmission Towers, Startup Tower Circuit Breaker Foundation, Electrical Enclosure)</b>								
<b>New, Modified, Deleted, Edited Item</b>	<b>Item</b>	<b>SRP Item (Table, ID)</b>	<b>Structure and/or Component</b>	<b>Material</b>	<b>Environment</b>	<b>Aging Effect/Mechanism</b>	<b>Aging Management Program (AMP)/TLAA</b>	<b>Further Evaluation</b>
N	III.A3.TP-34	3.5-1, 071	Masonry walls: all	Concrete block	Air – outdoor	Loss of material (spalling, scaling) and cracking due to freeze-thaw	AMP XI.S5, "Masonry Walls"	No
E	III.A3.TP-302	3.5-1, 077	Steel components: all structural steel	Steel	Air – indoor uncontrolled, air – outdoor	Loss of material due to corrosion	AMP XI.S6, "Structures Monitoring"	No
	III.A3.TP-219	3.5-1, 079	Steel components: piles	Steel	Soil, groundwater	Loss of material due to corrosion	AMP XI.S6, "Structures Monitoring"	No
E	III.A3.TP-261	3.5-1, 088	Structural bolting	Any	Any	Loss of preload due to self-loosening	AMP XI.S6, "Structures Monitoring"	No
M	III.A3.TP-248	3.5-1, 080	Structural bolting	Steel	Air – indoor uncontrolled, air – outdoor	Loss of material due to general, pitting, crevice corrosion	AMP XI.S6, "Structures Monitoring"	No
	III.A3.TP-274	3.5-1, 082	Structural bolting	Steel; galvanized steel	Air – outdoor	Loss of material due to general, pitting, crevice corrosion	AMP XI.S6, "Structures Monitoring"	No
D	III.A3.TP-300							



III STRUCTURES AND COMPONENT SUPPORTS								
Table A4 Group Structures (Containment Internal Structures, Excluding Refueling Canal)								
New, Modified, Deleted, Edited Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
E	III.A4.TP-25	3.5-1, 054	Concrete (accessible areas): all	Concrete	Any	Cracking due to expansion from reaction with aggregates	AMP XI.S6, "Structures Monitoring"	No
	III.A4.TP-26	3.5-1, 066	Concrete (accessible areas): interior and above-grade exterior	Concrete	Air – indoor uncontrolled, air – outdoor	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	AMP XI.S6, "Structures Monitoring"	No
M	III.A4.TP-204	3.5-1, 043	Concrete (inaccessible areas): all	Concrete	Any	Cracking due to expansion from reaction with aggregates	Plant-specific aging management <u>program or AMP XI.S6, "Structures Monitoring," enhanced as necessary</u>	Yes
M	III.A4.TP-305	3.5-1, 047	Concrete (inaccessible areas): exterior above- and below-grade; foundation	Concrete	Water – flowing	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	Plant-specific aging management program <u>or AMP XI.S6, "Structures Monitoring," enhanced as necessary</u>	Yes
<u>EM</u>	III.A4.TP-114	3.5-1, 048	Concrete: all	Concrete	Air – indoor uncontrolled	Reduction of strength and modulus due to elevated temperature (>150°F general; >200°F local)	Plant-specific aging management program to be evaluated if temperature limits exceeded <u>or AMP XI.S6, "Structures Monitoring," enhanced as necessary</u>	Yes
E	III.A4.TP-30	3.5-1, 044	Concrete: all	Concrete	Soil	Cracking and distortion due to increased stress levels from settlement	AMP XI.S6, "Structures Monitoring"	Yes

III STRUCTURES AND COMPONENT SUPPORTS								
Table A4 Group Structures (Containment Internal Structures, Excluding Refueling Canal)								
New, Modified, Deleted, Edited Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	III.A4.TP-28	3.5-1, 067	Concrete: interior; above-grade exterior	Concrete	Air – indoor uncontrolled, air – outdoor	Increase in porosity and permeability; cracking; loss of material (spalling, scaling) due to aggressive chemical attack	AMP XI.S6, "Structures Monitoring"	No
N	III.A4.T-35	3.5-1, 097	Group 4: Concrete (reactor cavity area proximate to the reactor vessel): reactor (primary/biological) shield wall; sacrificial shield wall; reactor vessel support/pedestal structure	Concrete	Air – indoor uncontrolled	Reduction of strength; loss of mechanical properties due to irradiation (i.e., radiation interactions with material and radiation-induced heating)	Plant-specific aging management <u>program, or other selected AMPs, enhanced as necessary</u>	Yes
M	III.A4.TP-301	3.5-1, 073	Service Level I coatings	Coatings	Air – indoor uncontrolled, treated water	Loss of coating or lining integrity due to blistering, cracking, flaking, peeling, delamination, rusting, physical damage	AMP XI.S8, "Protective Coating Monitoring and Maintenance"	No
M	III.A4.TP-35	3.5-1, 076	Sliding surfaces: radial beam seats in BWR drywell	Lubrite; Fluorogold; Lubrofluor	Air – indoor uncontrolled	Loss of mechanical function due to corrosion, distortion, dirt or debris accumulation, overload, wear	AMP XI.S6, "Structures Monitoring"	No
E	III.A4.TP-302	3.5-1, 077	Steel components: all structural steel	Steel	Air – indoor uncontrolled, air – outdoor	Loss of material due to corrosion	AMP XI.S6, "Structures Monitoring"	No
E	III.A4.TP-261	3.5-1, 088	Structural bolting	Any	Any	Loss of preload due to self-loosening	AMP XI.S6, "Structures Monitoring"	No

III STRUCTURES AND COMPONENT SUPPORTS								
Table A4 Group Structures (Containment Internal Structures, Excluding Refueling Canal)								
New, Modified, Deleted, Edited Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	III.A4.TP-248	3.5-1, 080	Structural bolting	Steel	Air – indoor uncontrolled, air – outdoor	Loss of material due to general, pitting, crevice corrosion	AMP XI.S6, "Structures Monitoring"	No
	III.A4.TP-274	3.5-1, 082	Structural bolting	Steel; galvanized steel	Air – outdoor	Loss of material due to general, pitting, crevice corrosion	AMP XI.S6, "Structures Monitoring"	No
D	III.A4.TP-300							

III STRUCTURES AND COMPONENT SUPPORTS								
Table A5 Group 5 Structures (Fuel Storage Facility, Refueling Canal)								
New, Modified, Deleted, Edited Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
E	III.A5.TP-25	3.5-1, 054	Concrete (accessible areas): all	Concrete	Any	Cracking due to expansion from reaction with aggregates	AMP XI.S6, "Structures Monitoring"	No
	III.A5.TP-27	3.5-1, 065	Concrete (accessible areas): below-grade exterior; foundation	Concrete	Groundwater/soil	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	AMP XI.S6, "Structures Monitoring"	No
	III.A5.TP-23	3.5-1, 064	Concrete (accessible areas): exterior above- and below-grade; foundation	Concrete	Air – outdoor	Loss of material (spalling, scaling) and cracking due to freeze-thaw	AMP XI.S6, "Structures Monitoring"	No

III STRUCTURES AND COMPONENT SUPPORTS								
Table A5 Group 5 Structures (Fuel Storage Facility, Refueling Canal)								
New, Modified, Deleted, Edited Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	III.A5.TP-24	3.5-1, 063	Concrete (accessible areas): exterior above- and below-grade; foundation	Concrete	Water – flowing	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	AMP XI.S6, "Structures Monitoring"	No
	III.A5.TP-26	3.5-1, 066	Concrete (accessible areas): interior and above-grade exterior	Concrete	Air – indoor uncontrolled, air – outdoor	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	AMP XI.S6, "Structures Monitoring"	No
M	III.A5.TP-204	3.5-1, 043	Concrete (inaccessible areas): all	Concrete	Any	Cracking due to expansion from reaction with aggregates	Plant-specific aging management program <u>or AMP XI.S6, "Structures Monitoring," enhanced as necessary</u>	Yes
	III.A5.TP-212	3.5-1, 065	Concrete (inaccessible areas): below-grade exterior; foundation	Concrete	Groundwater/soil	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	AMP XI.S6, "Structures Monitoring"	No
	III.A5.TP-29	3.5-1, 067	Concrete (inaccessible areas): below-grade exterior; foundation	Concrete	Groundwater/soil	Increase in porosity and permeability; cracking; loss of material (spalling, scaling) due to aggressive chemical attack	AMP XI.S6, "Structures Monitoring"	No

III STRUCTURES AND COMPONENT SUPPORTS								
Table A5 Group 5 Structures (Fuel Storage Facility, Refueling Canal)								
New, Modified, Deleted, Edited Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	III.A5.TP-67	3.5-1, 047	Concrete (inaccessible areas): exterior above- and below-grade; foundation	Concrete	Water – flowing	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	Plant-specific aging management program <u>or AMP XI.S6, "Structures Monitoring," enhanced as necessary</u>	Yes
M	III.A5.TP-108	3.5-1, 042	Concrete (inaccessible areas): foundation	Concrete	Air – outdoor, groundwater/soil	Loss of material (spalling, scaling) and cracking due to freeze-thaw	Plant-specific aging management program to be evaluated for plants in moderate to severe weathering conditions <u>or AMP XI.S6, "Structures Monitoring," enhanced as necessary</u>	Yes
<u>EM</u>	III.A5.TP-114	3.5-1, 048	Concrete: all	Concrete	Air – indoor uncontrolled	Reduction of strength and modulus due to elevated temperature (>150°F general; >200°F local)	Plant-specific aging management program to be evaluated if temperature limits exceeded <u>or AMP XI.S6, "Structures Monitoring," enhanced as necessary</u>	Yes
E	III.A5.TP-30	3.5-1, 044	Concrete: all	Concrete	Soil	Cracking and distortion due to increased stress levels from settlement	AMP XI.S6, "Structures Monitoring"	Yes

III STRUCTURES AND COMPONENT SUPPORTS								
Table A5 Group 5 Structures (Fuel Storage Facility, Refueling Canal)								
New, Modified, Deleted, Edited Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
E	III.A5.TP-31	3.5-1, 046	Concrete: foundation; subfoundation	Concrete; porous concrete	Water – flowing	Reduction of foundation strength and cracking due to differential settlement and erosion of porous concrete subfoundation	AMP XI.S6, "Structures Monitoring"	Yes
	III.A5.TP-28	3.5-1, 067	Concrete: interior; above-grade exterior	Concrete	Air – indoor uncontrolled, air – outdoor	Increase in porosity and permeability; cracking; loss of material (spalling, scaling) due to aggressive chemical attack	AMP XI.S6, "Structures Monitoring"	No
	III.A5.T-12	3.5-1, 070	Masonry walls: all	Concrete block	Air – indoor uncontrolled, air – outdoor	Cracking due to restraint shrinkage, creep, and aggressive environment	AMP XI.S5, "Masonry Walls"	No
	III.A5.TP-34	3.5-1, 071	Masonry walls: all	Concrete block	Air – outdoor	Loss of material (spalling, scaling) and cracking due to freeze-thaw	AMP XI.S5, "Masonry Walls"	No
M	III.A5.T-14	3.5-1, 078	Stainless steel fuel pool liner	Stainless steel	Treated water, treated borated water	Cracking due to SCC; loss of material due to pitting and crevice corrosion	AMP XI.M2, "Water Chemistry," and monitoring of the spent fuel pool water level and leakage from the leak chase channels.	No
E	III.A5.TP-302	3.5-1, 077	Steel components: all structural steel	Steel	Air – indoor uncontrolled, air – outdoor	Loss of material due to corrosion	AMP XI.S6, "Structures Monitoring"	No
E	III.A5.TP-261	3.5-1, 088	Structural bolting	Any	Any	Loss of preload due to self-loosening	AMP XI.S6, "Structures Monitoring"	No

III STRUCTURES AND COMPONENT SUPPORTS								
Table A5 Group 5 Structures (Fuel Storage Facility, Refueling Canal)								
New, Modified, Deleted, Edited Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	III.A5.TP-248	3.5-1, 080	Structural bolting	Steel	Air – indoor uncontrolled, air – outdoor	Loss of material due to general, pitting, crevice corrosion	AMP XI.S6, "Structures Monitoring"	No
	III.A5.TP-274	3.5-1, 082	Structural bolting	Steel; galvanized steel	Air – outdoor	Loss of material due to general, pitting, crevice corrosion	AMP XI.S6, "Structures Monitoring"	No
D	III.A5.TP-300							

III STRUCTURES AND COMPONENT SUPPORTS								
Table A6 Group 6 Structures (Water-Control Structures)								
New, Modified, Deleted, Edited Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
N	III.A6.T-34	3.5-1, 096	Concrete (accessible areas): all	Concrete	Any	Cracking due to expansion from reaction with aggregates	AMP XI.S7, "Inspection of Water-Control Structures Associated with Nuclear Power Plants"	No
N	III.A6.TP-25	3.5-1, 054	Concrete (accessible areas): all	Concrete	Any	Cracking due to expansion from reaction with aggregates	AMP XI.S6, "Structures Monitoring"	No

III STRUCTURES AND COMPONENT SUPPORTS								
Table A6 Group 6 Structures (Water-Control Structures)								
New, Modified, Deleted, Edited Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
E	III.A6.TP-38	3.5-1, 059	Concrete (accessible areas): all	Concrete	Any	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	AMP XI.S7, "Inspection of Water-Control Structures Associated with Nuclear Power Plants" or the FERC / US Army Corp of Engineers dam inspections and maintenance programs.	No
M	III.A6.TP-36	3.5-1, 060	Concrete (accessible areas): exterior above- and below-grade; foundation	Concrete	Any	Loss of material (spalling, scaling) and cracking due to freeze-thaw	AMP XI.S7, "Inspection of Water-Control Structures Associated with Nuclear Power Plants" or the FERC / US Army Corp of Engineers dam inspections and maintenance programs.	No
M	III.A6.TP-37	3.5-1, 061	Concrete (accessible areas): exterior above- and below-grade; foundation; interior slab	Concrete	Any	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	AMP XI.S7, "Inspection of Water-Control Structures Associated with Nuclear Power Plants" or the FERC / US Army Corp of Engineers dam inspections and maintenance programs.	No



