NUCLEAR ENERGY INSTITUTE

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May 25, 2000

Mr. Christopher I. Grimes
Chief, License Renewal and Standardization Branch
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

SUBJECT: Generic Aging Lessons Learned Report Comments

PROJECT NUMBER: 690

Dear Mr. Grimes:

Enclosed are comments on Generic Aging Lessons Learned (GALL) Report Chapter II, Section B. The enclosure includes three documents. One document is a mark-up of the existing GALL pages to reflect our comments. Each comment is identified by number. The second document is a table containing our comments, numbered consistent with the marked-up pages. The third document is a clean copy of the GALL pages to reflect how GALL reads with our comments incorporated.

Please note that in previous comments we suggested creating a new Chapter XI in GALL as a repository for the program evaluations. Having such a chapter allows the various GALL sections to merely reference the new chapter when a program is credited. In the enclosed comments we have followed this recommendation. Also in our previous comments we recommended removing Time Limited Aging Analyses (TLAA) from GALL and moving them to the License Renewal Standard Review Plan. As a minimum, we recommend the creation of a new chapter in GALL as a repository for TLAAs. The TLAAs in section IIB are identified but have not moved to a new chapter pending a decision by the NRC staff relative to our recommendation.

We look forward to discussing the enclosed comments with the NRC staff. Please contact me to establish a meeting date.

Sincerely,

Douglas J. Walters

Douglas J. Walters

Enclosures

c: Mr. Sam Lee
Mr. P.T. Kuo

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CHAPTER II B

BOILING WATER REACTOR (BWR) CONTAINMENTS

Draft December 6, 1999

Major BWR Containments

B1. Mark I Containments

B2. Mark II Containments

B3. Mark III Containments

B4. Common Components

B1. Mark I Containments

B1.1 Steel Containments

B1.1.1 Steel Elements

B1.2 Concrete Containments

B1.2.1 Concrete Elements

B1.2.2 Steel Elements

B1. Mark I Containments

Systems, Structures, and Components

Review Table II B addresses the elements of BWR containment structures. Mark I containments, Mark II containments, Mark III containments, and common components are discussed separately under subheadings B1, B2, B3, and B4, respectively. This format follows the presentation format in Section 3.4 of the draft Standard Review Plan for License Renewal (SRP-LR). Mark I Concrete containments in Review Table II B1 are divided into three elements: concrete, steel, and prestressing system.

System Interfaces

Functional interfaces include the primary containment HVAC system(VII.A), containment isolation system(V.A), containment spray system(V.B), and containment heat removal system(V.C). Physical interfaces exist with any structure, system, or component which either penetrates the containment wall, such as the main steam system(VIII.A) and feedwater systems(VIII.~~B, VIII-C~~), or is supported by the containment structure. The containment structure basemat may provide support to the NSSS components and containment internal structures.

II CONTAINMENT STRUCTURES
B BWR Containments
B1 Mark I Containments
B1.1 Steel Containments

Item	Structure/ Component	Region of Interest	Material	Environment	Aging Effect	Aging Mechanism	References
B1.1.1	Steel Elements	Drywell; Torus; Drywell Head; Embedded Shell and Sand Pocket Regions; Drywell Support Skirt; Torus Ring Girder, Seismic Restraints, and Support Saddles/ Columns; Vent Lines, Header, and System Supports; Down-comers and Bracing; ECCS Suction Header.	Carbon Steel	Inside and/or Outside Containment	Loss of Material	Corrosion	10CFR50.55a ASME Section XI, Subsection IWE 10CFR50, Appendix J NUREG-1611 Draft Regulatory Guide DG-1076

The scope of components identified in this column should be consistent with ASME Section XI, Subsection IWE..

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See Chapter XI for an evaluation of ASME Section XI, Subsection IWE / 10CFR50.55a

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B1 Mark I Containments
B1.1 Steel Containments

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
~~10CFR50.55a imposes the examination~~ requirements of ASME B&PV Code Section XI on reinforced and prestressed concrete containments. Examination requirements of ASME Class MC pressure retaining components, metallic shell/liners of Class CC containments, integral attachments, seals and gaskets, pressure retaining bolting, and surface areas including welds are covered in Subsection IWE. Therefore, ASME Code Section XI, Subsection IWE (1992 Edition with 1992 Addenda), along with additional requirements specified in 10CFR50.55a(b)(2), constitute an existing mandated program which should be referenced by the applicant's containment inservice inspection program for managing aging of steel containments and liners of concrete containments for license renewal. NUREG-1611 identifies 10CFR50.55a/IWE for managing the effects of corrosion, except for inaccessible areas when there are no indications of degradation for accessible areas. Note: Inspection of supports, restraints and bracing for containment components is addressed by Subsection IWF of ASME Code, Section XI. See Chapter III B – Component Supports for evaluation of ~~IWF as an aging management program.~~	~~For NUREG-1611, an application for License Renewal~~ should reference ASME Code Section XI, Subsection IWE and associated modifications/additions specified in 10 CFR50.55a for managing aging of containment steel elements. In addition, an applicant should describe and justify its approach to managing the aging effect of corrosion for inaccessible areas, when there are no indications of degradation for accessible areas. Evaluation of 10CFR50.55a/IWE against the ten (10) criteria for an acceptable aging management program is presented below. An applicant should ensure that its implementation of 10CFR50.55a/IWE for containment steel elements is consistent with this evaluation. Any relief from the requirements of IWE(1992 Edition with 1992 Addenda) which may have been granted prior to the LR Application should be identified in the application; they will be evaluated for their significance to License Renewal. ***(1) Scope of Program:*** Subsection IWE-1000 specifies the components within the scope of IWE (1992 with 1992 Addenda) for steel containments and liners of concrete containments. The components within the scope of IWE are Class MC pressure retaining components (steel containments) and their integral attachments; metallic shell and penetration liners of Class CC containments and their integral attachments; containment seals and gaskets; containment pressure retaining bolting; and surface areas, including welds and base metal. The concrete portions of containment are in accordance with IWL. IWE exempts from examination (1) components that are outside the boundaries of the containment as defined in the Design Specifications; (2) embedded or inaccessible portions of containment components that met the requirements of the original Construction Code; (3) components that become embedded or inaccessible as a result of vessel repair or replacement if IWE-1232 and IWE-5220 are met; and (4) piping, pumps, and valves that are part of the containment system, or which penetrate or are attached to the containment vessel (governed by IWB or IWC). 10 CFR 50.55a(b)(2)(x) specifies additional requirements, one of which covers inaccessible areas. It states that the licensee shall 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. Examination requirements for containment supports are not within the scope of IWE. ***(2) Preventive Action:*** No preventive actions are specified; IWE is a monitoring program. An effective method of aging management is through monitoring and maintenance of protective coatings which inhibit degradation. Draft Regulatory Guide DG-1076 provides an acceptable basis for such a program. ***(3) Parameters Monitored or Inspected:*** Table IWE-2500-1 specifies six categories for examination. Cat. E-A — Parts Examined: Containment Vessel Surface — Examination Method**: General Visual, Visual VT-3	Yes. NUREG-1611 specifies that aging management is necessary for potential corrosion of inaccessible areas of steel liners, steel containment shells, and common steel components when conditions in accessible areas may not indicate the presence of or result in degradation to such inaccessible areas. The applicant's aging management program to address this issue must be evaluated. Relief from the requirements of IWE (1992 Edition with 1992 Addenda) must be evaluated to determine their significance to license renewal.

