3.5.1 Aging Management of Containments, Structures, and Component Supports

Review Responsibilities

Primary— The branch(es) assigned responsibility by the Project Manager for the safety review of the subsequent license renewal application.

Secondary—None

3.5.1 Areas of Review

This section addresses the aging management review (AMR) and the associated aging management programs (AMPs) for containments, structures and components (SC) supports. For a recent vintage plant, the information related to containments, supports is contained in Chapter 3, "Design of Structures, Components, Equipment, and Systems," of the plant's final safety analysis report (FSAR), consistent with the "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants" (NUREG–0800). For older vintage plants, the location of applicable information is plant-specific because an older plant's FSAR may have predated NUREG–0800. The scope of this section is containment structures, and safety-related and other SC supports.

The pressurized water reactor (PWR) containment structures consist of concrete (reinforced or prestressed) and steel containments. The boiling water reactor (BWR) containment structures consist of Mark I, Mark II, and Mark III steel and concrete (reinforced or prestressed) containments.

The safety-related structures (other than containments) are organized into nine groups: Group 1: BWR reactor building, PWR shield building, control room/building; Group 2: BWR reactor building with steel superstructure; Group 3: auxiliary building, diesel generator building, radwaste building, turbine building, switchgear room, yard structures (auxiliary feedwater (AFW) pump house, utility/piping tunnels, security lighting poles, manholes, duct banks), station blackout (SBO) structures (transmission towers, startup transformer circuit breaker foundation, electrical enclosure); Group 4: containment internal structures, excluding refueling canal; Group 5: fuel storage facility, refueling canal; Group 6: water-control structures (e.g., intake structure, cooling tower, and spray pond); Group 7: concrete tanks and missile barriers; Group 8: steel tank foundations and missile barriers; and Group 9: BWR unit vent stack.

The component supports are organized into seven groups: Group B1.1: supports for American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) Class 1 piping and components; Group B1.2: supports for ASME Class 2 and 3 piping and components; Group B1.3: supports for ASME Class MC components; Group B2: supports for cable tray, conduit, heating, ventilation, and air conditioning (HVAC) ducts, TubeTrack®, instrument tubing, non-ASME piping and components; Group B3: anchorage of racks, panels, cabinets, and enclosures for electrical equipment and instrumentation; Group B4: supports for miscellaneous equipment (e.g., emergency diesel generator (EDG), HVAC components); and Group B5: supports for miscellaneous structures (e.g., platforms, pipe whip restraints, jet impingement shields, masonry walls).

The responsible review organization is to review the following subsequent license renewal application (SLRA) AMR and AMP items assigned to it, per SRP-SLR Section 1.2, for review:

AMRs

- AMR results consistent with the Generic Aging Lessons Learned for Subsequent License Renewal (GALL-SLR) Report
- AMR results for which further evaluation is recommended
- AMR results that are not consistent with or not addressed in the GALL-SLR Report

AMPs

- Consistent with GALL-SLR Report AMPs
- Plant-specific AMPs

FSAR Supplement

- The responsible review organization is to review the FSAR Supplement associated with each assigned AMP.

3.5.2 Acceptance Criteria

The acceptance criteria for the areas of review describe methods for determining whether the applicant has met the requirements of the U.S. Nuclear Regulatory Commission (NRC) regulations in Title 10 of the *Code of Federal Regulations* (10 CFR) 54.21.

3.5.2.1 Aging Management Review Results Consistent With the Generic Aging Lessons Learned for Subsequent License Renewal Report

The AMRs and the AMPs applicable to structures and component supports are described and evaluated in Chapters II and III of the GALL-SLR Report.

The applicant's SLRA should provide sufficient information so that the reviewer is able to confirm that the specific SLRA AMR item and the associated SLRA AMP are consistent with the cited GALL-SLR Report AMR item. The reviewer should then confirm that the SLRA AMR item is consistent with the GALL-SLR Report AMR item to which it is compared.

When the applicant is crediting a different AMP than recommended in the GALL-SLR Report, the reviewer should confirm that the alternate AMP is valid to use for aging management and will be capable of managing the effects of aging as adequately as the AMP recommended by the GALL-SLR Report.

3.5.2.2 Aging Management Review Results for Which Further Evaluation Is Recommended by the Generic Aging Lessons Learned for Subsequent License Renewal Report

The basic acceptance criteria defined in Section 3.5.2.1 need to be applied first for all of the AMRs and AMPs as part of this section. In addition, if the GALL-SLR Report AMR item to which the SLRA AMR item is compared identifies that "further evaluation is recommended," then additional criteria apply for each of the following aging effect/aging mechanism combinations. Refer to Table 3.5-1, comparing the "Further Evaluation Recommended" column and the "GALL-SLR Item" column, for the AMR items that reference the following subsections.

3.5.2.2.1 Pressurized Water Reactor and Boiling Water Reactor Containments

3.5.2.2.1.1 Cracking and Distortion Due to Increased Stress Levels from Settlement; Reduction of Foundation Strength, and Cracking Due to Differential Settlement and Erosion of Porous Concrete Subfoundations

Cracking and distortion due to increased stress levels from settlement could occur in PWR and BWR concrete and steel containments. The existing program relies on ASME Code Section XI, Subsection IWL to manage these aging effects. Also, reduction of foundation strength and cracking, due to differential settlement and erosion of porous concrete subfoundations could occur in all types of PWR and BWR containments. The existing program relies on the structures monitoring program to manage these aging effects. However, some plants may rely on a dewatering system to lower the site groundwater level. If the plant's current licensing basis (CLB) credits a dewatering system to control settlement, further evaluation is recommended to verify the continued functionality of the dewatering system during the subsequent period of extended operation.

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 if ~~of~~ a plant-specific AMP or plant-specific enhancements to ASME Code Section XI, Subsection IWL and/or Structures Monitoring AMPs, deemed essential to manage these~~is~~ aging effects ~~if~~ for ~~any~~ portions of the concrete containment components that exceed~~s~~ specified temperature limits {i.e., general area temperature greater than 66 °C (Celsius) [150 °F (Fahrenheit)] 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. Acceptance criteria are described in Branch Technical Position (BTP) RLSB-1 (Appendix A.1 of this SRP-SLR).