III STRUCTURES AND COMPONENT SUPPORTS								
Table A6 Group 6 Structures (Water-Control Structures)								
New, Modified, Deleted, Edited Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	III.A6.TP-104	3.5-1, 065	Concrete (inaccessible areas): all	Concrete	Air – indoor uncontrolled, air – outdoor, groundwater/soil	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	AMP XI.S6, "Structures Monitoring"	No
M	III.A6.TP-220	3.5-1, 050	Concrete (inaccessible areas): all	Concrete	Any	Cracking due to expansion from reaction with aggregates	Plant-specific aging management program <u>or AMP XI.S6, "Structures Monitoring," enhanced as necessary</u>	Yes
	III.A6.TP-107	3.5-1, 067	Concrete (inaccessible areas): all	Concrete	Groundwater/soil	Increase in porosity and permeability; cracking; loss of material (spalling, scaling) due to aggressive chemical attack	AMP XI.S6, "Structures Monitoring"	No
M	III.A6.TP-110	3.5-1, 049	Concrete (inaccessible areas): exterior above- and below-grade; foundation; interior slab	Concrete	Air – outdoor, groundwater/soil	Loss of material (spalling, scaling) and cracking due to freeze-thaw	Plant-specific aging management program to be evaluated for plants in moderate to severe weathering conditions <u>or AMP XI.S6, "Structures Monitoring," enhanced as necessary</u>	Yes

III STRUCTURES AND COMPONENT SUPPORTS								
Table A6 Group 6 Structures (Water-Control Structures)								
New, Modified, Deleted, Edited Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	III.A6.TP-109	3.5-1, 051	Concrete (inaccessible areas): exterior above- and below-grade; foundation; interior slab	Concrete	Water – flowing	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	Plant-specific aging management program <u>or AMP XI.S6, "Structures Monitoring," enhanced as necessary</u>	Yes
E	III.A6.TP-30	3.5-1, 044	Concrete: all	Concrete	Soil	Cracking and distortion due to increased stress levels from settlement	AMP XI.S6, "Structures Monitoring"	Yes
E	III.A6.T-20	3.5-1, 056	Concrete: exterior above- and below-grade; foundation; interior slab	Concrete	Water – flowing	Loss of material due to abrasion; cavitation	AMP XI.S7, "Inspection of Water-Control Structures Associated with Nuclear Power Plants" or the FERC / US Army Corp of Engineers dam inspections and maintenance programs.	No
E	III.A6.TP-31	3.5-1, 046	Concrete: foundation; subfoundation	Concrete; porous concrete	Water – flowing	Reduction of foundation strength and cracking due to differential settlement and erosion of porous concrete subfoundation	AMP XI.S6, "Structures Monitoring"	Yes

III STRUCTURES AND COMPONENT SUPPORTS								
Table A6 Group 6 Structures (Water-Control Structures)								
New, Modified, Deleted, Edited Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	III.A6.T-22	3.5-1, 058	Earthen water-control structures: dams; embankments; reservoirs; channels; canals; ponds	Various	Air – outdoor, water – flowing or standing	Loss of material; loss of form due to erosion, settlement, sedimentation, frost action, waves, currents, surface runoff, seepage	AMP XI.S7, "Inspection of Water-Control Structures Associated with Nuclear Power Plants" or the FERC / US Army Corp of Engineers dam inspections and maintenance programs.	No
E	III.A6.TP-223	3.5-1, 062	Group 6: Wooden Piles; sheeting	Wood	Air – outdoor, water – flowing or standing, groundwater/soil	Loss of material; change in material properties due to weathering, chemical degradation, and insect infestation repeated wetting and drying, fungal decay	AMP XI.S7, "Inspection of Water-Control Structures Associated with Nuclear Power Plants" or the FERC / US Army Corp of Engineers dam inspections and maintenance programs.	No
	III.A6.T-12	3.5-1, 070	Masonry walls: all	Concrete block	Air – indoor uncontrolled, air – outdoor	Cracking due to restraint shrinkage, creep, and aggressive environment	AMP XI.S5, "Masonry Walls"	No
N	III.A6.TP-34	3.5-1, 071	Masonry walls: all	Concrete block	Air – outdoor	Loss of material (spalling, scaling) and cracking due to freeze-thaw	AMP XI.S5, "Masonry Walls"	No

III STRUCTURES AND COMPONENT SUPPORTS								
Table A6 Group 6 Structures (Water-Control Structures)								
New, Modified, Deleted, Edited Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
M	III.A6.TP-7	3.5-1, 072	Seals; gaskets; moisture barriers (caulking, flashing, and other sealants)	Elastomer, rubber and other similar materials	Any	Loss of sealing due to wear, damage, erosion, tear, surface cracks, other defects	AMP XI.S6, "Structures Monitoring"	No
E	III.A6.TP-261	3.5-1, 088	Structural bolting	Any	Any	Loss of preload due to self-loosening	AMP XI.S6, "Structures Monitoring"	No
M	III.A6.TP-248	3.5-1, 080	Structural bolting	Steel	Air – indoor uncontrolled, air – outdoor	Loss of material due to general, pitting, crevice corrosion	AMP XI.S6, "Structures Monitoring"	No
E	III.A6.TP-221	3.5-1, 083	Structural bolting	Steel	Air – indoor uncontrolled, air – outdoor, water – flowing or standing	Loss of material due to general, pitting, crevice corrosion	AMP XI.S7, "Inspection of Water-Control Structures Associated with Nuclear Power Plants" or the FERC / US Army Corp of Engineers dam inspections and maintenance programs.	No

III STRUCTURES AND COMPONENT SUPPORTS								
Table A7 Group 7 Structures (Concrete Tanks and Missile Barriers)								
New, Modified, Deleted, Edited Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
E	III.A7.TP-25	3.5-1, 054	Concrete (accessible areas): all	Concrete	Any	Cracking due to expansion from reaction with aggregates	AMP XI.S6, "Structures Monitoring"	No
	III.A7.TP-27	3.5-1, 065	Concrete (accessible areas): below-grade exterior; foundation	Concrete	Groundwater/soil	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	AMP XI.S6, "Structures Monitoring"	No
	III.A7.TP-23	3.5-1, 064	Concrete (accessible areas): exterior above- and below-grade; foundation	Concrete	Air – outdoor	Loss of material (spalling, scaling) and cracking due to freeze-thaw	AMP XI.S6, "Structures Monitoring"	No
	III.A7.TP-24	3.5-1, 063	Concrete (accessible areas): exterior above- and below-grade; foundation	Concrete	Water – flowing	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	AMP XI.S6, "Structures Monitoring"	No
	III.A7.TP-26	3.5-1, 066	Concrete (accessible areas): interior and above-grade exterior	Concrete	Air – indoor uncontrolled, air – outdoor	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	AMP XI.S6, "Structures Monitoring"	No
M	III.A7.TP-204	3.5-1, 043	Concrete (inaccessible areas): all	Concrete	Any	Cracking due to expansion from reaction with aggregates	Plant-specific aging management program <u>or AMP XI.S6, "Structures Monitoring," enhanced as necessary</u>	Yes

III STRUCTURES AND COMPONENT SUPPORTS								
Table A7 Group 7 Structures (Concrete Tanks and Missile Barriers)								
New, Modified, Deleted, Edited Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	III.A7.TP-212	3.5-1, 065	Concrete (inaccessible areas): below-grade exterior; foundation	Concrete	Groundwater/soil	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	AMP XI.S6, "Structures Monitoring"	No
	III.A7.TP-29	3.5-1, 067	Concrete (inaccessible areas): below-grade exterior; foundation	Concrete	Groundwater/soil	Increase in porosity and permeability; cracking; loss of material (spalling, scaling) due to aggressive chemical attack	AMP XI.S6, "Structures Monitoring"	No
M	III.A7.TP-67	3.5-1, 047	Concrete (inaccessible areas): exterior above- and below-grade; foundation	Concrete	Water – flowing	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	Plant-specific aging management program <u>or AMP XI.S6, "Structures Monitoring," enhanced as necessary</u>	Yes
M	III.A7.TP-108	3.5-1, 042	Concrete (inaccessible areas): foundation	Concrete	Air – outdoor, groundwater/soil	Loss of material (spalling, scaling) and cracking due to freeze-thaw	Plant-specific aging management program to be evaluated for plants in moderate to severe weathering conditions <u>or AMP XI.S6, "Structures Monitoring," enhanced as necessary</u>	Yes
E	III.A7.TP-30	3.5-1, 044	Concrete: all	Concrete	Soil	Cracking and distortion due to increased stress levels from settlement	AMP XI.S6, "Structures Monitoring"	Yes

III STRUCTURES AND COMPONENT SUPPORTS								
Table A7 Group 7 Structures (Concrete Tanks and Missile Barriers)								
New, Modified, Deleted, Edited Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
E	III.A7.TP-31	3.5-1, 046	Concrete: foundation; subfoundation	Concrete; porous concrete	Water – flowing	Reduction of foundation strength and cracking due to differential settlement and erosion of porous concrete subfoundation	AMP XI.S6, "Structures Monitoring"	Yes
	III.A7.TP-28	3.5-1, 067	Concrete: interior; above-grade exterior	Concrete	Air – indoor uncontrolled, air – outdoor	Increase in porosity and permeability; cracking; loss of material (spalling, scaling) due to aggressive chemical attack	AMP XI.S6, "Structures Monitoring"	No
E	III.A7.TP-302	3.5-1, 077	Steel components: all structural steel	Steel	Air – indoor uncontrolled, air – outdoor	Loss of material due to corrosion	AMP XI.S6, "Structures Monitoring"	No
E	III.A7.T-23	3.5-1, 052	Steel components: tank liner	Stainless steel	Water – standing	Cracking due to SCC; loss of material due to pitting and crevice corrosion	Plant-specific aging management program	Yes
E	III.A7.TP-261	3.5-1, 088	Structural bolting	Any	Any	Loss of preload due to self-loosening	AMP XI.S6, "Structures Monitoring"	No
M	III.A7.TP-248	3.5-1, 080	Structural bolting	Steel	Air – indoor uncontrolled, air – outdoor	Loss of material due to general, pitting, crevice corrosion	AMP XI.S6, "Structures Monitoring"	No
	III.A7.TP-274	3.5-1, 082	Structural bolting	Steel; galvanized steel	Air – outdoor	Loss of material due to general, pitting, crevice corrosion	AMP XI.S6, "Structures Monitoring"	No
D	III.A7.TP-300							

III STRUCTURES AND COMPONENT SUPPORTS								
Table A8 Group 8 Structures (Steel Tanks and Missile Barriers)								
New, Modified, Deleted, Edited Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
E	III.A8.TP-25	3.5-1, 054	Concrete (accessible areas): all	Concrete	Any	Cracking due to expansion from reaction with aggregates	AMP XI.S6, "Structures Monitoring"	No
	III.A8.TP-27	3.5-1, 065	Concrete (accessible areas): below-grade exterior; foundation	Concrete	Groundwater/soil	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	AMP XI.S6, "Structures Monitoring"	No
	III.A8.TP-23	3.5-1, 064	Concrete (accessible areas): exterior above- and below-grade; foundation	Concrete	Air – outdoor	Loss of material (spalling, scaling) and cracking due to freeze-thaw	AMP XI.S6, "Structures Monitoring"	No
	III.A8.TP-24	3.5-1, 063	Concrete (accessible areas): exterior above- and below-grade; foundation	Concrete	Water – flowing	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	AMP XI.S6, "Structures Monitoring"	No
M	III.A8.TP-204	3.5-1, 043	Concrete (inaccessible areas): all	Concrete	Any	Cracking due to expansion from reaction with aggregates	Plant-specific aging management program <u>or AMP XI.S6, "Structures Monitoring," enhanced as necessary</u>	Yes
	III.A8.TP-212	3.5-1, 065	Concrete (inaccessible areas): below-grade exterior; foundation	Concrete	Groundwater/soil	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	AMP XI.S6, "Structures Monitoring"	No



III STRUCTURES AND COMPONENT SUPPORTS								
Table A8 Group 8 Structures (Steel Tanks and Missile Barriers)								
New, Modified, Deleted, Edited Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	III.A8.TP-29	3.5-1, 067	Concrete (inaccessible areas): below-grade exterior; foundation	Concrete	Groundwater/soil	Increase in porosity and permeability; cracking; loss of material (spalling, scaling) due to aggressive chemical attack	AMP XI.S6, "Structures Monitoring"	No
M	III.A8.TP-67	3.5-1, 047	Concrete (inaccessible areas): exterior above- and below-grade; foundation	Concrete	Water – flowing	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	Plant-specific aging management program <u>or AMP XI.S6, "Structures Monitoring," enhanced as necessary</u>	Yes
M	III.A8.TP-108	3.5-1, 042	Concrete (inaccessible areas): foundation	Concrete	Air – outdoor, groundwater/soil	Loss of material (spalling, scaling) and cracking due to freeze-thaw	Plant-specific aging management program to be evaluated for plants in moderate to severe weathering conditions <u>or AMP XI.S6, "Structures Monitoring," enhanced as necessary</u>	Yes
E	III.A8.TP-30	3.5-1, 044	Concrete: all	Concrete	Soil	Cracking and distortion due to increased stress levels from settlement	AMP XI.S6, "Structures Monitoring"	Yes