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ASME Section XI, Subsection IWE / 10CFR50.66a

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II CONTAINMENT STRUCTURES

B BWR Containments

B1 Mark I Containments

B1.1 Steel Containments

Item	Structure/ Component	Region of Interest	Material	Environ-ment	Aging Effect	Aging Mechanism	References

II CONTAINMENT STRUCTURES
B BWR Containments
B1 Mark I Containments
B1.1 Steel Containments

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
	Cat. / Parts Examined / Examination Method E-B* Containment Penetration — Visual VT-1 E-C Containment Surfaces Requiring Augmented Examination — Visual VT-1, Volumetric E-D Seals, Gaskets, and Moisture Barriers — Visual VT-3 E-F* Pressure Retaining Dissimilar Metal Welds — Surface E-G Pressure Retaining Bolting — Visual VT-1, Bolt torque or tension test E-P All Pressure Retaining Components (Pressure boundary, penetration bellows, airlocks, seals and gaskets) — 10 CFR 50, Appendix J (Containment Leak Rate Testing) * These two categories are optional per 10 CFR 50.55a(b)(2)(x)(C). ** The applicable examination method (where multiple methods are listed) depends on the particular subcategory within each category. *(4) Detection of Aging Effects:* Examination requirements specified in 10 CFR 50.55a and IWE ensure that aging effects would be detected before they would compromise the design basis requirements because of the frequency and extent of examination. Under IWE, inservice examinations and pressure tests must be performed in accordance with one of two Inspection Programs A or B on a specified schedule. Under Inspection Program A there are four inspection intervals (at 3, 10, 27, and 40 years) for which a 100% of the required examinations must be completed. Within each interval there are various inspection periods for which a certain percentage of the examinations must be performed to reach 100% at the end of that interval. In addition, a general visual examination is performed once each inpection period. After 40 years of operation, any future examinations must be performed in accordance with the Inspection Program B. Under Inspection Program B there is an initial interval of 10 years and successive intervals of 10 years each, during which 100% of the required examinations must be completed. Regarding the extent of examination, all accessible surfaces receive a visual examination. Selected areas, such as containment surfaces requiring augmented examination (E-C) require volumetric examination. All pressure retaining components (E-P) require system leakage test in accordance with 10 CFR 50, Appendix J. *(5) Monitoring and Trending:* With the exception of inaccessible areas, all surfaces are monitored by virtue of the examination requirements on a scheduled basis as described above. When component examination results require evaluation of flaws, areas of degradation, or repairs and the component is found to be acceptable for continued service, the areas containing such flaws, degradation, or repairs shall be reexamined during the next inspection period, in accordance with Examination	

II CONTAINMENT STRUCTURES

B BWR Containments

B1 Mark I Containments

B1.1 Steel Containments

Item	Structure/ Component	Region of Interest	Material	Environ-ment	Aging Effect	Aging Mechanism	References

II CONTAINMENT STRUCTURES
B BWR Containments
B1 Mark I Containments
B1.1 Steel Containments

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
	~~Category E-C (containment surfaces requiring~~ augmented examination). When these reexaminations reveal that the flaws, areas of degradation, or repairs remain essentially unchanged for three consecutive inspection periods, these areas no longer require augmented examination in accordance with Examination Category E-C. IWE requires that examinations performed during any one inspection that reveal flaws or areas of degradation exceeding the acceptance standards shall be extended to include an additional number of examinations within the same category approximately equal to the initial number of examinations. When additional flaws or areas of degradation that exceed the acceptance standards are revealed, all of the remaining examinations within the same category must be performed for the inspection interval. *(6) Acceptance Criteria:* IWE-3000 provides acceptance criteria for metal containments and liners of concrete containments. Table IWE-3410-1 presents criteria to evaluate the acceptability of the containment components for service following the preservice examination and each inservice examination. This table specifies the acceptance standard for each Examination Category (E-A, E-B, E-C, etc.). Most of the acceptance standards rely upon an engineering evaluation or require correction by repair or replacement. For some examinations such as Augmented Examinations, numerical values are specified for the acceptance standards. For the containment steel shell or liner, a reduction of up to 10% of the wall thickness is acceptable per IWE 3512.3. *(7) Corrective Actions:* IWE states that components whose examination results indicate flaws or areas of degradation that do not meet the acceptance standards listed in Table-3410-1 can be considered acceptable if an engineering evaluation indicates that the flaw or area of degradation is nonstructural in nature or has no effect on the structural integrity of the containment. Components that do not meet the acceptance standards are required to satisfy additional examination requirements and the flaw or area of degradation must be removed by mechanical methods or the component repaired. For repair of components within the scope of IWE, IWE-4000 and IWE-3124 state that repairs and reexaminations shall comply with the requirements of IWA-4000. IWA-4000 provides rules and requirements for the repair of pressure retaining components including metal containments and metallic liners of concrete containments. *(8) Confirmation Process:* When areas of degradation are identified, an evaluation is required to determine if repair or replacement is necessary. If the evaluation determines that repair or replacement is necessary, IWE requires confirmation to ensure that appropriate corrective actions have been completed and are effective. IWE states that repairs and reexaminations shall comply with the requirements of IWA-4000. Reexaminations are required to be conducted in accordance with the requirements of IWA-2000 and the recorded results must demonstrate that the repair meets the acceptance standards set forth in Table IWE-3410-1.	