3.5.2.2.1.3 Loss of Material Due to General, Pitting and Crevice Corrosion

1. Loss of material due to general, pitting, and crevice corrosion could occur in steel elements of inaccessible areas for all types of PWR and BWR containments. The existing program relies on ASME Code Section XI, Subsection IWE, and 10 CFR Part 50, Appendix J AMPs, to manage this aging effect. Further evaluation is recommended of plant-specific programs to manage this aging effect if corrosion is indicated from the IWE examinations. Acceptance criteria are described in BTP RLSB-1 (Appendix A.1 of this SRP-SLR).

2. Loss of material due to general, pitting, and crevice corrosion could occur in steel torus shell of Mark I containments. The existing program relies on ASME Code Section XI, Subsection IWE, and 10 CFR Part 50, Appendix J, to manage this aging effect. If corrosion is significant, recoating of the torus is recommended. Acceptance criteria are described in BTP RLSB-1 (Appendix A.1 of this SRP-SLR).

3. Loss of material due to general, pitting, and crevice corrosion could occur in steel torus ring girders and downcomers of Mark I containments, downcomers of Mark II containments, and interior surface of suppression chamber shell of Mark III containments. The existing program relies on ASME Code Section XI, Subsection IWE to manage this aging effect. Further evaluation is recommended of plant-specific programs to manage this aging effect if corrosion is significant. Acceptance criteria are described in BTP RLSB-1 (Appendix A.1 of this SRP-SLR).

3.5.2.2.1.4 Loss of Prestress Due to Relaxation, Shrinkage, Creep, and Elevated Temperature

Loss of prestress forces due to relaxation, shrinkage, creep, and elevated temperature for PWR prestressed concrete containments and BWR Mark II prestressed concrete containments is a time-limited aging analysis (TLAA) 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 4.5, "Concrete Containment Unbonded Tendon Pre-stress Analysis," and/or Section 4.7 "Other Plant-Specific Time-Limited Aging Analyses," of this SRP-SLR.

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 TLAAs as defined in 10 CFR 54.3. TLAAs 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 TLAAs.

3.5.2.2.1.6 Cracking Due to Stress Corrosion Cracking

Stress corrosion cracking (SCC) of stainless steel (SS) penetration sleeves, penetration bellows, vent line bellows, suppression chamber shell (interior surface), and dissimilar metal welds could occur in PWR and/or BWR containments. The existing program relies on ASME Code Section XI, Subsection IWE and10 CFR Part 50, Appendix J, to manage this aging effect. Further evaluation, including consideration of SCC susceptibility and applicable operating experience (OE) related to detection, is recommended of additional appropriate examinations/evaluations implemented to detect this aging effect for these SS components and dissimilar metal welds.

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 to determine if ~~of~~ a plant specific AMP or plant-specific enhancements to ASME Code Section XI, Subsection IWL and/or Structures Monitoring AMPs, deemed essential to manage these~~is~~ 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 if a plant-specific ~~aging management program~~AMP or plant-specific enhancements to ASME Code Section XI, Subsection IWL and/or Structures Monitoring AMPs, deemed ~~is required~~essential 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 if a plant-specific AMP or plant-specific enhancements to ASME Code Section XI, Subsection IWL and/or Structures Monitoring AMPs, deemed essential to manage these~~is~~ 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 Safety-Related and Other Structures and Component Supports

3.5.2.2.2.1 Aging 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 if a plant-specific AMP or plant-specific enhancements to ~~ASME Code Section XI, Subsection IWL and/or~~ Structures Monitoring AMP~~s~~, deemed essential to manage these~~is~~ 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 if a plant-specific AMP or plant-specific enhancements to ~~ASME Code Section XI, Subsection IWL and/or~~ Structures Monitoring AMP~~s~~, deemed essential ~~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 if a plant-specific AMP or plant-specific enhancements to ~~ASME Code Section XI, Subsection IWL and/or~~ Structures Monitoring AMP~~s~~, deemed essential to manage these~~is~~ 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 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 to determine if a plant-specific AMP or plant-specific enhancements to ~~ASME Code Section XI, Subsection IWL and/or~~ Structures Monitoring AMP~~s~~, deemed essential to manage these~~is~~ aging effects ~~of a plant-specific program~~ 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 to determine if a plant-specific AMP or plant-specific enhancements to ~~ASME Code Section XI, Subsection IWL and/or~~ Structures Monitoring AMP~~s~~, deemed essential to manage these~~is~~ ~~aging effect of this~~ 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 if a plant-specific AMP or plant-specific enhancements to ~~ASME Code Section XI, Subsection IWL and/or~~ Structures Monitoring AMP~~s~~, deemed essential ~~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 if a plant-specific AMP or plant-specific enhancements to ~~ASME Code Section XI, Subsection IWL and/or~~ Structures Monitoring AMP~~s~~, deemed essential to manage these~~is~~ 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).

3.5.2.2.2.4 Cracking Due to Stress Corrosion Cracking, and Loss of Material Due to Pitting and Crevice Corrosion

Cracking due to SSC and loss of material due to pitting and crevice corrosion could occur in (a) Group 7 and 8 SS tank liners exposed to standing water; and (b) SS and aluminum alloy support members; welds; bolted connections; or support anchorage to building structure exposed to air or condensation (see SRP-SLR Sections 3.2.2.2.2, 3.2.2.2.4, 3.2.2.2.8, and 3.2.2.2.10 for background information).

For Group 7 and 8 SS tank liners exposed to standing water, further evaluation is recommended of plant-specific programs to manage these aging effects. The acceptance criteria are described in BTP RLSB-1 (Appendix A.1 of this SRP-SLR).