III STRUCTURES AND COMPONENT SUPPORTS								
Table A8 Group 8 Structures (Steel Tanks and Missile Barriers)								
New, Modified, Deleted, Edited Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
E	III.A8.TP-31	3.5-1, 046	Concrete: foundation; subfoundation	Concrete; porous concrete	Water – flowing	Reduction of foundation strength and cracking due to differential settlement and erosion of porous concrete subfoundation	AMP XI.S6, "Structures Monitoring"	Yes
E	III.A8.TP-302	3.5-1, 077	Steel components: all structural steel	Steel	Air – indoor uncontrolled, air – outdoor	Loss of material due to corrosion	AMP XI.S6, "Structures Monitoring"	No
E	III.A8.T-23	3.5-1, 052	Steel components: tank liner	Stainless steel	Water – standing	Cracking due to SCC; loss of material due to pitting and crevice corrosion	Plant-specific aging management program	Yes
E	III.A8.TP-261	3.5-1, 088	Structural bolting	Any	Any	Loss of preload due to self-loosening	AMP XI.S6, "Structures Monitoring"	No
M	III.A8.TP-248	3.5-1, 080	Structural bolting	Steel	Air – indoor uncontrolled, air – outdoor	Loss of material due to general, pitting, crevice corrosion	AMP XI.S6, "Structures Monitoring"	No
	III.A8.TP-274	3.5-1, 082	Structural bolting	Steel; galvanized steel	Air – outdoor	Loss of material due to general, pitting, crevice corrosion	AMP XI.S6, "Structures Monitoring"	No
D	III.A8.TP-300							

III STRUCTURES AND COMPONENT SUPPORTS								
Table A9 Group 9 Structures (BWR Unit Vent Stack)								
New, Modified, Deleted, Edited Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
E	III.A9.TP-25	3.5-1, 054	Concrete (accessible areas): all	Concrete	Any	Cracking due to expansion from reaction with aggregates	AMP XI.S6, "Structures Monitoring"	No
	III.A9.TP-27	3.5-1, 065	Concrete (accessible areas): below-grade exterior; foundation	Concrete	Groundwater/soil	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	AMP XI.S6, "Structures Monitoring"	No
	III.A9.TP-23	3.5-1, 064	Concrete (accessible areas): exterior above- and below-grade; foundation	Concrete	Air – outdoor	Loss of material (spalling, scaling) and cracking due to freeze-thaw	AMP XI.S6, "Structures Monitoring"	No
	III.A9.TP-24	3.5-1, 063	Concrete (accessible areas): exterior above- and below-grade; foundation	Concrete	Water – flowing	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	AMP XI.S6, "Structures Monitoring"	No
	III.A9.TP-26	3.5-1, 066	Concrete (accessible areas): interior and above-grade exterior	Concrete	Air – indoor uncontrolled, air – outdoor	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	AMP XI.S6, "Structures Monitoring"	No
M	III.A9.TP-204	3.5-1, 043	Concrete (inaccessible areas): all	Concrete	Any	Cracking due to expansion from reaction with aggregates	Plant-specific aging management program <u>or AMP XI.S6, "Structures Monitoring," enhanced as necessary</u>	Yes

III STRUCTURES AND COMPONENT SUPPORTS								
Table A9 Group 9 Structures (BWR Unit Vent Stack)								
New, Modified, Deleted, Edited Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
	III.A9.TP-212	3.5-1, 065	Concrete (inaccessible areas): below-grade exterior; foundation	Concrete	Groundwater/soil	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	AMP XI.S6, "Structures Monitoring"	No
	III.A9.TP-29	3.5-1, 067	Concrete (inaccessible areas): below-grade exterior; foundation	Concrete	Groundwater/soil	Increase in porosity and permeability; cracking; loss of material (spalling, scaling) due to aggressive chemical attack	AMP XI.S6, "Structures Monitoring"	No
M	III.A9.TP-67	3.5-1, 047	Concrete (inaccessible areas): exterior above- and below-grade; foundation	Concrete	Water – flowing	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	Plant-specific aging management program <u>or AMP XI.S6, "Structures Monitoring," enhanced as necessary</u>	Yes
M	III.A9.TP-108	3.5-1, 042	Concrete (inaccessible areas): foundation	Concrete	Air – outdoor, groundwater/soil	Loss of material (spalling, scaling) and cracking due to freeze-thaw	Plant-specific aging management program to be evaluated for plants in moderate to severe weathering conditions <u>or AMP XI.S6, "Structures Monitoring," enhanced as necessary</u>	Yes
E	III.A9.TP-30	3.5-1, 044	Concrete: all	Concrete	Soil	Cracking and distortion due to increased stress levels from settlement	AMP XI.S6, "Structures Monitoring"	Yes

III STRUCTURES AND COMPONENT SUPPORTS								
Table A9 Group 9 Structures (BWR Unit Vent Stack)								
New, Modified, Deleted, Edited Item	Item	SRP Item (Table, ID)	Structure and/or Component	Material	Environment	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation
E	III.A9.TP-31	3.5-1, 046	Concrete: foundation; subfoundation	Concrete; porous concrete	Water – flowing	Reduction in foundation strength, cracking due to differential settlement, erosion of porous concrete subfoundation	AMP XI.S6, "Structures Monitoring"	Yes
	III.A9.TP-28	3.5-1, 067	Concrete: interior; above-grade exterior	Concrete	Air – indoor uncontrolled, air – outdoor	Increase in porosity and permeability; cracking; loss of material (spalling, scaling) due to aggressive chemical attack	AMP XI.S6, "Structures Monitoring"	No
E	III.A9.TP-261	3.5-1, 088	Structural bolting	Any	Any	Loss of preload due to self-loosening	AMP XI.S6, "Structures Monitoring"	No
M	III.A9.TP-248	3.5-1, 080	Structural bolting	Steel	Air – indoor uncontrolled, air – outdoor	Loss of material due to general, pitting, crevice corrosion	AMP XI.S6, "Structures Monitoring"	No
	III.A9.TP-274	3.5-1, 082	Structural bolting	Steel; galvanized steel	Air – outdoor	Loss of material due to general, pitting, crevice corrosion	AMP XI.S6, "Structures Monitoring"	No
D	III.A9.TP-300							

## APPENDIX E

### REVISIONS TO SRP-SLR SECTION 3.5 TO ALLOW OPTIONS IN LIEU OF PLANT-SPECIFIC AGING MANAGEMENT

#### Summary of Revisions

This appendix modifies NUREG-2192, "Standard Review Plan for Review of Subsequent License Renewal Applications for Nuclear Power Plants" (SRP-SLR) Section 3.5 including Table 3.5-1, "Summary of Aging Management Programs for Containments, Structures and Component Supports Evaluated in Chapters II and III of the GALL-SLR Report," to manage the effects of aging in concrete for the following:

- reduction of strength and modulus of elasticity due to elevated temperature (greater than 66 degrees Celsius (150 degrees Fahrenheit) general: greater than 93 degrees Celsius (200 degrees Fahrenheit) local)
- loss of material (spalling, scaling) and cracking due to freeze-thaw
- cracking due to expansion from reaction with aggregates
- increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation
- reduction of strength; loss of mechanical properties due to irradiation (i.e., radiation interactions with material and radiation-induced heating) for boiling-water reactor (BWR) and pressurized-water reactor (PWR) components in question, including those located in inaccessible areas

Appendix A to this ISG, modified SRP-SLR Table 3.5-1 and GALL-SLR Report AMR tables to provide the option to perform a further evaluation based on ASME Code Section III, Division 1, Subsection NE, fatigue waiver analysis for containment metallic pressure-retaining boundary components that are subject to cyclic loading but have no current licensing basis (CLB) fatigue analysis.

#### Basis for Revisions

Modifications to GALL-SLR Report AMR items and SRP-SLR Table 3.5-1 line items with associated further evaluations provide the option to use plant-specific enhancements to GALL-SLR Report AMP XI.S2, "ASME Section XI Subsection IWL," AMP XI.S6, "Structures Monitoring," or other AMPs in lieu of a plant-specific AMP. The option to use plant-specific enhancements to GALL-SLR Report AMPs increases the efficiency of subsequent license renewal application (SLRA) reviews by limiting the use of AMR "Note E" designations for plant-specific aging management activities when aging effects are managed by a plant-specific AMP.

Appendix A to this ISG provides the basis for revisions with regard to fatigue analysis.

#### AMP Revisions

None

Revisions to FSAR Supplement

None

Revisions to SRP-SLR Section 3.5*3.5.2.2.1.2 Reduction of Strength and Modulus Due to Elevated Temperature*

Reduction of strength and modulus of concrete due to elevated temperatures could occur in PWR and BWR concrete and steel containments. The implementation of 10 CFR 50.55a and ASME Code Section XI, Subsection IWL would not be able to identify the reduction of strength and modulus of concrete due to elevated temperature. Subsection CC-3440 of ASME Code Section III, Division 2, specifies the concrete temperature limits for normal operation or any other long-term period. Further evaluation is recommended to determine the need for of a plant-specific AMP if or plant-specific enhancements to ASME Code Section XI Subsection IWL and/or Structures Monitoring AMPs, essential to manage these aging effects for any-portions of the concrete containment components that exceeds specified temperature limits {i.e., general area temperature greater than 66 degrees °C (Celsius) [(150 degrees °F (Fahrenheit))] and local area temperature greater than 93 degrees Celsius °C (200 degrees Fahrenheit) °F}. Higher temperatures may be allowed if tests and/or calculations are provided to evaluate the reduction in strength and modulus of elasticity and these reductions are applied to the design calculations. Acceptance criteria are described in Branch Technical Position (BTP) RLSB (License Renewal and Standardization Branch)-1, "Aging Management Review – Generic, July 2017" (Appendix A.1 of this SRP-SLR).

*3.5.2.2.1.7 Loss of Material (Scaling, Spalling) and Cracking Due to Freeze-Thaw*

Loss of material (scaling, spalling) and cracking due to freeze-thaw could occur in inaccessible areas of PWR and BWR concrete containments. Further evaluation is recommended of this aging effect to determine the need for a plant-specific AMP or plant-specific enhancements to ASME Code Section XI, Subsection IWL, and/or Structures Monitoring AMPs, to manage these aging effects for plants located in moderate to severe weathering conditions. Acceptance criteria are described in BTP RLSB-1 (Appendix A.1 of this SRP-SLR).

*3.5.2.2.1.8 Cracking Due to Expansion From Reaction With Aggregates*

Cracking due to expansion from reaction with aggregates could occur in inaccessible areas of concrete elements of PWR and BWR concrete and steel containments. The GALL-SLR Report recommends further evaluation to determine the need for if a plant-specific AMPaging management program or plant-specific enhancements to ASME Code Section XI, Subsection IWL, and/or Structures Monitoring AMPs-is required to manage this aging effect. Acceptance criteria are described in BTP RLSB-1 (Appendix A.1 of this SRP-SLR).

*3.5.2.2.1.9 Increase in Porosity and Permeability Due to Leaching of Calcium Hydroxide and Carbonation*

Increase in porosity and permeability due to leaching of calcium hydroxide and carbonation could occur in inaccessible areas of concrete elements of PWR and BWR concrete and steel containments. Further evaluation is recommended to determine the need for a plant-specific AMP or plant-specific enhancements to ASME Code Section XI, Subsection IWL and/or Structures Monitoring AMPs, essential to manage these aging effects if leaching is observed in

accessible areas that impact intended functions. Acceptance criteria are described in BTP RLSB-1 (Appendix A.1 of this SRP-SLR).

#### 3.5.2.2.2.1 *Ageing Management of Inaccessible Areas*

1. Loss of material (spalling, scaling) and cracking due to freeze-thaw could occur in below-grade inaccessible concrete areas of Groups 1–3, 5 and 7–9 structures. Further evaluation is recommended of ~~this aging effect for~~ inaccessible areas of these Groups of structures for plants located in moderate to severe weathering conditions to determine the need for a plant-specific AMP or plant-specific enhancements to Structures Monitoring AMP, to manage these aging effects. Acceptance criteria are described in BTP RLSB-1 (Appendix A.1 of this SRP-SLR).
2. Cracking due to expansion and reaction with aggregates could occur in inaccessible concrete areas for Groups 1–5 and 7–9 structures. Further evaluation is recommended of inaccessible areas of these Groups of structures to determine ~~the need for~~ a plant-specific AMP or plant-specific enhancements to Structures Monitoring AMP, is required to manage this aging effect. Acceptance criteria are described in BTP RLSB-1 (Appendix A.1 of this SRP-SLR).
3. Cracking and distortion due to increased stress levels from settlement could occur in below-grade inaccessible concrete areas of structures for all Groups, and reduction in foundation strength and cracking due to differential settlement and erosion of porous concrete subfoundations could occur in below-grade inaccessible concrete areas of Groups 1–3, 5–9 structures. The existing program relies on structure monitoring programs to manage these aging effects. Some plants may rely on a dewatering system to lower the site groundwater level. If the plant's CLB credits a dewatering system, verification is recommended of the continued functionality of the dewatering system during the subsequent period of extended operation. No further evaluation is recommended if this activity is included in the scope of the applicant's structures monitoring program.
4. Increase in porosity and permeability, and loss of strength due to leaching of calcium hydroxide and carbonation could occur in below-grade inaccessible concrete areas of Groups 1–5 and 7–9 structures. Further evaluation is recommended to determine the need for a plant-specific AMP or plant-specific enhancements to Structures Monitoring AMP, to manage these aging effects if leaching is observed in accessible areas that impact intended functions. Acceptance criteria are described in BTP RLSB-1 (Appendix A.1 of this SRP-SLR).

#### 3.5.2.2.2.2 *Reduction of Strength and Modulus Due to Elevated Temperature*

Reduction of strength and modulus of concrete due to elevated temperatures could occur in PWR and BWR Group 1–5 concrete structures. For any concrete elements that exceed specified temperature limits, further evaluations are recommended. Appendix A of American Concrete Institute (ACI) 349-85, "Code Requirements for Nuclear Safety-Related Concrete Structures," specifies the concrete temperature limits for normal operation or any other long-term period. The temperatures shall not exceed 66 °C (150 °F) except for local areas, which are allowed to have increased temperatures not to exceed 93 °C (200 °F). Further evaluation is recommended ~~of a plant-specific program to determine the need for a plant-specific AMP or~~ plant-specific enhancements to Structures Monitoring AMP, to manage these aging effects if



any portion of the safety-related and other concrete structures exceeds specified temperature limits [i.e., general area temperature greater than 66 °C (150 °F) and local area temperature greater than 93 °C (200 °F)]. Higher temperatures may be allowed if tests and/or calculations are provided to evaluate the reduction in strength and modulus of elasticity and these reductions are applied to the design calculations. The acceptance criteria are described in BTP RLSB-1 (Appendix A.1 of this SRP-SLR).