II CONTAINMENT STRUCTURES

B BWR Containments

B1 Mark I Containments

B1.1 Steel Containments

Item	Structure/ Component	Region of Interest	Material	Environ-ment	Aging Effect	Aging Mechanism	References
							10CFR50.72 10CFR50.73 10CFR50, Appendix J Regulatory Guide 1.163 NEI 94-01 ANSI/ANS 56.8-1994

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
	~~(Additional confirmation of leak-tightness is achieved~~ through the pressure tests required by 10 CFR 50, Appendix J.) *(9) Administrative Controls:* An approved site QA Program would be applicable to IWE. IWA-1400 provides requirements for Owner's Responsibility. This includes responsibility for preparation of plans, schedules, and inservice inspection summary reports, and submittal of these plans and reports to the enforcement and regulatory authorities having jurisdiction at the plant site. Owner is also responsible for the preparation of written examination instructions and procedures, verification of qualification level of personnel who perform the examinations, and documentation of a Quality Assurance Program. IWA-6000 specifically covers the requirements for the preparation, submittal, and retention of records and reports. *(10) Operating Experience:* ASME Section XI, Subsection IWE was specifically developed to identify aging degradation of containment steel components. Since ASME Section XI, Subsection IWE was only recently adopted by 10CFR50.55a, long term experience in managing aging of containment components needs to be established. The license renewal applicant should provide plant-specific operating experience related to inservice inspection of containment and occurrences of degradation.	
~~10CFR50, Appendix J (Containment Leak~~ Rate Tests) A containment leak rate test (LRT) program in accordance with 10 CFR 50, Appendix J is required during the extended period of operation to ensure that (1) leakage does not exceed allowable leakage rate values as specified in the technical specifications and (2) periodic surveillance of reactor containment penetrations and isolation valves is performed so that proper maintenance and repairs are made during the service life.	~~Currently there are two options, Option A and Option B,~~ either of which can be chosen to meet the requirements of a containment LRT program. Under Option A, all of the testing must be performed on a periodic interval. Option B is a performance-based approach which eliminates the prescriptive requirements that are marginal to safety. Some of the differences between these options are discussed below and more detailed information for Option B is provided in NRC Regulatory Guide 1.163 and NEI 94-01, Rev. 0. *(1) Scope of Program:* The scope of the containment LRT program must include all pressure retaining passive components. Two types of tests shall be implemented. Type A tests are performed to measure leakage rates through all potential leakage paths including containment welds, valves, fittings, and components ~~which penetrate containment~~. Type B tests are performed to measure local leakage rates across each pressure containing or leakage limiting boundary for containment penetrations. Type A and Type B tests defined in 10 CFR 50, Appendix J are acceptable methods for performing these leak rate tests. Leakage testing for isolation valves (normally performed under Type C tests), if not included under this program, should be included under leakage rate test programs for systems containing the isolation valves. *(2) Preventive Actions:* Since the containment LRT program is a monitoring program, no preventive actions are needed. *(3) Parameters Monitored:* The parameters to be monitored are leakage rates through containment liner/welds, penetrations, fittings, and other access openings.	No

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Delete reference to App. J

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II CONTAINMENT STRUCTURES
B BWR Containments
B1 Mark I Containments
B1.1 Steel Containments

Item	Subsystem	Component	Material	Environment	Aging Effect	Aging Mechanism	References

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B1.1 Steel Containments

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
	~~*(4) Detection of Aging Effects:* A containment LRT~~ program is effective in detecting degradation which compromises the containment pressure boundary, including seals and gaskets. While the calculation of leakage rates demonstrates the leak-tightness and structural integrity of the containment, it does not by itself provide information which would indicate that aging degradation has initiated or that the capacity of the containment may have been reduced for other types of loads such as seismic. This would be achieved with the additional implementation of an acceptable containment inservice inspection program as described earlier. *(5) Monitoring and Trending:* Since the LRT program must be repeated throughout the operating license period, the entire pressure boundary is being monitored over time. The frequency of these tests depends on which option (A or B) is selected. With Option A, testing is performed on a regular fixed time interval as defined in 10 CFR 50, Appendix J. In the case of Option B, the period for testing may be extended based on acceptable performance of meeting leakage limits on prior tests. Additional details for implementing Option B are provided in NRC R.G. 1.163 and NEI 94-01, Rev.0. *(6) Acceptance Criteria:* Acceptance criteria for leakage rates are defined in the plant technical specifications. Acceptance criteria are acceptable if they meet the requirements in 10 CFR 50, Appendix J and are in accordance with ANSI/ANS-56.8-1994. *(7) Corrective Actions:* When leakage rates do not meet the acceptance criteria, corrective actions are taken in accordance with 10 CFR 50, Appendix J and NEI 94-01. If results are not acceptable, then an evaluation is required to identify the cause of the unacceptable performance and appropriate corrective actions must be taken. *(8) Confirmation Process:* When corrective actions are implemented to repair the condition causing the excessive leakage, confirmation by additional leak rate testing is required to confirm that the deficiency has been corrected. *(9) Administrative Controls:* Results of the LRT program must be documented as described in 10 CFR 50, Appendix J to demonstrate that the acceptance criteria for leakage have been satisfied. The records are required to be available for inspection at the plant site. If the test results exceed the performance criteria, then such exceedances must be assessed under 10 CFR 50.72 and 10 CFR 50.73. The quality assurance for corrective actions, confirmation process, and administrative control shall be in accordance with the plant's Quality Assurance Program. *(10) Operating Experience:* The plant-specific operating experience should be reviewed to ensure that the containment LRT program is effective in preventing unacceptable leakage through the containment pressure boundary. The requirements for Option B of 10 CFR 50, Appendix J should ensure that the test frequency is based on plant-specific operating experience.	