For SS and aluminum alloy support members; welds; bolted connections; support anchorage to building structure exposed to air or condensation, the plant-specific OE and condition of the SS and aluminum alloy components are evaluated to determine if the plant-specific air or condensation environments are aggressive enough to result in loss of material or cracking after prolonged exposure. The aging effects of loss of material and cracking in SS and aluminum alloy components is not applicable and does not require management if (a) the plant-specific OE does not reveal a history of pitting or crevice corrosion or cracking and (b) a one-time inspection demonstrates that the aging effects are not occurring or that an aging effect is occurring so slowly that it will not affect the intended function of the components during the subsequent period of extended operation. The applicant documents the results of the plant-specific OE review in the SLRA. Visual inspections conducted in accordance with GALL-SLR Report AMP XI.M32, "One-Time Inspection," are an acceptable method to demonstrate that the aging effects are not occurring at a rate that affects the intended function of the components. One-time inspections are conducted between the 50th and 60th year of operation, as recommended by the "detection of aging effects" program element in AMP XI.M32. If loss of material or cracking has occurred and is sufficient to potentially affect the intended function of SS or aluminum alloy support members; welds; bolted connections; or support anchorage to building structure, either: (a) enhancing the applicable AMP (i.e., GALL-SLR Report AMP XI.S3, "ASME Section XI, Subsection IWF," or AMP XI.S6, "Structures Monitoring"); (b) conducting a representative sample inspection consistent with GALL-SLR Report AMP XI.M36, "External Surfaces Monitoring of Mechanical Components;" or (c) developing a plant-specific AMP are acceptable programs to manage loss of material or cracking (as applicable). Tempers have been specifically developed to improve the SCC resistance for some aluminum alloys. Aluminum alloy and temper combinations which are not susceptible to SCC when used in structural support applications include 1xxx series, 3xxx series, 6061-T6x, and 5454-x. For these alloys and tempers, the susceptibility of cracking due to SCC is not applicable. If these alloys or tempers have been used, the SLRA states the specific alloy or temper used for the applicable in-scope components.

3.5.2.2.2.5 Cumulative Fatigue Damage

Evaluations involving time-dependent fatigue, cyclical loading, or cyclical displacement of component support members, anchor bolts, and welds for Groups B1.1, B1.2, and B1.3

component supports are TLAAs as defined in 10 CFR 54.3 only if a CLB fatigue analysis exists. TLAAs are required to be evaluated in accordance with 10 CFR 54.21(c). The evaluation of this TLAA is addressed in Section 4.3, "Metal Fatigue Analysis," and/or 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 TLAAs.

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 1×10^{19} neutrons/cm^2 neutron radiation and 1×10^8 Gy (1×10^{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 ~~of~~ if a plant-specific AMP or plant-specific enhancements to selected existing AMPs deemed essential ~~program~~ to manage the 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 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).

3.5.2.2.3 Quality Assurance for Aging Management of Nonsafety-Related Components

Acceptance criteria are described in BTP IQMB-1 (Appendix A.2 of this SRP-SLR).

3.5.2.2.4 Ongoing Review of Operating Experience

Acceptance criteria are described in Appendix A.4, "Operating Experience for Aging Management Programs."

3.5.2.3 Aging Management Review Results Not Consistent With or Not Addressed in the Generic Aging Lessons Learned for Subsequent License Renewal Report

Acceptance criteria are described in BTP RLSB-1 (Appendix A.1 of this SRP-SLR).

3.5.2.4 Aging Management Programs

For those AMPs that will be used for aging management and are based on the program elements of an AMP in the GALL-SLR Report, the NRC reviewer performs an audit of AMPs credited in the

SLRA to confirm consistency with the GALL-SLR Report AMPs identified in Chapter X, "Aging Management Programs That May Be Used to Demonstrate Acceptability of Time-Limited Aging Analyses in Accordance With 10 CFR 54.21(c)(1)(iii)," and Chapter XI, "Chapter XI—Aging Management Programs."

If the applicant identifies an exception to any of the program elements of the cited GALL-SLR Report AMP, the SLRA AMP should include a basis demonstrating how the criteria of 10 CFR 54.21(a)(3) would still be met. The NRC reviewer should then confirm that the SLRA AMP with all exceptions would satisfy the criteria of 10 CFR 54.21(a)(3). If, while reviewing the SLRA AMP, the reviewer identifies a difference from the GALL-SLR Report AMP that should have been identified as an exception to the GALL-SLR Report AMP, this difference should be reviewed and properly dispositioned. The reviewer should document the disposition of all SLRA-defined exceptions and NRC staff-identified differences.

The SLRA should identify any enhancements that are needed to permit an existing SLRA AMP to be declared consistent with the GALL-SLR Report AMP to which the SLRA AMP is compared. The reviewer is to confirm both that the enhancement, when implemented, would allow the existing SLRA AMP to be consistent with the GALL-SLR Report AMP and that the applicant has a commitment in the FSAR Supplement to implement the enhancement prior to the subsequent period of extended operation. The reviewer should document the disposition of all enhancements.

If the applicant chooses to use a plant-specific program that is not a GALL-SLR Report AMP, the NRC reviewer should confirm that the plant-specific program satisfies the criteria of BTP RLSB-1 (Appendix A.1.2.3 of this SRP-SLR).

3.5.2.5 Final Safety Analysis Report Supplement

The summary description of the programs and activities for managing the effects of aging for the subsequent period of extended operation in the FSAR Supplement should be sufficiently comprehensive, such that later changes can be controlled by 10 CFR 50.59. The description should contain information associated with the bases for determining that aging effects are managed during the subsequent period of extended operation. The description should also contain any future aging management activities, including enhancements and commitments, to be completed before the subsequent period of extended operation. Table X-01 and Table XI-01 of the GALL-SLR Report provide examples of the type of information to be included in the FSAR Supplement. Table 3.5-2 lists the programs that are applicable for this SRP-SLR subsection.

3.5.3 Review Procedures

For each area of review, the review procedures below are to be followed.

3.5.3.1 Aging Management Review Results Consistent With the Generic Aging Lessons Learned for Subsequent License Renewal Report

The applicant may reference the GALL-SLR Report in its SLRA, as appropriate, and demonstrate that the AMRs and AMPs at its facility are consistent with those reviewed and approved in the GALL-SLR Report. The reviewer should not conduct a review of the substance of the matters described in the GALL-SLR Report. If the applicant has provided the information necessary to adopt the finding of program acceptability as described and evaluated in the GALL-SLR Report, the reviewer should find acceptable the applicant's reference to GALL-SLR in its SLRA. In making this determination, the reviewer confirms that the applicant has provided a brief

description of the system, components, materials, and environment. The reviewer also confirms that the applicable aging effects have been addressed based on the staff's review of industry and plant-specific OE.

Furthermore, the reviewer should confirm that the applicant has addressed OE identified after the issuance of the GALL-SLR Report. Performance of this review requires the reviewer to confirm that the applicant has identified those aging effects for the SC supports that are contained in the GALL-SLR Report as applicable to its plant.

3.5.3.2 Aging Management Review Results for Which Further Evaluation Is Recommended by the Generic Aging Lessons Learned for Subsequent License Renewal Report

The basic review procedures defined in Section 3.5.3.1 need to be applied first for all of the AMRs and AMPs provided in this section. In addition, if the GALL-SLR AMR item to which the SLRA AMR item is compared identifies that further evaluation is recommended, then additional criteria apply for each of the following aging effect/aging mechanism combinations.