#### 3.5.2.2.2.3 Aging Management of Inaccessible Areas for Group 6 Structures

Further evaluation is recommended for inaccessible areas of certain Group 6 structure/aging effect combinations as identified below, whether or not they are covered by inspections in accordance with the GALL-SLR Report AMP XI.S7, "Inspection of Water-Control Structures Associated with Nuclear Power Plants," or Federal Energy Regulatory Commission (FERC)/U.S. Army Corp of Engineers dam inspection and maintenance procedures.

1. Loss of material (spalling, scaling) and cracking due to freeze-thaw could occur in below-grade inaccessible concrete areas of Group 6 structures. Further evaluation is recommended of this aging effect to determine the need for a plant-specific AMP or plant-specific enhancements to Structures Monitoring AMP to manage these aging effects for inaccessible areas for plants located in moderate to severe weathering conditions. Acceptance criteria are described in BTP RLSB-1 (Appendix A1 of this SRP-SLR).
2. Cracking due to expansion and reaction with aggregates could occur in inaccessible concrete areas of Group 6 structures. Further evaluation is recommended to determine the need for a plant-specific AMP- or plant-specific enhancements to Structures Monitoring AMP, is required to manage this aging effect. Acceptance criteria are described in BTP RLSB-1 (Appendix A.1 of this SRP-SLR).
3. Increase in porosity and permeability and loss of strength due to leaching of calcium hydroxide and carbonation could occur in inaccessible areas of concrete elements of Group 6 structures. Further evaluation is recommended to determine the need for if-a plant-specific AMP or plant-specific enhancements to Structures Monitoring AMP, to manage these aging effects if leaching is observed in accessible areas that impact intended functions. Acceptance criteria are described in BTP RLSB-1 (Appendix A.1 of this SRP-SLR).

#### 3.5.2.2.2.6 Reduction of Strength and Mechanical Properties of Concrete Due to Irradiation

Reduction of strength, loss of mechanical properties, and cracking due to irradiation could occur in PWR and BWR Group 4 concrete structures that are exposed to high levels of neutron and gamma radiation. These structures include the reactor (primary/biological) shield wall, the sacrificial shield wall, and the reactor vessel support/pedestal structure. Data related to the effects and significance of neutron and gamma radiation on concrete mechanical and physical properties is limited, especially for conditions (dose, temperature, etc.) representative of light-water reactor (LWR) plants. However, based on literature review of existing research, radiation fluence limits of  $1 \times 10^{19}$  neutrons/cm<sup>2</sup> neutron radiation and  $1 \times 10^8$  Gy ( $1 \times 10^{10}$  rad) gamma dose are considered conservative radiation exposure levels beyond which concrete material properties may begin to degrade markedly (Ref. 17, 18, 19).

Further evaluation is recommended ~~to determine the need for~~ a plant-specific AMP or plant-specific enhancements to selected existing AMPs to manage the ~~program to manage~~ aging effects of irradiation if the estimated (calculated) fluence levels or irradiation dose received by any portion of the concrete from neutron (fluence cutoff energy  $E > 0.1$  MeV) or gamma radiation exceeds the respective threshold level during the subsequent period of extended operation ~~that could affect or if plant-specific OE of concrete irradiation degradation exists that may impact~~ intended functions. Higher fluence or dose levels may be allowed in the concrete if tests and/or calculations are provided to evaluate the reduction in strength and/or loss of mechanical properties of concrete from those fluence levels, at or above the operating temperature experienced by the concrete, and the effects are applied to the design calculations. Supporting calculations/analyses, test data, and other technical basis are provided to estimate and evaluate fluence levels and the plant-specific program. The acceptance criteria are described in BTP RLSB-1 (Appendix A.1 of this SRP-SLR).

#### 3.5.3.2.1.2 *Reduction of Strength and Modulus Due to Elevated Temperature*

Further evaluation is recommended of programs to manage reduction of strength and modulus of concrete due to elevated temperature for PWR and BWR concrete and steel containments. The implementation of ASME Code Section XI, Subsection IWL examinations and 10 CFR 50.55a would not be able to detect the reduction of concrete strength and modulus due to elevated temperature and also notes that no mandated aging management exists for managing this aging effect.

A plant-specific evaluation should be performed if any portion of the concrete containment components exceeds specified temperature limits [i.e., general temperature greater than 66 °C (150 °F) and local area temperature greater than 93 °C (200 °F)]. Higher temperatures may be allowed if tests and/or calculations are provided to evaluate the reduction in strength and modulus of elasticity and these reductions are applied to the design calculations. The reviewer reviews and confirms that the applicant's discussion in the renewal application indicates that the affected PWR and BWR containment components are not exposed to a temperature that exceeds the temperature limits. If active cooling is relied upon to maintain acceptable temperatures, then the reviewer ensures that the aging effects associated with the cooling system are being properly managed or temperatures are being monitored to identify a problem with the cooling system. If the limits are exceeded the reviewer reviews the technical basis (i.e., tests and/or calculations) provided by the applicant to justify the higher temperature. Otherwise, the reviewer reviews the applicant's proposed ~~programs~~ plant-specific AMP or plant-specific enhancements to ASME Code Section XI, Subsection IWL and/or Structures Monitoring AMPs, needed to manage these aging effects. Plant-specific evaluations verify that, where appropriate, an effective enhanced inspection program has been developed and implemented, to ensure that reduction of strength and modulus of elasticity due to elevated temperatures are ~~to ensure that the effects of elevated temperature will be~~ adequately managed during the subsequent period of extended operation.

#### 3.5.3.2.1.7 *Loss of Material (Scaling, Spalling) and Cracking Due to Freeze-Thaw*

Further evaluation is recommended of programs to manage loss of material (scaling, spalling) and cracking due to freeze-thaw for concrete elements of PWR and BWR containments. Containment ISI Subsection IWL may not be sufficient for plants located in moderate to severe weathering conditions. Evaluation is needed for plants that are located in moderate to severe weathering conditions (weathering index  $>100$  day-inch/yr) (NUREG-1557). The weathering index for the continental United States is shown in ASTM International (formerly American

Society for Testing and Materials) ~~Standard (ASTM) C33-90, “Standard Specification for Concrete Aggregates,”~~ Figure 1. A plant-specific ~~AMP program or plant-specific enhancements to ASME Code Section XI, Subsection IWL and/or Structures Monitoring AMPs, needed to manage this aging effect are~~ is not required if documented evidence confirms that the existing concrete had air content of 3 percent to 8 percent (including tolerance) and subsequent inspection of accessible areas did not exhibit degradation related to freeze-thaw. Such inspections are considered a part of the evaluation. The reviewer reviews and confirms that the applicant has satisfied the recommendations for inaccessible concrete. Otherwise, the reviewer reviews the applicant’s ~~proposed AMP to verify that, where appropriate, an effective inspection program has been developed and implemented to ensure that these aging effects in inaccessible areas for plants located in moderate to severe weathering conditions are adequately managed.~~ proposed plant-specific AMP, or plant-specific enhancements to ASME Code Section XI, Subsection IWL and/or Structures Monitoring AMPs, needed to manage these aging effects. Plant-specific evaluations verify that, where appropriate, an effective enhanced inspection program has been developed and implemented to ensure that loss of material (scaling, spalling) and cracking due to freeze thaw in inaccessible areas for plants located in moderate to severe weathering conditions are adequately managed during the subsequent period of extended operation.

#### 3.5.3.2.1.8 *Cracking Due to Expansion from Reaction With Aggregates*

Further evaluation is recommended of programs to manage cracking due to expansion from reaction with aggregates in inaccessible areas of concrete elements of PWR and BWR concrete and steel containments. ~~A Either a plant-specific AMP, or plant-specific enhancement(s) to ASME Code Section XI, Subsection IWL and/or Structures Monitoring AMP is necessary to manage this aging effect~~ if (1) reactivity tests or petrographic examinations of concrete samples identify reaction with aggregates, or (2) accessible concrete exhibits visual indications of aggregate reactions, such as “map” or “patterned” cracking, alkali-silica gel, exudations, surface staining, expansion causing structural deformation, relative movement or displacement, or misalignment/distortion of attached components. The reviewer confirms that the applicant has not identified one of the above conditions. Otherwise, the reviewer reviews the applicant’s proposed plant-specific AMP or plant-specific enhancements to ASME Code Section XI, Subsection IWL and/or Structures Monitoring AMP, needed to manage this aging effect. Plant-specific evaluations verify that, where appropriate, an effective enhanced inspection program has been developed and implemented to ensure that cracking due to expansion from reaction with aggregates in inaccessible areas is adequately managed during the subsequent period of extended operation. ~~AMP or plant-specific evaluation to verify that, an effective evaluation or inspection program has been developed and implemented to ensure that this aging effect in inaccessible areas is adequately managed.~~

#### 3.5.3.2.1.9 *Increase in Porosity and Permeability Due to Leaching of Calcium Hydroxide and Carbonation*

Further evaluation is recommended of programs to manage increase in porosity and permeability due to leaching of calcium hydroxide and carbonation in inaccessible areas of PWR and BWR concrete and steel containments. A plant-specific AMP is not required, even if reinforced concrete is exposed to flowing water if (1) there is evidence in the accessible areas that the flowing water has not caused leaching and carbonation, or (2) evaluation determined that the observed leaching of calcium hydroxide and carbonation in accessible areas is not significant and has no impact on the intended function of the concrete structure. The reviewer confirms that the applicant has satisfied these conditions. Otherwise, the reviewer reviews the

applicant's proposed plant-specific AMP, or plant-specific enhancement(s) to ASME Code Section XI, Subsection IWL and/or Structures Monitoring AMP, needed to manage these aging effects. Plant-specific evaluations verify that, where appropriate, an effective enhanced inspection program has been developed and implemented to ensure that increase in porosity and permeability due to leaching in inaccessible areas are adequately managed during the subsequent period of extended operation. ~~AMP to verify that, where appropriate, an effective inspection program has been developed and implemented to ensure that this aging effect in inaccessible areas is adequately managed.~~

#### 3.5.3.2.2.1 Aging Management of Inaccessible Areas

1. Further evaluation is recommended of programs to manage loss of material (spalling, scaling) and cracking due to freeze-thaw in below-grade inaccessible concrete areas of Groups 1–3, 5, and 7–9 structures. Structure monitoring programs may not be sufficient for plants located in moderate to severe weathering conditions. Further evaluation is needed for plants that are located in moderate to severe weathering conditions (weathering index >100 day-inch/yr) (NUREG–1557). The weathering index for the continental United States is shown in ASTM C33-90, Figure 1. A plant-specific program is not required if documented evidence confirms that the existing concrete had air content of 3 percent to 8 percent and subsequent inspection did not exhibit degradation related to freeze-thaw. Such inspections should be considered a part of the evaluation. The reviewer confirms that the applicant has satisfied these conditions. Otherwise, the reviewer reviews the applicant's proposed plant-specific AMP or plant-specific enhancements to structures monitoring AMPs needed to manage these aging effects. Plant-specific evaluations verify that, where appropriate, an effective enhanced inspection program has been developed and implemented to ensure that loss of material (spalling, scaling) and cracking due to freeze-thaw in inaccessible areas for plants located in moderate to severe weathering conditions are adequately managed during the subsequent period of extended operation. ~~Otherwise, the reviewer reviews the applicant's proposed AMP to verify that, where appropriate, an effective inspection program has been developed and implemented to ensure that this aging effect in inaccessible areas for plants located in moderate to severe weathering conditions is adequately managed.~~
2. Further evaluation is recommended to determine if a plant-specific program is required to manage cracking due to expansion from reaction with aggregates in inaccessible concrete areas of Groups 1–5 and 7–9 structures. A plant-specific evaluation or program is required if (1) reactivity tests or petrographic examinations of concrete samples identify reaction with aggregates, or (2) accessible concrete exhibits visual indications of aggregate reactions, such as “map” or “patterned” cracking, alkali-silica gel exudations, surface staining, expansion causing structural deformation, relative movement or displacement, or misalignment/distortion of attached components. The reviewer confirms that the applicant has not identified any of the above conditions. Otherwise, the reviewer reviews the applicant's proposed AMP or plant-specific enhancements to structures monitoring AMPs needed to manage this aging effect. Plant-specific evaluations verify that, where appropriate, an effective enhanced inspection program has been developed and implemented to ensure that cracking due to expansion from reaction with aggregates in inaccessible concrete areas is adequately managed during the subsequent period of extended operation. ~~Otherwise, the reviewer reviews the applicant's proposed AMP or plant-specific evaluation to verify that, an~~

~~effective evaluation or inspection program has been developed and implemented to ensure that the aging effect is adequately managed.~~

3. Further evaluation is recommended of aging management of (a) cracking and distortion due to increased stress levels from settlement for inaccessible concrete areas of structures for all Groups and (b) reduction of foundation strength, and cracking due to differential settlement and erosion of porous concrete subfoundations for inaccessible concrete areas of Groups 1–3, and 5–9 structures if a dewatering system is relied upon to manage the aging effect. The reviewer confirms that, if the applicant's plant credits a dewatering system in its CLB, the applicant has committed to monitor the functionality of the dewatering system under the applicant's structures monitoring program. If not, the reviewer reviews and evaluates the plant-specific program for monitoring the dewatering system during the subsequent period of extended operation.
4. Further evaluation is recommended of programs to manage increase in porosity and permeability due to leaching of calcium hydroxide and carbonation in below-grade inaccessible concrete areas of Groups 1–5, and 7–9 structures. A plant-specific AMP is not required for the reinforced concrete exposed to flowing water if (1) there is evidence in the accessible areas that the flowing water has not caused leaching of calcium hydroxide and carbonation or (2) evaluation determined that the observed leaching of calcium hydroxide and carbonation in accessible areas has no impact on the intended function of the concrete structure. The reviewer confirms that the applicant has satisfied these conditions. Otherwise, the reviewer reviews the applicant's proposed plant-specific AMP or plant-specific enhancements to Structures Monitoring AMP needed to manage these aging effects. Plant-specific evaluations verify that, where appropriate, an effective enhanced inspection program has been developed and implemented to ensure that increase in porosity and permeability due to leaching of calcium hydroxide and carbonation in inaccessible areas are adequately managed during the subsequent period of extended operation. ~~Otherwise, the reviewer reviews the applicant's proposed AMP to verify that, where appropriate, an effective inspection program has been developed and implemented to ensure that this aging effect in inaccessible areas is adequately managed.~~

#### 3.5.3.2.2.2 Reduction of Strength and Modulus Due to Elevated Temperature

Further evaluation is recommended of programs to manage reduction of strength and modulus of concrete structures due to elevated ~~temperature~~ temperatures for PWR and BWR safety-related and other structures.