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II CONTAINMENT STRUCTURES
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B1 Mark I Containments
B1.1 Steel Containments

Item	Subsystem	Component	Material	Environment	Aging Effect	Aging Mechanism	References
							~~Draft Regulatory Guide DG-1076~~ ~~GL 98-04~~ ~~ASTM D5160-96~~ 75

II CONTAINMENT STRUCTURES
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B1 Mark I Containments
B1.1 Steel Containments

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
~~Program for Monitoring and Maintenance~~ of Protective Coatings – Proper Maintenance of Coatings inside containment is essential to ensure operability of post-accident safety systems which rely on water recycled through the containment sump/drain system. Degradation of coatings can lead to clogging of strainers, which causes reduction in flow through the sump/drain system. This has been described in GL 98-04. Maintenance of protective coatings applied to carbon steel surfaces inside containment (i.e., liners, steel containment shells, penetrations and hatches) also serve to prevent or minimize loss of material due to corrosion. Draft Regulatory Guide DG-1076 provides a technical basis for a coatings monitoring and maintenance program which can be credited for managing the effects of corrosion on containment carbon steel elements. Applicants for license renewal should include a coatings monitoring and maintenance program as part of their overall program to manage aging of ~~containment structures.~~ AU COMMENT #75	~~To be credited as an acceptable aging management~~ program for License Renewal, a coatings monitoring and maintenance program must effectively address the following ten (10) criteria: ***(1) Scope of Program:*** The minimum scope of the program should be Service Level I coatings, as defined in DG-1076. Inclusion of Service Level II and III coatings in the program would enable an applicant to take credit for managing the effects of corrosion for most of the steel structural elements included within the scope of License Renewal. ***(2) Preventive Action:*** A coatings monitoring and maintenance program is itself a preventive action. ***(3) Parameters Monitored/Inspected:*** Per DG-1076, ASTM D5163-96 provides guidelines for establishing an in-service coating monitoring program for Service Level I coatings. Both coatings degradation and evidence of corrosion should be monitored. ***(4) Detection of Aging Effects:*** To be effective, visual inspection of the condition of coatings should be conducted at the beginning of each refueling outage. Early detection and timely correction of coating degradation which jeopardizes corrosion protection are key elements of an acceptable program. ***(5) Monitoring and Trending:*** Frequent visual inspection (each refueling outage) for early signs of coatings degradation will permit trending of the condition and allow for development of a timely corrective plan. ***(6) Acceptance Criteria:*** The objective of a monitoring and maintenance program for protective coating is to prevent corrosion. Therefore, evidence of corrosion of coated surfaces must be considered unacceptable, requiring corrective action to restore corrosion protection. ***(7) Corrective Action, (8) Confirmation Process and (9) Administrative Controls:*** These should be satisfied by conducting the program in accordance with the requirements of 10CFR50, Appendix B (Quality Assurance). ***(10) Operating Experience:*** In assessing the applicability of existing plant-specific coatings programs to aging management for License Renewal, an applicant should review past operating experience for that program and ascertain whether it is achieving the desired outcome; i.e., no corrosion of carbon steel structural elements. ~~This should be discussed in the application.~~	~~Yes~~ ~~Applicant's program must be~~ evaluated.

NOTE: A TLAA SHOULD BE ADDED FOR MARK I AND MARK II CONTAINMENTS AS NOTED IN COMMENT # 268

II CONTAINMENT STRUCTURES
B BWR Containments
B1 Mark I Containments
B1.1 Steel Containments

Item	Structure/ Component	Region of Interest	Material	Environment	Aging Effect	Aging Mechanism	References
B1.1.1	Steel Elements	Vent Line Bellows	Stainless Steel	Inside and/or Outside Containment	Cumulative Fatigue Damage	Cyclic Loading	NUREG-1611
B1.1.1	Steel Elements	Vent Line Bellows	Stainless Steel	Inside and/or Outside Containment	Crack Initiation and Growth	Stress Corrosion Cracking	*Same as B1.1.1, Corrosion Aging Mechanism* IN 92-20
B1.1.1	Steel Elements	Drywell Head; Downcomers and Bracing; Vent System Supports; Torus Seismic Restraints; Torus Support Column/ Saddle	Carbon Steel and Graphite Plate	Inside and/or Outside Containment	Fretting/ Lockup	Mechanical Wear	10CFR50.55a ASME Section XI, Subsection IWE 10CFR50, Appendix J

THIS IS NOT A TLAA

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→ These components more likely managed by ASME Section XI, Subsection IWF

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B BWR Containments
B1 Mark I Containments
B1.1 Steel Containments

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
NUREG-1611 identifies the need for TLAA to account for the additional number of load cycles associated with the period of extended operation.	10 CFR 50.55a, IWE, and 10 CFR 50, Appendix J do not address cumulative fatigue damage. A time-limited aging analysis (TLAA) is required for the extended period of plant operation. Current licensing basis fatigue analyses, per ASME Code, Section III, were conducted for a 40 year life. These must be updated to account for the period of extended operation. All cyclic loadings considered in the original fatigue analyses (including Type A and Type B leak rate tests) must be reevaluated and revised as necessary. The revised Cumulative Fatigue Usage Factor must not exceed 1.0.	Yes. TLAA must be evaluated.
	See Chapter XI for an evaluation of	ASME Section XI, Subsection
~~*Same as B1.1.1, Corrosion Aging Mechanism*~~ ~~IN 92-20 describes an instance of containment bellows cracking, resulting in loss of leak tightness.~~ 10CFR50.55a / ASME Section XI, Subsection IWE 19	~~Previous evaluation~~ of 10 CFR 50.55a, IWE is ~~augmented as follows:~~ ~~*(3) Parameters Monitored or Inspected:*~~ Stress corrosion cracking (SCC) is a concern wherever dissimilar welds are used and in the case of bellows assemblies if the material is not shielded from a corrosive environment. IWE covers these items under examination categories E-F and E-B. 10 CFR 50.55a identifies examination of these categories as optional ~~during the current term of operation.~~ If plant-specific operating experience indicates a current or potential problem with leak tightness of containment bellows, then Examination Categories E-F and E-B, and augmented VT-1 visual examinations of bellows bodies ~~is warranted to address this issue.~~ 327	~~Yes~~ ~~Plant-specific, operating experience with cracking of containment bellows should be evaluated.~~ No
~~Codes and Standards (10CFR50.55a)~~, ASME Section XI, Subsection IWE 19	~~Aging effect will be managed by IWE.~~ See Chapter XI for an evaluation of ASME Section XI, Subsection IWE/10CFR50.55a	No.