3.5.3.2.1 Pressurized Water Reactor and Boiling Water Reactor Containments

3.5.3.2.1.1 Cracking and Distortion Due to Increased Stress Levels From Settlement; Reduction of Foundation Strength and Cracking Due to Differential Settlement and Erosion of Porous Concrete Subfoundations

Further evaluation is recommended of aging management of (1) cracking and distortion due to increases in component stress level from settlement for PWR and BWR concrete and steel containments and (2) reduction of foundation strength and cracking due to differential settlement and erosion of porous concrete subfoundations for all types of PWR and BWR containments if a dewatering system is relied upon to control settlement. The reviewer reviews and confirms that, if the applicant credits a dewatering system in its CLB, the applicant has committed to monitor the functionality of the dewatering system under the applicant's ASME Code Section XI, Subsection IWL or the structures monitoring program. If not, the reviewer evaluates the plant-specific program for monitoring the dewatering system during the subsequent period of extended operation.

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 ~~-plant--specific~~ AMP~~programs~~ or plant-specific enhancements to ASME Code Section XI, Subsection IWL and/or Structures Monitoring AMPs, essential to manage these aging effects. Performed plant-specific evaluations verify that, where appropriate, an effective enhanced inspection program has been developed and implemented, to ensure that ~~to ensure that the effects~~ reduction of strength and modulus of elasticity due to ~~of~~ elevated temperature~~s will be~~s are adequately managed during the subsequent period of extended operation.

3.5.3.2.1.3 Loss of Material Due to General, Pitting, and Crevice Corrosion

1. The GALL-SLR Report identifies programs to manage loss of material due to general, pitting, and crevice corrosion in accessible and inaccessible areas of the steel elements in drywell and torus or the steel liner and integral attachments for all types of PWR and BWR containments. The AMP consists of ASME Code Section XI, Subsection IWE, and 10 CFR Part 50, Appendix J, leak tests. Subsection IWE exempts from examination portions of the containments that are inaccessible, such as embedded or inaccessible portions of steel liners and steel elements in drywell and torus, and integral attachments.

   To cover the inaccessible areas, 10 CFR 50.55a(b)(2)(ix) requires that the applicant evaluate the acceptability of inaccessible areas when conditions exist in accessible areas that could indicate the presence of, or result in, degradation to such inaccessible areas. In addition, further evaluation of plant-specific programs to manage the aging effects for inaccessible areas is recommended if the following cannot be satisfied: (1) concrete meeting the requirements of ACI 318 or ACI 349 (low water-to-cement ratio, low permeability, and adequate air entrainment) as cited in NUREG–1557 and the guidance of ACI 201.2R, as applicable, was used for the containment concrete in contact with the embedded containment shell or liner; (2) the moisture barrier, at the junction where the shell or liner becomes embedded, is subject to aging management activities in accordance with ASME Code Section XI, Subsection IWE requirements; (3) the concrete is monitored to ensure that it is free of penetrating cracks that provide a path for water seepage to the surface of the containment shell or liner; and (4) borated water spills and water ponding on the concrete floor are common and when detected are cleaned up or diverted to a sump in a timely manner. OE has identified significant corrosion in some plants. If any of the above conditions cannot be satisfied, then a plant-specific AMP for corrosion is necessary. The reviewer reviews the applicant's proposed AMP to confirm that, where appropriate, an effective inspection program has been developed and implemented to ensure that the aging effects in inaccessible areas are adequately managed.

2. The GALL-SLR Report identifies programs to manage loss of material due to general, pitting, and crevice corrosion in steel torus shell of Mark I containments. The AMP consists of ASME Code Section XI, Subsection IWE, and 10 CFR Part 50, Appendix J, leak tests. In addition, further evaluation is recommended of plant-specific programs to manage the aging effects if corrosion is significant. Further evaluation of torus shell corrosion is warranted as a result of industry-wide OE that identified a number of incidences of torus corrosion. The reviewer reviews the applicant's proposed AMP to confirm that, where appropriate, an effective inspection program has been developed and implemented to ensure that the aging effects are adequately managed. A plant-specific program may include the recoating of the torus, if necessary.

3. The GALL-SLR Report identifies programs to manage loss of material due to general, pitting, and crevice corrosion in steel torus ring girders and downcomers of Mark I containments, suppression chambers and downcomers of Mark II containments, and interior surface of suppression chamber shell of Mark III containments. GALL-SLR Report AMP XI.S1, "ASME Section XI, Subsection IWE," is recommended for aging management. In addition, further evaluation of plant-specific programs is recommended to manage the aging effects if plant OE identified significant corrosion of the torus ring girders, downcomers and suppression chambers.

3.5.3.2.1.4 Loss of Prestress Due to Relaxation, Shrinkage, Creep, and Elevated Temperature

Loss of prestress is a TLAA 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 4.5, "Concrete Containment Unbonded Tendon Prestress Analysis," or 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 4.5 and/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).

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.

3.5.3.2.1.6 Cracking Due to Stress Corrosion Cracking

Further evaluation is recommended of programs to manage cracking due to SCC in SS penetration sleeves, penetration bellows, vent line bellows, suppression chamber shell (interior surface), and dissimilar metal welds in PWR and/or BWR containments. Transgranular stress corrosion cracking (TGSCC) is a concern for dissimilar metal welds. In the case of bellows assemblies, SCC may cause aging effects particularly if the material is not shielded from a corrosive environment. Containment inservice inspection (ISI) IWE and leak rate testing may not be sufficient to detect cracks, especially for dissimilar metal welds. Additional appropriate examinations to detect SCC in the listed SS components and dissimilar metal welds, considering SCC susceptibility and applicable OE (e.g., cracking of two-ply bellows) related to detection, are recommended to address this issue. The reviewer reviews and evaluates the applicant's

proposed programs to confirm that adequate inspection methods will be implemented to ensure that cracks are detected.