A plant-specific evaluation should be performed if any portion of the concrete Groups 1–5 structures exceeds specified temperature limits [i.e., general temperature greater than 66 °C (150 °F) and local area temperature greater than 93 °C (200 °F)]. Higher temperatures may be allowed if tests and/or calculations are provided to evaluate the reduction in strength and modulus of elasticity and these reductions are applied to the design calculations. The reviewer reviews and confirms that the applicant's discussion in the renewal application indicates that the affected Groups 1–5 structures are not exposed to temperature that exceeds the temperature limits. If active cooling is relied upon to maintain acceptable temperatures, then the reviewer ensures that the aging effects associated with the cooling system are being properly managed or temperatures are being monitored to identify a problem with the cooling system. If the limits are exceeded, the reviewer reviews the technical basis (i.e., tests and/or calculations) provided by the applicant to justify the higher temperature. Otherwise the reviewer reviews the

applicant's proposed plant-specific AMP or plant-specific enhancements to the Structures Monitoring AMP needed to manage these aging effects. Plant-specific evaluations verify that, where appropriate, an effective enhanced inspection program has been developed and implemented, to ensure that reduction of strength and modulus of concrete structures due to elevated temperatures are adequately managed during the subsequent period of extended operation. ~~Otherwise the reviewer reviews the applicant's proposed programs on a case-by-case basis to ensure that the effects of elevated temperature will be adequately managed during the subsequent period of extended operation.~~

### 3.5.3.2.2.3 Aging Management of Inaccessible Areas for Group 6 Structures

Further evaluation is recommended for inaccessible areas of certain Group 6 structure/aging effect combinations as identified below, whether or not they are covered by inspections in accordance with GALL-SLR Report AMP XI.S7, or FERC/US Army Corp of Engineers dam inspection and maintenance procedures.

1. Loss of material (spalling, scaling) and cracking due to freeze-thaw could occur in below-grade inaccessible concrete areas of Group 6 structures. Further evaluation is needed for plants that are located in moderate to severe weathering conditions (weathering index >100 day-inch/yr) (NUREG-1557, Ref. 15). The weathering index for the continental U.S. is shown in ASTM C33-90, Figure 1. A plant-specific program is not required if documented evidence confirms that the existing concrete had air content of 3 percent to 8 percent and subsequent inspection of accessible areas did not exhibit degradation related to freeze-thaw. Such inspections should be considered a part of the evaluation. The reviewer reviews and confirms that the applicant has satisfied these conditions. Otherwise, the reviewer reviews the applicant's proposed plant-specific AMP or plant-specific enhancements to Structures Monitoring AMP essential to manage these aging effects. Plant-specific evaluations verify that, where appropriate, an effective enhanced inspection program has been developed and implemented, to ensure that loss of material (spalling, scaling) and cracking due to freeze-thaw in inaccessible areas for plants located in moderate to severe weathering conditions are adequately managed during the subsequent period of extended operation. ~~Otherwise, the reviewer reviews the applicant's proposed AMP to determine that, where appropriate, an effective inspection program has been developed and implemented to ensure that this aging effect in inaccessible areas for plants located in moderate to severe weathering conditions will be adequately managed.~~
2. Cracking due to expansion from reaction with aggregates could occur in inaccessible concrete areas of Group 6 structures. Further evaluation is recommended to determine if a plant-specific program is required to manage the aging effect. A plant-specific evaluation or program is required if (1) reactivity tests or petrographic examinations of concrete samples identify reaction with aggregates, or (2) accessible concrete exhibits visual indications of aggregate reactions, such as "map" or "patterned" cracking, alkali-silica gel exudations, surface staining, expansion causing structural deformation, relative movement or displacement, or misalignment/distortion of attached components. The reviewer confirms that the applicant has not identified any of the above conditions. Otherwise, the reviewer reviews the applicant's proposed plant-specific AMP, or plant-specific enhancements to Structures Monitoring AMP, needed to manage this aging effect. Plant-specific evaluations verify that, where appropriate, an effective enhanced inspection program has been developed and implemented to ensure cracking due to expansion from reaction with aggregates are adequately managed during the

subsequent period of extended operation. Otherwise, the reviewer reviews the applicant's proposed AMP or plant-specific evaluation to verify that, an effective evaluation or inspection program has been developed and implemented to ensure that the aging effect will be adequately managed.

3. Increase in porosity and permeability due to leaching of calcium hydroxide and carbonation could occur in below-grade inaccessible concrete areas of Group 6 structures. Further evaluation is recommended to determine if a plant-specific program is required to manage the aging effect. A plant-specific program is not required for the reinforced structures exposed to flowing water if (1) there is evidence in the accessible areas that the flowing water has not caused leaching and carbonation, or (2) evaluation determined that the observed leaching of calcium hydroxide and carbonation in accessible areas has no impact on the intended function of the concrete structure. The reviewer confirms that the applicant has satisfied these conditions. Otherwise, the reviewer reviews the applicant's proposed AMP or plant-specific enhancements to Structures Monitoring AMP needed manage this aging effect. Plant-specific evaluations verify that, where appropriate, an effective enhanced inspection program has been developed and implemented to ensure that porosity and permeability due to leaching of calcium hydroxide and carbonation in inaccessible areas are adequately managed during the subsequent period of extended operation. ~~Otherwise, the reviewer reviews the applicant's proposed AMP to verify that, where appropriate, an effective inspection program has been developed and implemented to ensure that this aging effect in inaccessible areas will be adequately managed.~~

#### 3.5.3.2.2.6 *Reduction of Strength and Mechanical Properties of Concrete Due to Irradiation*

Further evaluation is recommended of a plant-specific AMP or plant-specific enhancements to selected AMPs program to manage reduction of strength, loss of mechanical properties, and cracking of concrete due to irradiation in PWR and BWR Group 4 concrete structures, exposed to high levels of neutron and gamma radiation. These structures include the reactor (primary/biological) shield wall, the sacrificial shield wall, and the reactor vessel support/pedestal structure. The irradiation mechanism consists of radiation interactions with the material and heating due to absorption of radiation energy at the operating temperature experienced by the concrete. The intensity of radiation is typically characterized by the measure of its field or fluence. Both neutron and gamma radiation produce internal heating from absorption of radiation energy and, at high fluence levels, changes in microstructure and certain mechanical properties of concrete (e.g., compressive strength, tensile strength, modulus of elasticity) from radiation interactions with the material. Limited data are available in the open literature related to the effects and significance of radiation fluences (neutron and gamma radiation) on intended functions of concrete structures, especially for conditions (dose, temperature, etc.) representative of existing LWR plants. However, based on literature review of existing research, fluence limits of  $1 \times 10^{19}$  neutrons/cm<sup>2</sup> neutron radiation and  $1 \times 10^8$  Gy ( $1 \times 10^{10}$  rad) gamma dose are considered conservative radiation exposure levels beyond which concrete material properties may begin to degrade markedly.

Plant-specific calculations/analyses should be performed to identify the neutron (fluence cutoff energy  $E > 0.1$  MeV) and gamma fields that develop in any portion of the concrete structures of interest at 80 years of operation and compare them to the above threshold limits. The impact of any plant-specific OE of concrete irradiation effects on intended functions are evaluated. The reviewer reviews these analyses, OE and supporting technical basis (e.g., calculations, test data, plant-specific evaluations) on a case-by-case basis. Higher fluence or dose levels may be

allowed in the concrete if tests and/or calculations are provided to evaluate the reduction in strength and/or change in mechanical properties of concrete, if any, from those fluence levels and the effects are applied to the design calculations. The reviewer confirms that the applicant's discussion in the SLRA indicates that the affected PWR and BWR concrete components are not exposed to neutron and gamma radiation fluence levels that exceed the threshold limits, or are otherwise evaluated, for example, the concrete is primarily for shielding and non-structural. The reviewer also confirms that the impact of any plant-specific OE of concrete irradiation degradation on intended functions is addressed. If the limits are exceeded, the technical basis (i.e., tests and/or calculations or evaluations) provided by the applicant to justify higher fluence or dose limits is reviewed. Otherwise, the applicant's proposed plant-specific ~~AMP or plant-specific enhancements to selected AMPs program~~ and the supporting technical basis is reviewed to ensure that the effects of irradiation on the concrete components will be adequately managed during the subsequent period of extended operation.



Revisions to SRP-SLR Table 3.5-1

<b>New, Modified, Deleted, Edited Item</b>	<b>ID</b>	<b>Type</b>	<b>Component</b>	<b>Aging Effect/Mechanism</b>	<b>Aging Management Program (AMP)/TLAA</b>	<b>Further Evaluation Recommended</b>	<b>GALL-SLR Item</b>
E	001	BWR/PWR	Concrete: dome; wall; basemat; ring girders; buttresses, concrete elements, all	Cracking and distortion due to increased stress levels from settlement	AMP XI.S2, "ASME Section XI, Subsection IWL," and/or AMP XI.S6, "Structures Monitoring"	Yes (SRP-SLR Section 3.5.2.2.1.1)	II.A1.CP-101 II.A2.CP-69 II.B1.2.CP-105 II.B2.2.CP-105 II.B3.1.CP-69 II.B3.2.CP-105
E	002	BWR/PWR	Concrete: foundation; subfoundation	Reduction of foundation strength and cracking due to differential settlement and erosion of porous concrete subfoundation	AMP XI.S6, "Structures Monitoring"	Yes (SRP-SLR Section 3.5.2.2.1.1)	II.A1.C-07 II.A2.C-07 II.B1.2.C-07 II.B2.2.C-07 II.B3.1.C-07 II.B3.2.C-07
M	003	BWR/PWR	Concrete: dome; wall; basemat; ring girders; buttresses, concrete: containment; wall; basemat, concrete: basemat, concrete fill-in annulus	Reduction of strength and modulus of elasticity due to elevated temperature (>150°F general; >200°F local)	Plant-specific aging management program <u>or AMP XI.S2, "ASME Section XI, Subsection IWL," and/or AMP XI.S6, "Structures Monitoring," enhanced as necessary</u>	Yes (SRP-SLR Section 3.5.2.2.1.2)	II.A1.CP-34 II.B1.2.CP-57 II.B2.2.CP-57 II.B3.1.CP-65 II.B3.2.CP-108
E	004	BWR	Steel elements (inaccessible areas): drywell shell; drywell head	Loss of material due to general, pitting, crevice corrosion	AMP XI.S1, "ASME Section XI, Subsection IWE," and AMP XI.S4, "10 CFR Part 50, Appendix J"	Yes (SRP-SLR Section 3.5.2.2.1.3.1)	II.B3.1.CP-113

<b>New, Modified, Deleted, Edited Item</b>	<b>ID</b>	<b>Type</b>	<b>Component</b>	<b>Aging Effect/Mechanism</b>	<b>Aging Management Program (AMP)/TLAA</b>	<b>Further Evaluation Recommended</b>	<b>GALL-SLR Item</b>
E	005	BWR/PWR	Steel elements (inaccessible areas): liner; liner anchors; integral attachments, steel elements (inaccessible areas): suppression chamber; drywell; drywell head; embedded shell; region shielded by diaphragm floor (as applicable)	Loss of material due to general, pitting, crevice corrosion	AMP XI.S1, "ASME Section XI, Subsection IWE," and AMP XI.S4, "10 CFR Part 50, Appendix J"	Yes (SRP-SLR Section 3.5.2.2.1.3.1)	II.A1.CP-98 II.A2.CP-98 II.B1.2.CP-63 II.B2.1.CP-63 II.B2.2.CP-63 II.B3.2.CP-98
E	006	BWR	Steel elements: torus shell	Loss of material due to general, pitting, crevice corrosion	AMP XI.S1, "ASME Section XI, Subsection IWE," and AMP XI.S4, "10 CFR Part 50, Appendix J"	Yes (SRP-SLR Section 3.5.2.2.1.3.2)	II.B1.1.CP-48
E	007	BWR	Steel elements: torus ring girders; downcomers; Steel elements: suppression chamber shell (interior surface)	Loss of material due to general, pitting, crevice corrosion	AMP XI.S1, "ASME Section XI, Subsection IWE"	Yes (SRP-SLR Section 3.5.2.2.1.3.3)	II.B1.1.CP-109 II.B3.1.CP-158
M	008	BWR/PWR	Prestressing system: tendons	Loss of prestress due to relaxation; shrinkage; creep; elevated temperature	TLAA, SRP-SLR Section 4.5, "Concrete Containment Tendon Prestress," and/or SRP-SLR Section 4.7, "Other Plant-Specific Time-Limited Aging Analyses"	Yes (SRP-SLR Section 3.5.2.2.1.4)	II.A1.C-11 II.B2.2.C-11