II CONTAINMENT STRUCTURES

B BWR Containments

B1 Mark I Containments

B1.2 Concrete Containments

Item	Structure/ Component	Region of Interest	Material	Environment	Aging Effect	Aging Mechanism	References
B1.2.1	Concrete Elements	Drywell; Torus	Concrete	Inside and/or Outside Containment	Increase in Porosity, Permeability; Scaling, Cracking, Spalling	Leaching of Calcium Hydroxide; Aggressive Chemical Attack	10CFR50.55a ASME Section XI, Subsection IWL 10CFR50, Appendix J NUREG-1611 Draft Regulatory Guide DG-1076 ACI 201.1R-68 ACI 349.3R-96

WE ARE ONLY AWARE OF ONE MARK I CONCRETE CONTAINMENT

II CONTAINMENT STRUCTURES
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~~B1.2 Concrete Containments~~

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Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
~~10CFR50.55a~~ imposes the examination requirements of ASME B&PV Code Section XI on reinforced and prestressed concrete containments. Examination requirements of ASME Class CC concrete components are covered in Subsection IWL. Therefore, ASME Code Section XI, Subsection IWL (1992 Edition with 1992 Addenda), along with additional requirements specified in 10CFR50.55a(b)(2), constitute an existing mandated program which should be referenced by the applicant's containment inservice inspection program for managing aging of concrete containments for license renewal. NUREG-1611 identifies 10CFR50.55a/IWL for managing the aging effects of aggressive chemical attack and leaching of calcium hydroxide, except for inaccessible areas when there are no indications of degradation for accessible areas.	~~Per NUREG-1611, an application for license renewal~~ should reference ASME Code Section XI, Subsection IWL and associated modifications/additions specified in 10CFR50.55a for managing aging of containment concrete elements and prestressing systems. In addition, an applicant should describe and justify its approach to managing the aging effects of aggressive chemical attack, leaching of calcium hydroxide, and corrosion of embedded steel/rebar, for inaccessible areas, when there are no indications of degradation for accessible areas. Evaluation of 10CFR50.55a/IWL against the ten (10) criteria for acceptable aging management program is presented below. An applicant should ensure that its implementation of 10CFR50.55a/IWL for containment concrete elements and prestressing systems is consistent with this evaluation. ***(1) Scope of Program:*** Subsection IWL-1000 specifies the components within the scope of IWL (1992 with 1992 Addenda) for concrete containments. The components within the scope of IWL are reinforced concrete and unbonded post-tensioning systems of Class CC containments, as defined by CC-1000. Steel metallic liners are governed by IWE. IWL exempts from examination portions of the concrete containment that are inaccessible (e.g. concrete covered by liner, foundation material, or backfill, or are obstructed by adjacent structures or other components). 10 CFR 50.55a(b)(2)(ix) specifies additional requirements, one of which covers inaccessible areas. It states that the licensee shall 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. Examination requirements for containment supports are not within the scope of IWL. ***(2) Preventive Action:*** No preventive actions are specified; IWL is a monitoring program. An effective method of aging management is through monitoring and maintenance of protective coatings which inhibit degradation. Draft Regulatory Guide DG-1076 provides an acceptable basis for such a program. ***(3) Parameters Monitored or Inspected:*** Table IWL-2500-1 specifies two categories for examination of concrete surfaces. Category L-A for all concrete surfaces and Category L-B for concrete surfaces surrounding tendon anchorages. Both of these categories rely upon visual examination methods. ***(4) Detection of Aging Effects:*** The frequency and scope of examination are sufficient to ensure that aging effects are detected before the design basis requirements would be compromised. Under IWL, inservice inspections for concrete and unbonded post-tensioning systems are required at 1, 3, and 5 years following the structural integrity test. Thereafter, inspections are performed at 5 year intervals. In the case of tendons, only a sample of the tendons of each tendon type requires examination at each inspection. The tendons to be examined during an inspection are selected on a random basis. Table IWL-2521-1 specifies the number of tendons to be selected for each type (e.g. hoop, vertical, dome, helical, and	~~Yes.~~ NUREG-1611 specifies aging management of inaccessible areas for aggressive chemical attack of concrete surfaces exposed to groundwater and for leaching of calcium hydroxide in concrete subject to flowing water. The appliant's aging management program to address this issue must be evaluated.

II CONTAINMENT STRUCTURES
B BWR Containments
B1 Mark I Containments
B1.2 Concrete Containments

Item	Structure/ Component	Region of Interest	Material	Environ-ment	Aging Effect	Aging Mechanism	References

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
271	inverted U) for each inspection period. The required minimum number of each tendon type selected for inspection varies from 2 to 4 percent. Regarding the extent, all concrete surfaces receive a visual VT-3C examination. Selected areas, such as those that indicate suspect conditions and areas surrounding tendon anchorages receive a more rigorous VT-1 or VT-1C examination. *(5) Monitoring and Trending:* With the exception of inaccessible areas, all concrete surfaces are monitored by virtue of the examination requirements on a regular basis as described above. Trending of prestressing force in tendons is required for prestressed containments. In addition to the random sampling used for tendon examination, one tendon of each type is selected from the first year inspection sample and designated as a common tendon. Each common tendon is then examined during each inspection. This provides monitoring and trending information over the life of the plant. 10 CFR 50.55a and IWL also require that prestressing forces in all inspection sample tendons be measured by lift-off tests and compared to acceptance standards based on the predicted force for that type of tendon over its life. *(6) Acceptance Criteria:* IWL-3000 provides acceptance criteria for concrete containments. For concrete surfaces, the acceptance criteria rely on the determination of the Responsible Engineer whether there is any evidence of damage or degradation sufficient to warrant further evaluation or repair. Although the acceptance criteria are qualitative, guidance is provided in IWL-2510, which references ACI 201.1R-68 for identification of concrete degradation. In addition, IWL-2320 requires the Responsible Engineer to be a registered professional engineer experienced in evaluating the inservice condition of structural concrete and knowledgeable of the design and construction codes and other criteria used in design and construction of concrete containments. Alternate acceptance criteria based on ACI 349/3R is also acceptable. The acceptance standards for the unbonded post-tensioning system is quantitative in nature. For the post-tensioning system, quantitative acceptance criteria are given for tendon force, tendon wire or strand samples, and corrosion protection medium. *(7) Corrective Actions:* IWL specifies that items with examination results which do not meet the acceptance standards shall be evaluated to IWL-3300 "Evaluation." Items which do not meet the acceptance standards are to be evaluated by the Owner. The Owner is responsible for preparation of an Engineering Evaluation Report. The report should include an evaluation whether the concrete containment is acceptable without repair of the item and if repair is required, the extent, method, and completion date for the repair or replacement. Also included in the report is the cause of the condition and the extent, nature, and frequency of additional examinations. IWL also provides repair procedures to follow in Article IWL-4000. This includes requirements for the concrete repair, repair of reinforcing steel, repair of the post-tensioning system, and examination of the repaired area.	