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 American Society for Testing and Materials (ASTM) C33-90, Figure 1. A plant-specific AMP~~program~~ or plant-specific enhancements to ASME Code Section XI, Subsection IWL and/or Structures Monitoring AMPs, essential 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 plant-specific AMP, or plant-specific enhancement(s) to ASME Code Section XI, Subsection IWL and/or Structures Monitoring AMPs, essential to manage theseis aging effects. Performed ~~Where appropriate, a~~ plant-specific evaluations ~~is performed existing AMP(s), to~~ verify that, where appropriate, an effective enhanced inspection program has been developed and implemented to ensure that ~~these aging effects~~ 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 plant-specific AMP, or plant-specific enhancement(s) to ASME Code Section XI, Subsection IWL and/or Structures Monitoring AMPs, essential to manage this aging effect, is necessary 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 enhancement(s) to ASME Code Section XI, Subsection IWL and/or Structures Monitoring AMPs, essential to manage this aging effect. ~~Where appropriate, a or p~~Performed plant-specific evaluations ~~is performed to~~ verify that, where appropriate, an effective enhanced ~~evaluation or~~ inspection program has been developed and implemented to ensure that ~~this aging effect~~ cracking due to expansion from reaction with aggregates in inaccessible areas is adequately managed during the subsequent period of extended operation.~~.~~

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 AMPs, essential to manage theseis aging effects. P~~Where appropriate, a~~ plant-specific evaluation ~~is performed~~existing AMP(s) ~~,~~ ~~to~~ verify that, ~~where appropriate,~~ where appropriate, an effective enhanced inspection program has been developed and implemented to ensure that ~~this aging effect~~ increase in porosity and permeability due to leaching in inaccessible areas ~~is~~ are adequately managed during the subsequent period of extended operation.~~.~~

3.5.3.2.2 Safety-Related and Other Structures, and Component Supports

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 enhancement(s) to ~~ASME Code Section XI, Subsection IWL and/or~~ Structures Monitoring AMP~~s~~, essential to manage theseis aging effects. ~~Where appropriate, a~~ Performed plant-specific evaluations ~~is performed~~existing AMP(s), ~~to~~ verify that, where appropriate, ~~where appropriate,~~ an effective enhanced inspection program has been developed and implemented to ensure that ~~this aging effect~~ loss of material (spalling, scaling) and cracking due to freeze-thaw in inaccessible areas for plants located in moderate to severe weathering conditions ~~is~~ are adequately managed during the subsequent period of extended operation. ~~.~~

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 enhancement(s) to ~~ASME Code Section XI, Subsection IWL and/or~~ Structures Monitoring AMPs, essential to manage this aging effect. ~~Where appropriate,~~ ~~a~~Performed plant-specific evaluations ~~is performed to~~ verify that, where appropriate, ~~or plant-specific evaluation to verify that,~~ an effective enhanced ~~evaluation or~~ inspection

program has been developed and implemented to ensure that ~~the~~ cracking due to expansion from reaction with aggregates in inaccessible concrete areas ~~aging effect~~is ~~is~~ adequately managed during the subsequent period of extended operation.~~.~~

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 enhancement(s) to ~~ASME Code Section XI, Subsection IWL and/or~~ Structures Monitoring AMPs, essential to manage these~~is~~ aging effects~~existing AMP(s)~~. Performed plant-specific evaluations ~~Where appropriate, , a plant-specific evaluation is performed to~~ verify that, where appropriate, an effective enhanced inspection program has been developed and implemented to ensure that ~~this aging effect i~~increase in porosity and permeability due to leaching of calcium hydroxide and carbonation in inaccessible areas ~~is~~ are adequately managed during the subsequent period of extended operation.

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 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 AMPor plant-specific enhancement(s) to ~~ASME Code Section XI, Subsection IWL and/or~~ Structures Monitoring AMP~~s~~, essential to manage these aging effects. Performed plant-specific evaluations verify that, where appropriate, an effective enhanced inspection program has been developed and implemented, to ensure that ~~programs on a case-by-case basis to ensure that the effects of~~ reduction of strength and modulus of concrete structures due to elevated temperatures ~~will be~~are 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 enhancement(s) to ~~ASME Code Section XI, Subsection IWL and/or~~ Structures Monitoring AMP~~s~~, essential to manage these~~is~~ aging effects. Performed plant-specific evaluations verify ~~Where appropriate, a plant-specific evaluation is performed existing AMP(s), to determine~~ that, where appropriate, an effective enhanced inspection program has been developed and implemented, to ensure that ~~this aging effect~~ loss of material (spalling, scaling) and cracking due to freeze-thaw in inaccessible areas for plants located in moderate to severe weathering conditions ~~will be~~are adequately ~~managed.~~during the subsequent period of extended operation.

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 enhancement(s) to ~~ASME Code Section XI, Subsection IWL and/or~~ Structures Monitoring AMP~~s~~, essential to manage this aging effect. . Performed plant-specific evaluations ~~Where appropriate, a or plant-specific evaluation is performed to~~ verify that, where appropriate, an effective enhanced ~~evaluation or~~ inspection program has been developed and implemented to ensure ~~that the aging effect~~ cracking due to expansion from reaction with aggregates ~~will be~~are adequately managed during the subsequent period of extended operation.

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 enhancement(s) to ~~ASME Code Section XI, Subsection IWL and/or~~ Structures Monitoring AMP~~s~~, essential to manage this aging effect. ~~Where appropriate, a~~Performed plant-specific evaluations ~~is performed~~existing AMP(s), ~~to~~ verify that, where appropriate, an effective enhanced inspection program has been developed and implemented to ensure that ~~this aging effect~~ porosity and permeability due to leaching of calcium hydroxide and carbonation in inaccessible areas ~~will be~~are adequately managed during the subsequent period of extended operation.

3.5.3.2.2.4 Cracking Due to Stress Corrosion Cracking and Loss of Material Due to Pitting and Crevice Corrosion

Further evaluation is recommended of plant-specific programs to manage cracking due to SCC and loss of material due to pitting and crevice corrosion for SS tank liners exposed to standing water. The reviewer reviews the applicant's proposed AMP on a case-by-case basis to ensure that the intended functions will be maintained during the subsequent period of extended operation.

The GALL-SLR Report recommends further evaluation to manage loss of material due to pitting and crevice corrosion and cracking due to SCC in SS and aluminum alloy support members; welds; bolted connections; or support anchorage to building structure exposed to any air, condensation, or underground environment where the presence of sufficient halides (e.g., chlorides) and moisture is possible; or in the vicinity of potentially transportable halogens. The possibility of these aging effects also extends to indoor components located in close proximity to sources of outdoor air (e.g., components near intake vents).