<b>New, Modified, Deleted, Edited Item</b>	<b>ID</b>	<b>Type</b>	<b>Component</b>	<b>Aging Effect/Mechanism</b>	<b>Aging Management Program (AMP)/TLAA</b>	<b>Further Evaluation Recommended</b>	<b>GALL-SLR Item</b>
M	009	BWR/PWR	Metal liner, metal plate, personnel airlock, equipment hatch, CRD hatch, penetration sleeves; penetration bellows, steel elements: torus; vent line; vent header; vent line bellows; downcomers, suppression pool shell; unbraced downcomers, steel elements: vent header; downcomers	Cumulative fatigue damage due to cyclic loading (Only if CLB fatigue analysis exists)	TLAA, SRP-SLR Section 4.6, "Containment Liner Plate and Penetration Fatigue Analysis"	Yes (SRP-SLR Section 3.5.2.2.1.5)	II.A3.C-13 II.B1.1.C-21 II.B2.1.C-45 II.B2.2.C-48 II.B4.C-13
E	010	BWR/PWR	Penetration sleeves; penetration bellows	Cracking due to SCC	AMP XI.S1, "ASME Section XI, Subsection IWE," and AMP XI.S4, "10 CFR Part 50, Appendix J"	Yes (SRP-SLR Section 3.5.2.2.1.6)	II.A3.CP-38 II.B4.CP-38
<u>EM</u>	011	BWR/PWR	Concrete (inaccessible areas): dome; wall; basemat; ring girders; buttresses	Loss of material (spalling, scaling) and cracking due to freeze-thaw	Plant-specific aging management program <u>or AMP XI.S2, "ASME Section XI, Subsection IWL," and/or AMP XI.S6, "Structures Monitoring," enhanced as necessary</u>	Yes (SRP-SLR Section 3.5.2.2.1.7)	II.A1.CP-147 II.A2.CP-70 II.B3.2.CP-135

<b>New, Modified, Deleted, Edited Item</b>	<b>ID</b>	<b>Type</b>	<b>Component</b>	<b>Aging Effect/Mechanism</b>	<b>Aging Management Program (AMP)/TLAA</b>	<b>Further Evaluation Recommended</b>	<b>GALL-SLR Item</b>
M	012	BWR/PWR	Concrete (inaccessible areas): dome; wall; basemat; ring girders; buttresses, containment, concrete fill-in annulus	Cracking due to expansion from reaction with aggregates	Plant-specific aging management program <u>or AMP XI.S2, "ASME Section XI, Subsection IWL," and/or AMP XI.S6, "Structures Monitoring," enhanced as necessary</u>	Yes (SRP-SLR Section 3.5.2.2.1.8)	II.A1.CP-67 II.A2.CP-104 II.B1.2.CP-99 II.B2.2.CP-99 II.B3.1.CP-83 II.B3.2.CP-121
D	013						
M	014	BWR/PWR	Concrete (inaccessible areas): dome; wall; basemat; ring girders; buttresses, containment	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	Plant-specific aging management program <u>or AMP XI.S2, "ASME Section XI, Subsection IWL," and/or AMP XI.S6, "Structures Monitoring," enhanced as necessary</u>	Yes (SRP-SLR Section 3.5.2.2.1.9)	II.A1.CP-102 II.A2.CP-53 II.B1.2.CP-110 II.B2.2.CP-110 II.B3.1.CP-53 II.B3.2.CP-122
D	015						
M	016	BWR/PWR	Concrete (accessible areas): basemat, concrete: containment; wall	Increase in porosity and permeability; cracking; loss of material (spalling, scaling) due to aggressive chemical attack	AMP XI.S2, "ASME Section XI, Subsection IWL," and/or AMP XI.S6, "Structures Monitoring"	No	II.A1.CP-87 II.A2.CP-72 II.B1.2.CP-106 II.B2.2.CP-106 II.B3.1.CP-72
D	017						

<b>New, Modified, Deleted, Edited Item</b>	<b>ID</b>	<b>Type</b>	<b>Component</b>	<b>Aging Effect/Mechanism</b>	<b>Aging Management Program (AMP)/TLAA</b>	<b>Further Evaluation Recommended</b>	<b>GALL-SLR Item</b>
M	018	BWR/PWR	Concrete (accessible areas): dome; wall; basemat; ring girders; buttresses	Loss of material (spalling, scaling) and cracking due to freeze-thaw	AMP XI.S2, "ASME Section XI, Subsection IWL," and/or AMP XI.S6, "Structures Monitoring"	No	II.A1.CP-31 II.A2.CP-51 II.B3.2.CP-52
M	019	BWR/PWR	Concrete (accessible areas): dome; wall; basemat; ring girders; buttresses, containment; concrete fill-in annulus	Cracking due to expansion from reaction with aggregates	AMP XI.S2, "ASME Section XI, Subsection IWL," and/or AMP XI.S6, "Structures Monitoring"	No	II.A1.CP-33 II.A2.CP-58 II.B1.2.CP-59 II.B2.2.CP-59 II.B3.1.CP-66 II.B3.2.CP-60
M	020	BWR/PWR	Concrete (accessible areas): dome; wall; basemat; ring girders; buttresses, containment	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	AMP XI.S2, "ASME Section XI, Subsection IWL"	No	II.A1.CP-32 II.A2.CP-155 II.B1.2.CP-54 II.B2.2.CP-54 II.B3.1.CP-156 II.B3.2.CP-55
E	021	BWR/PWR	Concrete (accessible areas): dome; wall; basemat; ring girders; buttresses; reinforcing steel	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	AMP XI.S2, "ASME Section XI, Subsection IWL," and/or AMP XI.S6, "Structures Monitoring"	No	II.A1.CP-68 II.A2.CP-74 II.B1.2.CP-79 II.B2.2.CP-79 II.B3.1.CP-74 II.B3.2.CP-88
D	022						
M	023	BWR/PWR	Concrete (inaccessible areas): basemat; reinforcing steel, dome; wall	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	AMP XI.S2, "ASME Section XI, Subsection IWL," and/or AMP XI.S6, "Structures Monitoring"	No	II.A1.CP-97 II.A2.CP-75 II.B1.2.CP-80 II.B2.2.CP-80 II.B3.1.CP-75 II.B3.2.CP-89
E	024	BWR/PWR	Concrete (inaccessible areas): dome; wall; basemat; ring girders; buttresses, concrete (accessible areas): dome; wall; basemat	Increase in porosity and permeability; cracking; loss of material (spalling, scaling) due to aggressive chemical attack	AMP XI.S2, "ASME Section XI, Subsection IWL," and/or AMP XI.S6, "Structures Monitoring"	No	II.A1.CP-100 II.A2.CP-71 II.B3.1.CP-71 II.B3.2.CP-73 II.B3.2.CP-84
D	025						

<b>New, Modified, Deleted, Edited Item</b>	<b>ID</b>	<b>Type</b>	<b>Component</b>	<b>Aging Effect/Mechanism</b>	<b>Aging Management Program (AMP)/TLAA</b>	<b>Further Evaluation Recommended</b>	<b>GALL-SLR Item</b>
	026	BWR/PWR	Moisture barriers (caulking, flashing, and other sealants)	Loss of sealing due to wear, damage, erosion, tear, surface cracks, other defects	AMP XI.S1, "ASME Section XI, Subsection IWE"	No	II.A3.CP-40 II.B4.CP-40
M	027	BWR/PWR	Metal liner, metal plate, airlock, equipment hatch, CRD hatch; penetration sleeves; penetration bellows, steel elements: torus; vent line; vent header; vent line bellows; downcomers, suppression pool shell	Cracking due to cyclic loading (CLB fatigue analysis does not exist)	AMP XI.S1, "ASME Section XI, Subsection IWE," and AMP XI.S4, "10 CFR Part 50, Appendix J"	<del>No</del> Yes (SRP-SLR Section 3.5.2.2.1.5)	II.A3.CP-37 II.B1.1.CP-49 II.B2.1.CP-107 II.B4.CP-37
	028	BWR/PWR	Personnel airlock, equipment hatch, CRD hatch	Loss of material due to general, pitting, crevice corrosion	AMP XI.S1, "ASME Section XI, Subsection IWE," and AMP XI.S4, "10 CFR Part 50, Appendix J"	No	II.A3.C-16 II.B4.C-16
M	029	BWR/PWR	Personnel airlock, equipment hatch, CRD hatch: locks, hinges, and closure mechanisms	Loss of leak tightness due to mechanical wear	AMP XI.S1, "ASME Section XI, Subsection IWE," and AMP XI.S4, "10 CFR Part 50, Appendix J"	No	II.A3.CP-39 II.B4.CP-39
	030	BWR/PWR	Pressure-retaining bolting	Loss of preload due to self-loosening	AMP XI.S1, "ASME Section XI, Subsection IWE," and AMP XI.S4, "10 CFR Part 50, Appendix J"	No	II.A3.CP-150 II.B4.CP-150
	031	BWR/PWR	Pressure-retaining bolting, steel elements: downcomer pipes	Loss of material due to general, pitting, crevice corrosion	AMP XI.S1, "ASME Section XI, Subsection IWE"	No	II.A3.CP-148 II.B1.2.CP-117 II.B2.1.CP-117 II.B2.2.CP-117 II.B4.CP-148

**Table 3.5-1 Summary of Aging Management Programs for Containments, Structures and Component Supports Evaluated in Chapters II and III of the GALL-SLR Report**

<b>New, Modified, Deleted, Edited Item</b>	<b>ID</b>	<b>Type</b>	<b>Component</b>	<b>Aging Effect/Mechanism</b>	<b>Aging Management Program (AMP)/TLAA</b>	<b>Further Evaluation Recommended</b>	<b>GALL-SLR Item</b>
	032	BWR/PWR	Prestressing system: tendons; anchorage components	Loss of material due to corrosion	AMP XI.S2, "ASME Section XI, Subsection IWL"	No	II.A1.C-10 II.B2.2.C-10
	033	BWR/PWR	Seals and gaskets	Loss of sealing due to wear, damage, erosion, tear, surface cracks, other defects	AMP XI.S4, "10 CFR Part 50, Appendix J "	No	II.A3.CP-41 II.B4.CP-41
	034	BWR/PWR	Service Level I coatings	Loss of coating or lining integrity due to blistering, cracking, flaking, peeling, delamination, rusting, or physical damage	AMP XI.S8, "Protective Coating Monitoring and Maintenance"	No	II.A3.CP-152 II.B4.CP-152
M	035	BWR/PWR	Steel elements (accessible areas): liner; liner anchors; integral attachments, penetration sleeves, drywell shell; drywell head; drywell shell in sand pocket regions; suppression chamber; drywell; embedded shell; region shielded by diaphragm floor (as applicable)	Loss of material due to general, pitting, crevice corrosion	AMP XI.S1, "ASME Section XI, Subsection IWE," and AMP XI.S4, "10 CFR Part 50, Appendix J"	Yes (SRP-SLR Section 3.5.2.2.1.3.1)	II.A1.CP-35 II.A2.CP-35 II.A3.CP-36 II.B1.1.CP-43 II.B1.2.CP-46 II.B2.1.CP-46 II.B2.2.CP-46 II.B3.1.CP-43 II.B3.2.CP-35 II.B4.CP-36
M	036	BWR	Steel elements: drywell head; downcomers	Loss of material due to mechanical wear, including fretting	AMP XI.S1, "ASME Section XI, Subsection IWE"	No	II.B1.1.C-23 II.B1.2.C-23 II.B2.1.C-23 II.B2.2.C-23
	037	BWR	Steel elements: suppression chamber (torus) liner (interior surface)	Loss of material due to general (steel only), pitting, crevice corrosion	AMP XI.S1, "ASME Section XI, Subsection IWE," and AMP XI.S4, "10 CFR Part 50, Appendix J"	No	II.B1.2.C-49 II.B2.2.C-49

<b>New, Modified, Deleted, Edited Item</b>	<b>ID</b>	<b>Type</b>	<b>Component</b>	<b>Aging Effect/Mechanism</b>	<b>Aging Management Program (AMP)/TLAA</b>	<b>Further Evaluation Recommended</b>	<b>GALL-SLR Item</b>
M	038	BWR	Steel elements: suppression chamber shell (interior surface)	Cracking due to SCC	AMP XI.S1, "ASME Section XI, Subsection IWE," and AMP XI.S4, "10 CFR Part 50, Appendix J"	Yes (SRP-SLR Section 3.5.2.2.1.6)	II.B3.1.C-24 II.B3.2.C-24
M	039	BWR	Steel elements: vent line bellows	Cracking due to SCC	AMP XI.S1, "ASME Section XI, Subsection IWE," and AMP XI.S4, "10 CFR Part 50, Appendix J"	Yes (SRP-SLR Section 3.5.2.2.1.6)	II.B1.1.CP-50
<u>M</u>	040	BWR	Unbraced downcomers, steel elements: vent header; downcomers	Cracking due to cyclic loading (CLB fatigue analysis does not exist)	AMP XI.S1, "ASME Section XI, Subsection IWE"	<del>Yes</del> (SRP-SLR <a href="#">Section 3.5.2.2.1.5</a> )	II.B2.1.CP-142 II.B2.2.CP-64
E	041	BWR	Steel elements: drywell support skirt, steel elements (inaccessible areas): support skirt	None	None	No	II.B1.1.CP-44 II.B1.2.CP-114 II.B2.1.CP-114 II.B2.2.CP-114
M	042	BWR/PWR	Groups 1-3, 5, 7- 9: concrete (inaccessible areas): foundation	Loss of material (spalling, scaling) and cracking due to freeze-thaw	Plant-specific aging management program <u>or</u> <a href="#">AMP XI.S6, "Structures Monitoring," enhanced as necessary</a>	Yes (SRP-SLR Section 3.5.2.2.2.1.1)	III.A1.TP-108 III.A2.TP-108 III.A3.TP-108 III.A5.TP-108 III.A7.TP-108 III.A8.TP-108 III.A9.TP-108
M	043	BWR/PWR	All Groups except Group 6: concrete (inaccessible areas): all	Cracking due to expansion from reaction with aggregates	Plant-specific aging management program <u>or</u> <a href="#">AMP XI.S6, "Structures Monitoring," enhanced as necessary</a>	Yes (SRP-SLR Section 3.5.2.2.2.1.2)	III.A1.TP-204 III.A2.TP-204 III.A3.TP-204 III.A4.TP-204 III.A5.TP-204 III.A7.TP-204 III.A8.TP-204 III.A9.TP-204