II CONTAINMENT STRUCTURES
B BWR Containments
B1 Mark I Containments
B1.2 Concrete Containments

Item	Structure/ Component	Region of Interest	Material	Environ-ment	Aging Effect	Aging Mechanism	References

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
271	~~(8) Confirmation Process: When areas of degradation~~ are identified, an evaluation is performed to determine if repair or replacement is necessary. As part of this evaluation, IWL-3300 requires the Engineering Evaluation Report include the extent, nature, and frequency of additional examinations. (When significant repairs on modifications are made, additional confirmation is achieved through pressure tests required by IWL and 10 CFR 50, Appendix J.) ***(9) Administrative Controls:*** An approved site QA Program would be applicable to IWL. IWA-1400 provides requirements for Owner's Responsibility. This includes responsibility for preparation of plans, schedules, and inservice inspection summary reports, and submittal of these plans and reports to the enforcement and regulatory authorities having jurisdiction at the plant site. Owner is also responsible for the preparation of written examination instructions and procedures, verification of qualification level of personnel who perform the examinations, and documentation of a Quality Assurance Program. IWA-6000 specifically covers the requirements for the preparation, submittal, and retention of records and reports. ***(10) Operating Experience:*** ASME Section XI, Subsection IWL was specifically developed to identify aging degradation of containment concrete components. Since ASME Section XI, Subsection IWL was only recently adopted by 10CFR50.55a, long term experience in managing aging of containment concrete components needs to be established. The license renewal applicant should provide plant-specific operating experience related to inservice inspection of containment and ~~occurrences of degradation.~~	

II CONTAINMENT STRUCTURES
B BWR Containments
B1 Mark I Containments
B1.2 Concrete Containments

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Item	Structure/ Component	Region of Interest	Material	Environment	Aging Effect	Aging Mechanism	References
B1.2.1	Concrete Elements	Drywell; Torus	Concrete	Inside and/or Outside Containment	Expansion & Cracking	Reaction with Aggregates	*Same as B1.2.1, Aggressive Chemical Attack Aging Mechanism*
B1.2.1	Concrete Elements	Drywell; Torus, and Reinforcing Steel	Concrete, Carbon Steel	Inside and/or Outside Containment	Cracking, Spalling, Loss of Bond, Loss of Material	Corrosion of Embedded Steel	*Same as B1.2.1, Aggressive Chemical Attack Aging Mechanism*
B1.2.1	Concrete Elements	Drywell; Torus	Concrete	Inside and/or Outside Containment	Loss of Strength and Modulus, Change in Poisson's Ratio	Elevated Temperature (>150 °F general; >200 °F local)	NUREG-1611

II CONTAINMENT STRUCTURES
~~B BWR Containments~~
B1 Mark I Containments
B1.2 Concrete Containments

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Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
~~Same as B1.2.1, Aggressive Chemical Attack Aging Mechanism~~ NUREG-1611 identifies 10CFR50.55a/IWL for managing the effects of reaction with aggregates, and resolves staff's concern about delayed occurrences.	*~~Same as B1.2.1, Aggressive Chemical Attack Aging Mechanism~~*	~~No.~~
Same as B1.2.1, Aggressive Chemical Attack Aging Mechanism NUREG-1611 identifies 10CFR50.55a/IWL for managing the effects of corrosion of embedded steel, except for inaccessible areas when there are no indications of degradation for accessible areas.	*Same as B1.2.1, Aggressive Chemical Attack Aging Mechanism, except inaccessible areas must be addressed.*	Yes. NUREG-1611 specifies aging management of inaccessible areas for corrosion of embedded steel exposed to an aggressive environment. The applicant's aging management program to address this issue must be evaluated.
No mandated Aging Management Program exists. NUREG-1611 identifies the need for plant-specific evaluation, if the prerequisite conditions exist.	The implementation of 10 CFR 50.55a and IWL would not be able to identify the loss of strength and modulus due to elevated temperature. Thus, for any portions of concrete containment that exceed specified temperature limits, ~~further evaluations are warranted.~~ NUREG-1611 specifies the temperature limits, both general (150 °F) and local (200 °F), above which a plant-specific evaluation is needed.	Yes. If applicable, the applicant's aging management program to address this issue must be evaluated.

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II CONTAINMENT STRUCTURES
B BWR Containments
B1 Mark I Containments
B1.2 Concrete Containments

Item	Structure/ Component	Region of Interest	Material	Environment	Aging Effect	Aging Mechanism	References
B1.2.2	Steel Elements	Drywell Liner; Torus Liner; Liner Anchors; Drywell Head; Vent Lines, Header, and System Supports; Downcomers and Bracing	Carbon Steel	Inside and/or Outside Containment	Loss of Material	Corrosion	*Same as B1.1.1, Corrosion Aging Mechanism* NRC IN 97-10
B1.2.2	Steel Elements	Vent Line Bellows	Stainless Steel	Inside and/or Outside Containment	Cumulative Fatigue Damage	Cyclic Loading	*Same as B1.1.1, Cyclic Loading Aging Mechanism*

II CONTAINMENT STRUCTURES
B BWR Containments
~~B1 Mark I Containments~~
~~B1.2 Concrete Containments~~

All - Comment #271

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
~~*Same as B1.1.1, Corrosion Aging Mechanism*~~ **IN 97-10 identifies specific locations where concrete containments are susceptible to liner plate corrosion. Applicants should consider these and review plant-specific operating experience to determine applicability.**	~~*Same as B1.1.1, Corrosion Aging Mechanism*~~	*Same as B1.1.1, Corrosion Aging Mechanism*
Same as B1.1.1, Cyclic Loading Aging Mechanism	*Same as B1.1.1, Cyclic Loading Aging Mechanism*	*Same as B1.1.1, Cyclic Loading Aging Mechanism*

II CONTAINMENT STRUCTURES

~~B BWR Containments~~

~~B1 Mark I Containments~~

~~B1.2 Concrete Containments~~

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Item	Structure/ Component	Region of Interest	Material	Environment	Aging Effect	Aging Mechanism	References
B1.2.2	Steel Elements	Vent Line Bellows	Stainless Steel	Inside and/or Outside Containment	Crack Initiation and Growth	Stress Corrosion Cracking	*Same as B1.1.1, Stress Corrosion Cracking Aging Mechanism*
B1.2.2	Steel Elements	Drywell Head; Downcomers and Bracing; Vent System Supports	Carbon Steel	Inside and/or Outside Containment	Fretting/ Lockup	Mechanical Wear	*Same as B1.1.1, Mechanical Wear Aging Mechanism*