The reviewer independently verifies the sufficiency of the applicant's evaluation of plant-specific OE. If the review of plant-specific OE reveals loss of material due to pitting or crevice corrosion or cracking due to SCC in SS or aluminum alloys, the reviewer determines whether an adequate program is credited to manage the aging effect. If the review of plant-specific OE reveals that loss of material due to pitting and crevice corrosion and cracking due to SCC is not applicable, the reviewer verifies that AMP XI.M32, "One-Time Inspection," is cited for all applicable AMR line items.

An applicant may refine its OE search, and subsequent one-time inspections, by binning plant-specific environments into subcategories. For example, the OE search could be based on two environments including outdoor air and indoor air. The results could be that loss of material or cracking has occurred in the outdoor air environment but not the indoor air environment. The applicant could further categorize the indoor air locations as those where leakage could impinge on a component's surface (e.g., leakage from mechanical connections) and those where there is not a potential for leakage. When the applicant chooses to conduct its OE search in this manner, the reviewer is to also confirm that the applicant has adequately addressed the potential for the

periodic introduction of either moisture or halides from secondary sources. Secondary sources of moisture or halides should be considered for all environments including indoor conditioned air. Typical secondary sources of moisture or halides include: leakage from mechanical connections; leakage into vaults; insulation containing halides; and outdoor air intrusion. Grouping of environments consistent with that described in the detection of aging effects program element of GALL-SLR Report AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components," is appropriate.

3.5.3.2.2.5 Cumulative Fatigue Damage

Evaluations involving time-dependent fatigue, cyclical loading, or cyclical displacement of support members, anchor bolts, and welds for Groups B1.1, B1.2, and B1.3 component supports are TLAAs as defined in 10 CFR 54.3 only if a CLB fatigue analysis exists. TLAAs are required to be evaluated in accordance with 10 CFR 54.21(c). The evaluation of this TLAA is addressed in Section 4.3, "Metal Fatigue Analysis," and/or 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 4.3 and/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.

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~~program~~ or plant-specific enhancements to selected AMPs 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 1×10^{19} neutrons/cm^2 neutron radiation and 1×10^8 Gy (1×10^{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~~program~~ or plant-specific enhancements to selected AMPs 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.

3.5.3.2.3 Quality Assurance for Aging Management of Nonsafety-Related Components

The applicant's AMP for subsequent license renewal (SLR) should contain the elements of corrective actions, the confirmation process, and administrative controls. Safety-related components are covered by 10 CFR Part 50 Appendix B, which is adequate to address these program elements. However, Appendix B does not apply to nonsafety-related components that are subject to an AMR for SLR. Nevertheless, an applicant has the option to expand the scope of its 10 CFR Part 50 Appendix B program to include these components and address these program elements. If the applicant chooses this option, the reviewer verifies that the applicant has documented such a commitment in the FSAR Supplement. If the applicant chooses alternative means, the branch responsible for quality assurance should be requested to review the applicant's proposal on a case-by-case basis.

3.5.3.2.4 Ongoing Review of Operating Experience

The applicant's AMPs should contain the element of OE. The reviewer verifies that the applicant has appropriate programs or processes for the ongoing review of both plant-specific and industry OE concerning age-related degradation and aging management. Such reviews are used to ensure that the AMPs are effective to manage the aging effects for which they are created. The AMPs are either enhanced or new AMPs are developed, as appropriate, when it is determined through the evaluation of OE that the effects of aging may not be adequately managed. Additional information is in Appendix A.4, "Operating Experience for Aging Management Programs" of this SRP-SLR. In addition, the reviewer confirms that the applicant has provided an appropriate summary description of these activities in the FSAR Supplement.

3.5.3.3 Aging Management Review Results Not Consistent With or Not Addressed in the Generic Aging Lessons Learned for Subsequent License Renewal Report

The reviewer should confirm that the applicant, in their SLRA, has identified applicable aging effects, listed the appropriate combination of materials and environments, and credited AMPs that will adequately manage the aging effects. The AMP credited by the applicant could be an AMP that is described and evaluated in the GALL-SLR Report or a plant-specific program. Review procedures are described in BTP RLSB-1 (Appendix A.1 of this SRP-SLR).

3.5.3.4 Aging Management Programs

The reviewer confirms that the applicant has identified the appropriate AMPs as described and evaluated in the GALL-SLR Report. If the applicant commits to an enhancement to make its

SLRA AMP consistent with a GALL-SLR Report AMP, then the reviewer is to confirm that this enhancement, when implemented, will make the SLRA AMP consistent with the GALL-SLR Report AMP. If the applicant identifies, in the SLRA AMP, an exception to any of the program elements of the GALL-SLR Report AMP, the reviewer is to confirm that the SLRA AMP with the exception will satisfy the criteria of 10 CFR 54.21(a)(3). If the reviewer identifies a difference, not identified by the SLRA, between the SLRA AMP and the GALL-SLR Report AMP, with which the SLRA claims to be consistent, the reviewer should confirm that the SLRA AMP with this difference satisfies 10 CFR 54.21(a)(3). The reviewer should document the basis for accepting enhancements, exceptions, or differences. The AMPs evaluated in the GALL-SLR Report pertinent to the containments, structures, and component supports are summarized in Table 3.5-1 of this SRP-SLR. The "GALL-SLR Item" column identifies the AMR item numbers in the GALL-SLR Report, Chapters II and III, presenting detailed information summarized by this row.

If the applicant chooses to use a plant-specific program that is not a GALL-SLR Report AMP, the NRC reviewer should confirm that the plant-specific program satisfies the criteria of BTP RLSB-1 (Appendix A.1.2.3 of this SRP-SLR).

3.5.3.5 Final Safety Analysis Report Supplement

The reviewer confirms that the applicant has provided in its FSAR Supplement information for aging management of the containments, structures, and component supports. Table 3.5-2 lists the AMPs that are applicable for this SRP-SLR subsection. The reviewer also confirms that the applicant has provided information for Subsection 3.5.3.3, "Aging Management Review Results Not Consistent With or Not Addressed in the Generic Aging Lessons Learned for Subsequent License Renewal Report."

The NRC staff expects to impose a license condition on any renewed license to require the applicant to update its FSAR to include this FSAR Supplement at the next update required pursuant to 10 CFR 50.71(e)(4). As part of the license condition, until the FSAR update is complete, the applicant may make changes to the programs described in its FSAR Supplement without prior NRC approval, provided that the applicant evaluates each such change pursuant to the criteria set forth in 10 CFR 50.59. If the applicant updates the FSAR to include the final FSAR Supplement before the license is renewed, no condition will be necessary.