<b>New, Modified, Deleted, Edited Item</b>	<b>ID</b>	<b>Type</b>	<b>Component</b>	<b>Aging Effect/Mechanism</b>	<b>Aging Management Program (AMP)/TLAA</b>	<b>Further Evaluation Recommended</b>	<b>GALL-SLR Item</b>
E	044	BWR/PWR	All Groups: concrete: all	Cracking and distortion due to increased stress levels from settlement	AMP XI.S6, "Structures Monitoring"	Yes (SRP-SLR Section 3.5.2.2.2.1.3)	III.A1.TP-30 III.A2.TP-30 III.A3.TP-30 III.A4.TP-30 III.A5.TP-30 III.A6.TP-30 III.A7.TP-30 III.A8.TP-30 III.A9.TP-30
D	045						
E	046	BWR/PWR	Groups 1-3, 5-9: concrete: foundation; subfoundation	Reduction of foundation strength and cracking due to differential settlement and erosion of porous concrete subfoundation	AMP XI.S6, "Structures Monitoring"	Yes (SRP-SLR Section 3.5.2.2.2.1.3)	III.A1.TP-31 III.A2.TP-31 III.A3.TP-31 III.A5.TP-31 III.A6.TP-31 III.A7.TP-31 III.A8.TP-31 III.A9.TP-31
M	047	BWR/PWR	Groups 1-5, 7-9: concrete (inaccessible areas): exterior above- and below-grade; foundation	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	Plant-specific aging management program <u>or AMP XI.S6, "Structures Monitoring," enhanced as necessary</u>	Yes (SRP-SLR Section 3.5.2.2.2.1.4)	III.A1.TP-67 III.A2.TP-67 III.A3.TP-67 III.A4.TP-305 III.A5.TP-67 III.A7.TP-67 III.A8.TP-67 III.A9.TP-67
M	048	BWR/PWR	Groups 1-5: concrete: all	Reduction of strength and modulus due to elevated temperature (>150°F general; >200°F local)	Plant-specific aging management program <u>or AMP XI.S6, "Structures Monitoring," enhanced as necessary</u>	Yes (SRP-SLR Section 3.5.2.2.2.2)	III.A1.TP-114 III.A2.TP-114 III.A3.TP-114 III.A4.TP-114 III.A5.TP-114

<b>New, Modified, Deleted, Edited Item</b>	<b>ID</b>	<b>Type</b>	<b>Component</b>	<b>Aging Effect/Mechanism</b>	<b>Aging Management Program (AMP)/TLAA</b>	<b>Further Evaluation Recommended</b>	<b>GALL-SLR Item</b>
M	049	BWR/PWR	Groups 6 - concrete (inaccessible areas): exterior above- and below-grade; foundation; interior slab	Loss of material (spalling, scaling) and cracking due to freeze-thaw	Plant-specific aging management program <u>or</u> <a href="#">AMP XI.S6, "Structures Monitoring," enhanced as necessary</a>	Yes (SRP-SLR Section 3.5.2.2.2.3.1)	III.A6.TP-110
M	050	BWR/PWR	Groups 6: concrete (inaccessible areas): all	Cracking due to expansion from reaction with aggregates	Plant-specific aging management program <u>or</u> <a href="#">AMP XI.S6, "Structures Monitoring," enhanced as necessary</a>	Yes (SRP-SLR Section 3.5.2.2.2.3.2)	III.A6.TP-220
M	051	BWR/PWR	Groups 6: concrete (inaccessible areas): exterior above- and below-grade; foundation; interior slab	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	Plant-specific aging management program <u>or</u> <a href="#">AMP XI.S6, "Structures Monitoring," enhanced as necessary</a>	Yes (SRP-SLR Section 3.5.2.2.2.3.3)	III.A6.TP-109
E	052	BWR/PWR	Groups 7, 8 - steel components: tank liner	Cracking due to SCC; Loss of material due to pitting and crevice corrosion	Plant-specific aging management program	Yes (SRP-SLR Section 3.5.2.2.2.4)	III.A7.T-23 III.A8.T-23
M	053	BWR/PWR	Support members; welds; bolted connections; support anchorage to building structure	Cumulative fatigue damage due to cyclic loading (Only if CLB fatigue analysis exists)	TLAA, SRP-SLR Section 4.3 "Metal Fatigue," and/or Section 4.7 "Other Plant-Specific Time-Limited Aging Analyses"	Yes (SRP-SLR Section 3.5.2.2.2.5)	III.B1.1.T-26 III.B1.2.T-26 III.B1.3.T-26

<b>New, Modified, Deleted, Edited Item</b>	<b>ID</b>	<b>Type</b>	<b>Component</b>	<b>Aging Effect/Mechanism</b>	<b>Aging Management Program (AMP)/TLAA</b>	<b>Further Evaluation Recommended</b>	<b>GALL-SLR Item</b>
M	054	BWR/PWR	All groups except 6: concrete (accessible areas): all	Cracking due to expansion from reaction with aggregates	AMP XI.S6, "Structures Monitoring"	No	III.A1.TP-25 III.A2.TP-25 III.A3.TP-25 III.A4.TP-25 III.A5.TP-25 III.A6.TP-25 III.A7.TP-25 III.A8.TP-25 III.A9.TP-25
	055	BWR/PWR	Building concrete at locations of expansion and grouted anchors; grout pads for support base plates	Reduction in concrete anchor capacity due to local concrete degradation/ service-induced cracking or other concrete aging mechanisms	AMP XI.S6, "Structures Monitoring"	No	III.B1.1.TP-42 III.B1.2.TP-42 III.B1.3.TP-42 III.B2.TP-42 III.B3.TP-42 III.B4.TP-42 III.B5.TP-42
E	056	BWR/PWR	Concrete: exterior above- and below- grade; foundation; interior slab	Loss of material due to abrasion; cavitation	AMP XI.S7, "Inspection of Water-Control Structures Associated with Nuclear Power Plants" or the FERC/US Army Corp of Engineers dam inspections and maintenance programs.	No	III.A6.T-20
M	057	BWR/PWR	Constant and variable load spring hangers; guides; stops	Loss of mechanical function due to corrosion, distortion, dirt or debris accumulation, overload, wear	AMP XI.S3, "ASME Section XI, Subsection IWF"	No	III.B1.1.T-28 III.B1.2.T-28 III.B1.3.T-28

<b>New, Modified, Deleted, Edited Item</b>	<b>ID</b>	<b>Type</b>	<b>Component</b>	<b>Aging Effect/Mechanism</b>	<b>Aging Management Program (AMP)/TLAA</b>	<b>Further Evaluation Recommended</b>	<b>GALL-SLR Item</b>
E	058	BWR/PWR	Earthen water-control structures: dams; embankments; reservoirs; channels; canals and ponds	Loss of material; loss of form due to erosion, settlement, sedimentation, frost action, waves, currents, surface runoff, seepage	AMP XI.S7, "Inspection of Water-Control Structures Associated with Nuclear Power Plants" or the FERC/US Army Corp of Engineers dam inspections and maintenance programs.	No	III.A6.T-22
E	059	BWR/PWR	Group 6: concrete (accessible areas): all	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	AMP XI.S7, "Inspection of Water-Control Structures Associated with Nuclear Power Plants" or the FERC/US Army Corp of Engineers dam inspections and maintenance programs.	No	III.A6.TP-38
E	060	BWR/PWR	Group 6: concrete (accessible areas): exterior above- and below-grade; foundation	Loss of material (spalling, scaling) and cracking due to freeze-thaw	AMP XI.S7, "Inspection of Water-Control Structures Associated with Nuclear Power Plants" or the FERC/US Army Corp of Engineers dam inspections and maintenance programs.	No	III.A6.TP-36

<b>New, Modified, Deleted, Edited Item</b>	<b>ID</b>	<b>Type</b>	<b>Component</b>	<b>Aging Effect/Mechanism</b>	<b>Aging Management Program (AMP)/TLAA</b>	<b>Further Evaluation Recommended</b>	<b>GALL-SLR Item</b>
E	061	BWR/PWR	Group 6: concrete (accessible areas): exterior above- and below-grade; foundation; interior slab	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	AMP XI.S7, "Inspection of Water-Control Structures Associated with Nuclear Power Plants" or the FERC/US Army Corp of Engineers dam inspections and maintenance programs.	No	III.A6.TP-37
E	062	BWR/PWR	Group 6: Wooden Piles; sheeting	Loss of material; change in material properties due to weathering, chemical degradation, and insect infestation repeated wetting and drying, fungal decay	AMP XI.S7, "Inspection of Water-Control Structures Associated with Nuclear Power Plants" or the FERC/US Army Corp of Engineers dam inspections and maintenance programs.	No	III.A6.TP-223
	063	BWR/PWR	Groups 1-3, 5, 7-9: concrete (accessible areas): exterior above- and below-grade; foundation	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	AMP XI.S6, "Structures Monitoring"	No	III.A1.TP-24 III.A2.TP-24 III.A3.TP-24 III.A5.TP-24 III.A7.TP-24 III.A8.TP-24 III.A9.TP-24
	064	BWR/PWR	Groups 1-3, 5, 7-9: concrete (accessible areas): exterior above- and below-grade; foundation	Loss of material (spalling, scaling) and cracking due to freeze-thaw	AMP XI.S6, "Structures Monitoring"	No	III.A1.TP-23 III.A2.TP-23 III.A3.TP-23 III.A5.TP-23 III.A7.TP-23 III.A8.TP-23 III.A9.TP-23

<b>New, Modified, Deleted, Edited Item</b>	<b>ID</b>	<b>Type</b>	<b>Component</b>	<b>Aging Effect/Mechanism</b>	<b>Aging Management Program (AMP)/TLAA</b>	<b>Further Evaluation Recommended</b>	<b>GALL-SLR Item</b>
	065	BWR/PWR	Groups 1-3, 5, 7-9: concrete (inaccessible areas): below-grade exterior; foundation, Groups 1-3, 5, 7-9: concrete (accessible areas): below-grade exterior; foundation, Groups 6: concrete (inaccessible areas): all	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	AMP XI.S6, "Structures Monitoring"	No	III.A1.TP-212 III.A1.TP-27 III.A2.TP-212 III.A2.TP-27 III.A3.TP-212 III.A3.TP-27 III.A5.TP-212 III.A5.TP-27 III.A6.TP-104 III.A7.TP-212 III.A7.TP-27 III.A8.TP-212 III.A8.TP-27 III.A9.TP-212 III.A9.TP-27
	066	BWR/PWR	Groups 1-5, 7, 9: concrete (accessible areas): interior and above-grade exterior	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	AMP XI.S6, "Structures Monitoring"	No	III.A1.TP-26 III.A2.TP-26 III.A3.TP-26 III.A4.TP-26 III.A5.TP-26 III.A7.TP-26 III.A9.TP-26
	067	BWR/PWR	Groups 1-5, 7, 9: Concrete: interior; above-grade exterior, Groups 1-3, 5, 7-9 - concrete (inaccessible areas): below-grade exterior; foundation, Group 6: concrete (inaccessible areas): all	Increase in porosity and permeability; cracking; loss of material (spalling, scaling) due to aggressive chemical attack	AMP XI.S6, "Structures Monitoring"	No	III.A1.TP-28 III.A1.TP-29 III.A2.TP-28 III.A2.TP-29 III.A3.TP-28 III.A3.TP-29 III.A4.TP-28 III.A5.TP-28 III.A5.TP-29 III.A6.TP-107 III.A7.TP-28 III.A7.TP-29 III.A8.TP-29 III.A9.TP-28 III.A9.TP-29

<b>New, Modified, Deleted, Edited Item</b>	<b>ID</b>	<b>Type</b>	<b>Component</b>	<b>Aging Effect/Mechanism</b>	<b>Aging Management Program (AMP)/TLAA</b>	<b>Further Evaluation Recommended</b>	<b>GALL-SLR Item</b>
M	068	BWR/PWR	High-strength steel structural bolting	Cracking due to SCC	AMP XI.S3, "ASME Section XI, Subsection IWF"	No	III.B1.1.TP-41
D	069						
	070	BWR/PWR	Masonry walls: all	Cracking due to restraint shrinkage, creep, aggressive environment	AMP XI.S5, "Masonry Walls"	No	III.A1.T-12 III.A2.T-12 III.A3.T-12 III.A5.T-12 III.A6.T-12
M	071	BWR/PWR	Masonry walls: all	Loss of material (spalling, scaling) and cracking due to freeze-thaw	AMP XI.S5, "Masonry Walls"	No	III.A1.TP-34 III.A2.TP-34 III.A3.TP-34 III.A5.TP-34 III.A6.TP-34
M	072	BWR/PWR	Seals; gasket; moisture barriers (caulking, flashing, and other sealants)	Loss of sealing due to wear, damage, erosion, tear, surface cracks, other defects	AMP XI.S6, "Structures Monitoring"	No	III.A6.TP-7
	073	BWR/PWR	Service Level I coatings	Loss of coating or lining integrity due to blistering, cracking, flaking, peeling, delamination, rusting, or physical damage	AMP XI.S8, "Protective Coating Monitoring and Maintenance"	No	III.A4.TP-301
M	074	BWR/PWR	Sliding support bearings; sliding support surfaces	Loss of mechanical function due to corrosion, distortion, dirt or debris accumulation, overload, wear	AMP XI.S6, "Structures Monitoring"	No	III.B2.TP-46 III.B2.TP-47 III.B4.TP-46 III.B4.TP-47
M	075	BWR/PWR	Sliding surfaces	Loss of mechanical function due to corrosion, distortion, dirt or debris accumulation, overload, wear	AMP XI.S3, "ASME Section XI, Subsection IWF"	No	III.B1.1.TP-45 III.B1.2.TP-45 III.B1.3.TP-45
M	076	BWR/PWR	Sliding surfaces: radial beam seats in BWR drywell	Loss of mechanical function due to corrosion, distortion, dirt or debris accumulation, overload, wear	AMP XI.S6, "Structures Monitoring"	No	III.A4.TP-35