II CONTAINMENT STRUCTURES

B BWR Containments

B1 Mark I Containments

B1.2 Concrete Containments

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Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
Same as B1.1.1, Stress Corrosion Cracking Aging Mechanism	*Same as B1.1.1, Stress Corrosion Cracking Aging Mechanism*	*Same as B1.1.1, Stress Corrosion Cracking Aging Mechanism*
Same as B1.1.1, Mechanical Wear Aging Mechanism	*Same as B1.1.1, Mechanical Wear Aging Mechanism*	*Same as B1.1.1, Mechanical Wear Aging Mechanism*

B2. Mark II Containments

B2.1 Steel Containments

B2.1.1 Steel Elements

B2.2 Concrete Containments

B2.2.1 Concrete Elements

B2.2.2 Steel Elements

B2.2.3 Prestressing System

B2. Mark II Containments

B2.1 Steel Containments

B2.1.1 Steel Elements

B2.2 Concrete Containments

B2.2.1 Concrete Elements

B2.2.2 Steel Elements

B2.2.3 Prestressing System

B2. Mark II Containments

Systems, Structures, and Components

Review Table II B addresses the elements of BWR containment structures. Mark I containments, Mark II containments, Mark III containments, and common components are discussed separately under subheadings B1, B2, B3, and B4, respectively. This format follows the presentation format in Section 3.4 of the draft Standard Review Plan for License Renewal (SRP-LR). In Review Table II B2, Mark II Concrete containments are divided into three elements: concrete, steel, and prestressing system and Mark II Steel containments are divided into two elements: steel and concrete.

System Interfaces

Functional interfaces include the primary containment HVAC system(VII.F), containment isolation system(V.A), containment spray system(V.B), and containment heat removal system(V.C). Physical interfaces exist with any structure, system, or component which either penetrates the containment wall, such as the main steam system(VIII.A) and feedwater systems(VIII.F,VIII.G), or is supported by the containment structure. The containment structure basemat may provide support to the NSSS components and containment internal structures.

II CONTAINMENT STRUCTURES
B BWR Containments
B2 Mark II Containments
B2.1 Steel Containments

Item	Structure/ Component	Region of Interest	Material	Environment	Aging Effect	Aging Mechanism	References
B2.1.1	Steel Elements	Drywell; Suppression Chamber; Drywell Head; Embedded Shell and Sand Pocket Regions; Support Skirt; Downcomer Pipes & Bracing; Region Shielded by Diaphragm Floor	Carbon Steel	Inside and/or Outside Containment	Loss of Material	Corrosion	*Same as B1.1.1, Corrosion Aging Mechanism*
B2.1.1	Steel Elements	Drywell Head; Downcomer Pipes & Bracing	Carbon Steel	Inside and/or Outside Containment	Fretting/ Lockup	Mechanical Wear	*Same as B1.1.1, Mechanical Wear Aging Mechanism*

SEE COMMENT #276 for Cyclic LOADING and FATIGUE as TLAA's

II CONTAINMENT STRUCTURES
B BWR Containments
B2 Mark II Containments
B2.1 Steel Containments

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
~~Same as B1.1.1, Corrosion Aging Mechanism~~ ~~See C1.~~ 10CFR50.55a/ASME Section XI, Subsection IWE	~~Same as B1.1.1, Corrosion Aging Mechanism~~ See Chapter XI for an evaluation of 10CFR50.55a/ASME Section XI, Subsection IWE.	~~Same as B1.1.1, Corrosion Aging Mechanism~~ No
Codes and Standards (10CFR50.55a/ASME Section XI, Subsection IWE	~~Aging effect will be managed by IWE~~ See Chapter XI for an evaluation of 10CFR50.55a/ASME Section XI, Subsection IWE.	No.

II CONTAINMENT STRUCTURES
B BWR Containments
B2 Mark II Containments
B2.2 Concrete Containments

Item	Structure/ Component	Region of Interest	Material	Environment	Aging Effect	Aging Mechanism	References
B2.2.1	Concrete Elements	Containment; Basemat	Concrete	Inside and/or Outside Containment	Increase in Porosity, Permeability; Scaling, Cracking, Spalling	Leaching of Calcium Hydroxide; Aggressive Chemical Attack	*Same as B1.2.1, Aggressive Chemical Attack Aging Mechanism*
B2.2.1	Concrete Elements	Containment; Basemat	Concrete	Inside and/or Outside Containment	Expansion & Cracking	Reaction with Aggregates	*Same as B1.2.1, Reaction with Aggregates Aging Mechanism*
B2.2.1	Concrete Elements	Containment; Basemat; Reinforcing Steel	Concrete; Carbon Steel	Inside and/or Outside Containment	Cracking, Spalling, Loss of Bond, Loss of Material	Corrosion of Embedded Steel	*Same as B1.2.1, Corrosion of Embedded Steel Aging Mechanism*

II CONTAINMENT STRUCTURES
B BWR Containments
B2 Mark II Containments
B2.2 Concrete Containments

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
~~Same as B1.2.1, Aggressive Chemical Attack Aging Mechanism~~ 10CFR50.55a/ASME Section XI, Subsection IWL	~~Same as B1.2.1, Aggressive Chemical Attack Aging Mechanism~~ See Chapter XI for an evaluation of 10CFR50.55a/ASME Section XI, Subsection IWL.	~~Same as B1.2.1, Aggressive Chemical Attack Aging Mechanism~~ NO
~~Same as B1.2.1, Reaction with Aggregates Aging Mechanism~~	~~Same as B1.2.1, Reaction with Aggregates Aging Mechanism~~	No
~~Same as B1.2.1, Corrosion of Embedded Steel Aging Mechanism~~	~~Same as B1.2.1, Corrosion of Embedded Steel Aging Mechanism~~	~~Same as B1.2.1, Corrosion of Embedded Steel Aging Mechanism~~ NO

II CONTAINMENT STRUCTURES
B BWR Containments
B2 Mark II Containments
B2.2 Concrete Containments

Item	Structure/ Component	Region of Interest	Material	Environment	Aging Effect	Aging Mechanism	References
B2.2.1	Concrete Elements	Basemat	Concrete	~~Inside and/or~~ Outside Containment	Cracks; Distortion; Increase in Component Stress Level	Settlement	NUREG-1611
B2.2.1	Concrete Elements	Containment; Concrete Fill in Annulus; Basemat	Concrete	Inside and/or Outside Containment	Loss of Strength and Modulus	Elevated Temperature	*Same as B1.2.1, Elevated Temperature Aging Mechanism*