An applicant should incorporate the implementation schedule into its FSAR. The reviewer should verify that the applicant has identified and committed in the SLRA to any future aging management activities, including enhancements and commitments, to be completed before entering the subsequent period of extended operation. The NRC staff expects to impose a license condition on any renewed license to ensure that the applicant will complete these activities no later than the committed date.

3.5.4 Evaluation Findings

If the reviewer determines that the applicant has provided information sufficient to satisfy the provisions of this section, then an evaluation finding similar to the following text should be included in the NRC staff's safety evaluation report:

> On the basis of its review, as discussed above, the NRC staff concludes that the applicant has demonstrated that the aging effects associated with the containments, structures, and component supports components will be adequately managed so that the intended functions will be maintained consistent

with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3).

The NRC staff also reviewed the applicable FSAR Supplement program summaries and concludes that they adequately describe the AMPs credited for managing aging of the containments, structures, and component supports, as required by 10 CFR 54.21(d).

3.5.5 Implementation

Except for cases in which the applicant proposes an alternative method for complying with specified portions of NRC regulations, NRC staff members follow the methods described herein in their evaluation of conformance with NRC regulations. The staff evaluates these alternatives and finds them acceptable if the staff determines that the alternatives provide reasonable assurance that the component's intended functions will be maintained.

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.

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Table 3.5.1-1 Summary of Aging Management Programs for Containments, Structures and Component Supports Evaluated in Chapters II and III of the GALL-SLR Report

New, Modified, Deleted, Edited Item	ID	Type	Component	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation Recommended	GALL-SLR Item
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, or XI.S2, "ASME Section XI, Subsection IWL," and/or AMP XI.S6, "Structures Monitoring," enhanced as necessary	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

Table 3.5.1-1 Summary of Aging Management Programs for Containments, Structures and Component Supports Evaluated in Chapters II and III of the GALL-SLR Report							
New, Modified, Deleted, Edited Item	**ID**	**Type**	**Component**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation Recommended**	**GALL-SLR Item**
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

Table 3.5.1-1 Summary of Aging Management Programs for Containments, Structures and Component Supports Evaluated in Chapters II and III of the GALL-SLR Report							
New, Modified, Deleted, Edited Item	**ID**	**Type**	**Component**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation Recommended**	**GALL-SLR Item**
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
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

Table 3.5.1-1 Summary of Aging Management Programs for Containments, Structures and Component Supports Evaluated in Chapters II and III of the GALL-SLR Report							
New, Modified, Deleted, Edited Item	**ID**	**Type**	**Component**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation Recommended**	**GALL-SLR Item**
E	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, or XI.S2, "-ASME Section XI, Subsection IWL, "- and/or AMP XI.S6, "-Structures Monitoring,"- enhanced as necessary	Yes (SRP-SLR Section 3.5.2.2.1.7)	II.A1.CP-147 II.A2.CP-70 II.B3.2.CP-135
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, or XI.S2, "-ASME Section XI, Subsection IWL,"- and/or AMP XI.S6, "-Structures Monitoring,"- enhanced as necessary	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						

Table 3.5.1-1 Summary of Aging Management Programs for Containments, Structures and Component Supports Evaluated in Chapters II and III of the GALL-SLR Report							
New, Modified, Deleted, Edited Item	**ID**	**Type**	**Component**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation Recommended**	**GALL-SLR Item**
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, or XI.S2, ""ASME Section XI, Subsection IWL, "" and/or AMP XI.S6, ""Structures Monitoring,"" enhanced as necessary	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						
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

Table 3.5.1-1 Summary of Aging Management Programs for Containments, Structures and Component Supports Evaluated in Chapters II and III of the GALL-SLR Report							
New, Modified, Deleted, Edited Item	**ID**	**Type**	**Component**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation Recommended**	**GALL-SLR Item**
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

Table 3.5.1-1 Summary of Aging Management Programs for Containments, Structures and Component Supports Evaluated in Chapters II and III of the GALL-SLR Report							
New, Modified, Deleted, Edited Item	**ID**	**Type**	**Component**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation Recommended**	**GALL-SLR Item**
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						
	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"	No	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

Table 3.5.1-1 Summary of Aging Management Programs for Containments, Structures and Component Supports Evaluated in Chapters II and III of the GALL-SLR Report							
New, Modified, Deleted, Edited Item	**ID**	**Type**	**Component**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation Recommended**	**GALL-SLR Item**
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
	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

Table 3.5.1-1 Summary of Aging Management Programs for Containments, Structures and Component Supports Evaluated in Chapters II and III of the GALL-SLR Report							
New, Modified, Deleted, Edited Item	**ID**	**Type**	**Component**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation Recommended**	**GALL-SLR Item**
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
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

Table 3.5.1-1 Summary of Aging Management Programs for Containments, Structures and Component Supports Evaluated in Chapters II and III of the GALL-SLR Report							
New, Modified, Deleted, Edited Item	**ID**	**Type**	**Component**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation Recommended**	**GALL-SLR Item**
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
	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"	No	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, or ~~XI.S2, "ASME Section XI, Subsection IWL," and/or~~ AMP XI.S6, ""Structures Monitoring," enhanced as necessary "	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

Table 3.5.1-1 Summary of Aging Management Programs for Containments, Structures and Component Supports Evaluated in Chapters II and III of the GALL-SLR Report

New, Modified, Deleted, Edited Item	ID	Type	Component	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation Recommended	GALL-SLR Item
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, or ~~XI.S2, "ASME Section XI, Subsection IWL," and/or~~ AMP XI.S6, ""~~"~~Structures Monitoring," enhanced as necessary "	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
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

Table 3.5.1-1 Summary of Aging Management Programs for Containments, Structures and Component Supports Evaluated in Chapters II and III of the GALL-SLR Report

New, Modified, Deleted, Edited Item	ID	Type	Component	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation Recommended	GALL-SLR Item
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, or ~~XI.S2, "ASME Section XI, Subsection IWL," and/or~~ AMP XI.S6, ""Structures Monitoring," enhanced as necessary "	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, or ~~XI.S2, "ASME Section XI, Subsection IWL," and/or~~ AMP XI.S6, ""Structures Monitoring," enhanced as necessary "	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