<b>New, Modified, Deleted, Edited Item</b>	<b>ID</b>	<b>Type</b>	<b>Component</b>	<b>Aging Effect/Mechanism</b>	<b>Aging Management Program (AMP)/TLAA</b>	<b>Further Evaluation Recommended</b>	<b>GALL-SLR Item</b>
E	077	BWR/PWR	Steel components: all structural steel	Loss of material due to corrosion	AMP XI.S6, "Structures Monitoring"	No	III.A1.TP-302 III.A2.TP-302 III.A3.TP-302 III.A4.TP-302 III.A5.TP-302 III.A7.TP-302 III.A8.TP-302
M	078	BWR/PWR	Stainless steel fuel pool liner	Cracking due to SCC; Loss of material due to pitting and crevice corrosion	AMP XI.M2, "Water Chemistry," and monitoring of the spent fuel pool water level and leakage from the leak chase channels.	No	III.A5.T-14
	079	BWR/PWR	Steel components: piles	Loss of material due to corrosion	AMP XI.S6, "Structures Monitoring"	No	III.A3.TP-219
	080	BWR/PWR	Structural bolting	Loss of material due to general, pitting, crevice corrosion	AMP XI.S6, "Structures Monitoring"	No	III.A1.TP-248 III.A2.TP-248 III.A3.TP-248 III.A4.TP-248 III.A5.TP-248 III.A6.TP-248 III.A7.TP-248 III.A8.TP-248 III.A9.TP-248 III.B2.TP-248 III.B3.TP-248 III.B4.TP-248 III.B5.TP-248
	081	BWR/PWR	Structural bolting	Loss of material due to general, pitting, crevice corrosion	AMP XI.S3, "ASME Section XI, Subsection IWF"	No	III.B1.1.TP-226 III.B1.2.TP-226 III.B1.3.TP-226



<b>New, Modified, Deleted, Edited Item</b>	<b>ID</b>	<b>Type</b>	<b>Component</b>	<b>Aging Effect/Mechanism</b>	<b>Aging Management Program (AMP)/TLAA</b>	<b>Further Evaluation Recommended</b>	<b>GALL-SLR Item</b>
	082	BWR/PWR	Structural bolting	Loss of material due to general, pitting, crevice corrosion	AMP XI.S6, "Structures Monitoring"	No	III.A1.TP-274 III.A2.TP-274 III.A3.TP-274 III.A4.TP-274 III.A5.TP-274 III.A7.TP-274 III.A8.TP-274 III.A9.TP-274 III.B2.TP-274 III.B3.TP-274 III.B4.TP-274 III.B5.TP-274
E	083	BWR/PWR	Structural bolting	Loss of material due to general, pitting, crevice corrosion	AMP XI.S7, "Inspection of Water-Control Structures Associated with Nuclear Power Plants" or the FERC/US Army Corp of Engineers dam inspections and maintenance programs.	No	III.A6.TP-221
D	084						
M	085	BWR/PWR	Structural bolting	Loss of material due to pitting, crevice corrosion	AMP XI.M2, "Water Chemistry," and AMP XI.S3, "ASME Section XI, Subsection IWF"	No	III.B1.1.TP-232 III.B1.2.TP-232 III.B1.3.TP-232
	086	BWR/PWR	Structural bolting	Loss of material due to pitting, crevice corrosion	AMP XI.S3, "ASME Section XI, Subsection IWF"	No	III.B1.1.TP-235 III.B1.2.TP-235 III.B1.3.TP-235
	087	BWR/PWR	Structural bolting	Loss of preload due to self-loosening	AMP XI.S3, "ASME Section XI, Subsection IWF"	No	III.B1.1.TP-229 III.B1.2.TP-229 III.B1.3.TP-229

<b>New, Modified, Deleted, Edited Item</b>	<b>ID</b>	<b>Type</b>	<b>Component</b>	<b>Aging Effect/Mechanism</b>	<b>Aging Management Program (AMP)/TLAA</b>	<b>Further Evaluation Recommended</b>	<b>GALL-SLR Item</b>
	088	BWR/PWR	Structural bolting	Loss of preload due to self-loosening	AMP XI.S6, "Structures Monitoring"	No	III.A1.TP-261 III.A2.TP-261 III.A3.TP-261 III.A4.TP-261 III.A5.TP-261 III.A6.TP-261 III.A7.TP-261 III.A8.TP-261 III.A9.TP-261 III.B2.TP-261 III.B3.TP-261 III.B4.TP-261 III.B5.TP-261
	089	PWR	Support members; welds; bolted connections; support anchorage to building structure	Loss of material due to boric acid corrosion	AMP XI.M10, "Boric Acid Corrosion"	No	III.B1.1.T-25 III.B1.1.TP-3 III.B1.2.T-25 III.B1.3.TP-3 III.B1.2.TP-3 III.B2.T-25 III.B2.TP-3 III.B3.T-25 III.B3.TP-3 III.B4.T-25 III.B4.TP-3 III.B5.T-25 III.B5.TP-3
E	090	BWR/PWR	Support members; welds; bolted connections; support anchorage to building structure	Loss of material due to general (steel only), pitting, crevice corrosion	AMP XI.M2, "Water Chemistry," and AMP XI.S3, "ASME Section XI, Subsection IWF"	No	III.B1.1.TP-10
	091	BWR/PWR	Support members; welds; bolted connections; support anchorage to building structure	Loss of material due to general, pitting corrosion	AMP XI.S3, "ASME Section XI, Subsection IWF"	No	III.B1.1.T-24 III.B1.2.T-24 III.B1.3.T-24

<b>New, Modified, Deleted, Edited Item</b>	<b>ID</b>	<b>Type</b>	<b>Component</b>	<b>Aging Effect/Mechanism</b>	<b>Aging Management Program (AMP)/TLAA</b>	<b>Further Evaluation Recommended</b>	<b>GALL-SLR Item</b>
	092	BWR/PWR	Support members; welds; bolted connections; support anchorage to building structure	Loss of material due to general, pitting corrosion	AMP XI.S6, "Structures Monitoring"	No	III.B2.TP-43 III.B3.TP-43 III.B4.TP-43 III.B5.TP-43
M	093	BWR/PWR	Galvanized steel support members; welds; bolted connections; support anchorage to building structure	Loss of material due to pitting, crevice corrosion	AMP XI.S6, "Structures Monitoring"	No	III.B2.TP-6 III.B4.TP-6
M	094	BWR/PWR	Vibration isolation elements	Reduction or loss of isolation function due to radiation hardening, temperature, humidity, sustained vibratory loading	AMP XI.S3, "ASME Section XI, Subsection IWF," and/or AMP XI.S6, "Structures Monitoring"	No	III.B1.1.T-33 III.B1.2.T-33 III.B1.3.T-33 III.B4.TP-44
E	095	BWR/PWR	Galvanized steel support members; welds; bolted connections; support anchorage to building structure	None	None	No	III.B1.1.TP-8 III.B1.2.TP-8 III.B1.3.TP-8 III.B2.TP-8 III.B3.TP-8 III.B4.TP-8 III.B5.TP-8
N	096	BWR/PWR	Groups 6: concrete (accessible areas): all	Cracking due to expansion from reaction with aggregates	AMP XI.S7, "Inspection of Water-Control Structures Associated with Nuclear Power Plants"	No	III.A6.T-34
<u>AM</u>	097	BWR/PWR	Group 4: Concrete (reactor cavity area proximate to the reactor vessel): reactor (primary/biological) shield wall; sacrificial shield wall; reactor vessel support/pedestal structure	Reduction of strength; loss of mechanical properties due to irradiation (i.e., radiation interactions with material and radiation-induced heating)	Plant-specific aging management program <u>or plant-specific enhancements to selected AMPs</u>	Yes (SRP-SLR Section 3.5.2.2.2.6)	III.A4.T-35

<b>New, Modified, Deleted, Edited Item</b>	<b>ID</b>	<b>Type</b>	<b>Component</b>	<b>Aging Effect/Mechanism</b>	<b>Aging Management Program (AMP)/TLAA</b>	<b>Further Evaluation Recommended</b>	<b>GALL-SLR Item</b>
N	098	BWR/PWR	Stainless steel, aluminum alloy support members; welds; bolted connections; support anchorage to building structure	None	None	No	III.B1.1.TP-4 III.B1.2.TP-4 III.B1.3.TP-4 III.B2.TP-4 III.B3.TP-4 III.B4.TP-4 III.B5.TP-4
N	099	BWR/PWR	Aluminum, stainless steel support members; welds; bolted connections; support anchorage to building structure	Loss of material due to pitting and crevice corrosion, cracking due to SCC	AMP XI.M32, "One-Time Inspection," AMP XI.S3, "ASME Section XI, Subsection IWF," or AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes (SRP-SLR Section 3.5.2.2.2.4)	III.B1.1.T-36a III.B1.1.T-36b III.B1.1.T-36c III.B1.2.T-36a III.B1.2.T-36b III.B1.2.T-36c III.B1.3.T-36a III.B1.3.T-36b III.B1.3.T-36c
N	100	BWR/PWR	Aluminum, stainless steel support members; welds; bolted connections; support anchorage to building structure	Loss of material due to pitting and crevice corrosion, cracking due to SCC	AMP XI.M32, "One-Time Inspection," AMP XI.S6, "Structures Monitoring," or AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes (SRP-SLR Section 3.5.2.2.2.4)	III.B2.T-37a III.B2.T-37b III.B2.T-37c III.B3.T-37a III.B3.T-37b III.B3.T-37c III.B4.T-37a III.B4.T-37b III.B4.T-37c III.B5.T-37a III.B5.T-37b III.B5.T-37c



## APPENDIX F

### DISPOSITION OF PUBLIC COMMENTS

Comments received on the draft interim staff guidance (ISG) are available electronically through the U.S. Nuclear Regulatory Commission's (NRC's) electronic Reading Room at <http://www.nrc.gov/reading-rm/adams.html>.

From this page, the public can access the Agencywide Documents Access and Management System (ADAMS), which provides text and image files of the NRC's public documents. The following table lists the comments the NRC received on the draft version of this ISG.

Letter Number	ADAMS Accession No	Commenter Affiliation	Commenter Name
1	ML20224A465	Nuclear Energy Institute	Peter W. Kissinger

The NRC received one public comment letter. The table below provides the comment number as listed in the public comment letter, the original comment as written by the commenter, and the NRC staff's response.

Disposition of Public Comments

Comment #	ISG Section/Page	Comment	NRC Staff Response
1	Appendix B AMP XI.S8 Page 2, 3, and 4 of 7	Aging management of in-vessel debris limits is not required. Consistent with GSI-191 evaluations and closure documentation, aging management of coating integrity and the contribution of qualified, unqualified, and damaged coatings to the ECCS suction strainer total debris term/inventory will provide reasonable assurance of ECCS sump strainer functions including associated downstream effects and in-vessel effects.	Agreed and incorporated.
2	Appendix B, AMP XI.S8, Protective Coating Page 1 of 7 Item #1 in Basis of Revision	The trending of the total amount of degraded coatings, which is allowed, is generally completed by someone else in the engineering organization that is knowledgeable of the ECCS Strainer debris loading analysis and is not typically performed by the qualified coating inspector.	Agreed and incorporated.
3	Appendix B, AMP XI.S8, Protective Coating Page 2 of 7 Item #5 in Basis of Revision	“Any coating degradation mechanisms” noted in item #5 second paragraph in the Basis For Revision section is not consistent with guidance in NUREG-2191 AMP XI.S8. Clarify the second paragraph to identify aging effects monitored or inspected (e.g., blistering, cracking, flaking, peeling, rusting, and physical damage) to be consistent with element #3 of NUREG-2191 AMP XI.S8.	Agreed and incorporated.

Comment #	ISG Section/Page	Comment	NRC Staff Response
4	Appendices C, D, and E NUREG-2192 Table 3.5-1, NUREG-2191 Chapters II & III Tables Page - various	The use of the term “enhanced as necessary” in the AMP column of NUREG-2192 Table 3.5-1 and NUREG-2191 Chapter II and Chapter III AMR Tables are not necessary and should be deleted.	<p>The staff did not agree with this comment. No changes were made to the ISG.</p> <p>The ISG incorporates changes requested by Industry to reduce Plant-Specific AMPs associated with several structural AMR items. Specifically, by email dated January 14, 2020, the Industry noted that:</p> <p style="padding-left: 40px;">No operating experience justifies a Plant Specific AMP for these aging mechanisms. NUREG-2192 Further Evaluations would review plant specific materials, environments, and operating experience to determine if an enhancement or a Plant Specific AMP is required in addition to those aging management activities identified in NUREG-2191 AMPs. If plant specific aging management activities are required, an AMP enhancement or plant specific AMP (AMR Note E) would be required.</p> <p>The staff reviewed Industry’s proposed changes and concluded that the inclusion of enhancements to AMPs XI.S2, “ASME Section XI, Subsection IWL,” and/or XI.S6, “Structures Monitoring,” would improve the efficiency of application reviews based on past reviews of LRAs and SLRAs and was therefore justified. The addition of AMP XI.S2 and/or XI.S6, along with any necessary enhancements, expands the SLR guidance to allow greater flexibility to applicants. The phrase “enhance as necessary” emphasizes to staff and applicants that the existing GALL SLR XI.S2 and XI.S6 AMPs may not be adequate to address the aging effects, depending on the results of the associated further evaluations. Therefore, it may be necessary for applicants to enhance their programs to adequately manage the aging effects.</p> <p>Deleting “enhanced as necessary” from the modifications could lead to decreased efficiency in reviews, increased number of RAIs, and potential staff and applicant confusion in future implementation of the SLR guidance.</p>