Table 3.5.1-1 Summary of Aging Management Programs for Containments, Structures and Component Supports Evaluated in Chapters II and III of the GALL-SLR Report							
New, Modified, Deleted, Edited Item	**ID**	**Type**	**Component**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation Recommended**	**GALL-SLR Item**
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, or ~~XI.S2, "ASME Section XI, Subsection IWL," and/or~~ AMP XI.S6, ""~~"~~Structures Monitoring," enhanced as necessary "	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, or ~~XI.S2, "ASME Section XI, Subsection IWL," and/or~~ AMP XI.S6, ""~~"~~Structures Monitoring," enhanced as necessary "	Yes (SRP-SLR Section 3.5.2.2.2.3.2)	III.A6.TP-220

Table 3.5.1-1 Summary of Aging Management Programs for Containments, Structures and Component Supports Evaluated in Chapters II and III of the GALL-SLR Report

New, Modified, Deleted, Edited Item	ID	Type	Component	Aging Effect/Mechanism	Aging Management Program (AMP)/TLAA	Further Evaluation Recommended	GALL-SLR Item
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, or ~~XI.S2, "ASME Section XI, Subsection IWL," and/or~~ AMP XI.S6, ""~~"~~Structures Monitoring," enhanced as necessary "	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

Table 3.5.1-1 Summary of Aging Management Programs for Containments, Structures and Component Supports Evaluated in Chapters II and III of the GALL-SLR Report							
New, Modified, Deleted, Edited Item	**ID**	**Type**	**Component**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation Recommended**	**GALL-SLR Item**
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

Table 3.5.1-1 Summary of Aging Management Programs for Containments, Structures and Component Supports Evaluated in Chapters II and III of the GALL-SLR Report							
New, Modified, Deleted, Edited Item	**ID**	**Type**	**Component**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation Recommended**	**GALL-SLR Item**
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
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

Table 3.5.1-1 Summary of Aging Management Programs for Containments, Structures and Component Supports Evaluated in Chapters II and III of the GALL-SLR Report							
New, Modified, Deleted, Edited Item	**ID**	**Type**	**Component**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation Recommended**	**GALL-SLR Item**
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
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

Table 3.5.1-1 Summary of Aging Management Programs for Containments, Structures and Component Supports Evaluated in Chapters II and III of the GALL-SLR Report							
New, Modified, Deleted, Edited Item	**ID**	**Type**	**Component**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation Recommended**	**GALL-SLR Item**
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

Table 3.5.1-1 Summary of Aging Management Programs for Containments, Structures and Component Supports Evaluated in Chapters II and III of the GALL-SLR Report							
New, Modified, Deleted, Edited Item	**ID**	**Type**	**Component**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation Recommended**	**GALL-SLR Item**
	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

Table 3.5.1-1 Summary of Aging Management Programs for Containments, Structures and Component Supports Evaluated in Chapters II and III of the GALL-SLR Report							
New, Modified, Deleted, Edited Item	**ID**	**Type**	**Component**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation Recommended**	**GALL-SLR Item**
	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
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

Table 3.5.1-1 Summary of Aging Management Programs for Containments, Structures and Component Supports Evaluated in Chapters II and III of the GALL-SLR Report							
New, Modified, Deleted, Edited Item	**ID**	**Type**	**Component**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation Recommended**	**GALL-SLR Item**
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

Table 3.5.1-1 Summary of Aging Management Programs for Containments, Structures and Component Supports Evaluated in Chapters II and III of the GALL-SLR Report							
New, Modified, Deleted, Edited Item	**ID**	**Type**	**Component**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation Recommended**	**GALL-SLR Item**
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

Table 3.5.1-1 Summary of Aging Management Programs for Containments, Structures and Component Supports Evaluated in Chapters II and III of the GALL-SLR Report							
New, Modified, Deleted, Edited Item	**ID**	**Type**	**Component**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation Recommended**	**GALL-SLR Item**
	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
	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						

Table 3.5.1-1 Summary of Aging Management Programs for Containments, Structures and Component Supports Evaluated in Chapters II and III of the GALL-SLR Report							
New, Modified, Deleted, Edited Item	**ID**	**Type**	**Component**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation Recommended**	**GALL-SLR Item**
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
	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

Table 3.5.1-1 Summary of Aging Management Programs for Containments, Structures and Component Supports Evaluated in Chapters II and III of the GALL-SLR Report							
New, Modified, Deleted, Edited Item	**ID**	**Type**	**Component**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation Recommended**	**GALL-SLR Item**
	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
	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

Table 3.5.1-1 Summary of Aging Management Programs for Containments, Structures and Component Supports Evaluated in Chapters II and III of the GALL-SLR Report							
New, Modified, Deleted, Edited Item	**ID**	**Type**	**Component**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation Recommended**	**GALL-SLR Item**
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
N	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 or plant-specific enhancements to selected AMPs	Yes (SRP-SLR Section 3.5.2.2.2.6)	III.A4.T-35

Table 3.5.1-1 Summary of Aging Management Programs for Containments, Structures and Component Supports Evaluated in Chapters II and III of the GALL-SLR Report							
New, Modified, Deleted, Edited Item	**ID**	**Type**	**Component**	**Aging Effect/Mechanism**	**Aging Management Program (AMP)/TLAA**	**Further Evaluation Recommended**	**GALL-SLR Item**
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

Table 3.5.1-2 AMPs and Additional Guidance Appendices Recommended for Containments, Structures, and Component Supports	
GALL-SLR Report Chapter/AMP	**Program Name**
AMP XI.M2	Water Chemistry
AMP XI.M10	Boric Acid Corrosion
AMP XI.M32	One-Time Inspection
AMP XI.M36	External Surfaces Monitoring of Mechanical Components
AMP XI.S1	ASME Section XI, Subsection IWE
AMP XI.S2	ASME Section XI, Subsection IWL
AMP XI.S3	ASME Section XI, Subsection IWF
AMP XI.S4	10 CFR Part 50, Appendix J
AMP XI.S5	Masonry Walls
AMP XI.S6	Structures Monitoring
AMP XI.S7	Inspection of Water-Control Structures Associated with Nuclear Power Plants
AMP XI.S8	Protective Coating Monitoring and Maintenance
GALL-SLR Report Appendix A	Quality Assurance for Aging Management Programs
GALL-SLR Report Appendix B	Operating Experience for Aging Management Programs
SRP-SLR Appendix A.1	Aging Management Review—Generic (Branch Technical Position RLSB-1)