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Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
No mandated Aging Management Program exists. NUREG-1611 identifies the need for a settlement monitoring program, if the prerequisite conditions exist. ACI 349.3R-96 provides guidance for addressing settlement. NOTE: Cracks, distortions, and increases in Component stress levels may not require management because settlement is not plausible for the particular site.	Settlement is not addressed by 10 CFR 50.55a or IWL. NUREG-1611 specifies that a settlement monitoring program is needed for a containment structure/basemat resting on soil or piles, or if the site experiences significant changes in ground water conditions.	Yes. If applicable, the applicant's aging management program to address this issue must be evaluated.
~~Same as B1.2.1, Elevated Temperature Aging Mechanism~~ No mandated Aging Management Program exists. NUREG-1611 identifies the need for plant-specific evaluation, if the prerequisite conditions exist.	~~Same as B1.2.1, Elevated Temperature Aging Mechanism~~ The implementation of 10CFR50.55a and IWL would not be able to identify the loss of strength and modulus due to elevated temperature. Thus, for any portions of concrete containment that exceed specified temperature limits, further evaluations are warranted. NUREG-1611 specifies the temperature limits, both general (150°F) and local (200°F) above which a plant-specific evaluation is needed.	~~Same as B1.2.1, Elevated Temperature Aging Mechanism~~

II CONTAINMENT STRUCTURES
B BWR Containments
B2 Mark II Containments
B2.2 Concrete Containments

Item	Structure/ Component	Region of Interest	Material	Environment	Aging Effect	Aging Mechanism	References
B2.2.2	Steel Elements	Drywell, Suppression Chamber and Basemat Liners; Liner Anchors; Drywell Head; Downcomer Pipes & Bracing	Carbon Steel	Inside and/or Outside Containment	Loss of Material	Corrosion	*Same as B1.2.2, Corrosion Aging Mechanism*
B2.2.2	Steel Elements	Suppression Chamber Liner (Interior Surface)	Stainless Steel	Inside and/or Outside Containment	Crack Initiation and Growth	Stress Corrosion Cracking	*Same as B1.1.1, Stress Corrosion Cracking Aging Mechanism*

II CONTAINMENT STRUCTURES
B BWR Containments
B2 Mark II Containments
B2.2 Concrete Containments

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
~~Same as B1.2.2, Corrosion Aging Mechanism~~ 10CFR50.55a/ASME Section XI, Subsection IWE	~~Same as B1.2.2, Corrosion Aging Mechanism~~ See Chapter XI for an evaluation of 10CFR50.55a/ASME Section XI, Subsection IWE	~~Same as B1.2.2, Corrosion Aging Mechanism~~ No
~~Codes and Standards~~ (10CFR50.55a), ASME Section XI, Subsection IWE	~~Aging effect will be managed by Examination Category E-P (10 CFR 50, Appendix J, Integrated Leak Rate Test).~~ See Chapter XI for an evaluation of 10CFR50, Appendix J.	No.

II CONTAINMENT STRUCTURES
B BWR Containments
B2 Mark II Containments
B2.2 Concrete Containments

Item	Structure/ Component	Region of Interest	Material	Environment	Aging Effect	Aging Mechanism	References
B2.2.2	Steel Elements	Drywell Head; Downcomer Pipes & Bracing	Carbon Steel	Inside and/or Outside Containment	Fretting/ Lockup	Mechanical Wear	*Same as B1.1.1, Mechanical Wear Aging Mechanism*
B2.2.3	Prestressing System	Tendons and Anchorage Components	Carbon Steel	Inside and/or Outside Containment	Loss of Material	Corrosion of Tendons/ Anchorage Components	*Same as B1.2.1, Aggressive Chemical Attack Aging Mechanism* NUREG-1522 IN 99-10

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Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
~~*Same as B1.1.1, Mechanical Wear Aging Mechanism*~~ 10CFR50.55a/ASME Section XI, Subsection IWE	~~*Same as B1.1.1, Mechanical Wear Aging Mechanism*~~ See Chapter XI for an evaluation of 10CFR50.55a/ASME Section XI, Subsection IWE	~~*Same as B1.1.1, Mechanical Wear Aging Mechanism*~~ NO
Same as B1.2.1, Aggressive Chemical Attack Aging Mechanism Note: 10CFR50.55a and IWL do not apply to bonded post-tensioning systems. NUREG-1611 identifies 10CFR50.55a/IWL for managing tendon and anchor corrosion.	*Same as B1.2.1, Aggressive Chemical Attack Aging Mechanism*	No.
NUREG-1522 and IN 99-10 describe conditions in tendon access galleries conducive to corrosion of tendon anchorage components.	Managing the condition and environment in the tendon access gallery (e.g., moisture and humidity) is a prudent way to manage the degradation (i.e., corrosion) of bearing plates and other vertical tendon anchorage components.	Yes. Plant-specific consideration of the tendon access gallery should be evaluated.

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Item	Subsystem	Component	Material	Environment	Aging Effect	Aging Mechanism	References
B2.2.3	Prestressing System	Tendons and Anchorage Components	Carbon Steel	Inside and/or Outside Containment	Loss of Prestress	Relaxation; Shrinkage; Creep; Elevated Temperature	10CFR50.55a ASME Section XI, Subsection IWL NUREG-1611 10CFR54 Regulatory Guide 1.35.1 IN 99-10

II CONTAINMENT STRUCTURES
B BWR Containments
B2 Mark II Containments
B2.2 Concrete Containments

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
~~Codes and Standards (10CFR50.55a),~~ ASME Section XI, Subsection IWL Note: 10CFR50.55a and IWL do not apply to bonded post-tensioning systems. NUREG-1611 identifies both 10CFR50.55a/IWL and TLAA to manage loss of prestress	~~Previous~~ evaluation of 10 CFR ~~50.55a~~, IWL is augmented as follows: ***(5) Monitoring and Trending:*** 10 CFR 50.55a and IWL do not provide guidance on how to calculate expected tendon prestressing forces that are needed to compare against the measured tendon lift-off forces. This guidance is provided in NRC Regulatory Guide 1.35.1.	~~No~~, Provided Regulatory Guide 1.35.1 is followed. Otherwise plant-specific evaluation is necessary.
Tendon Surveillance Program requires TLAA	To ensure that the structural and functional adequacy of the containment are maintained, a TLAA for the tendon prestressing forces is needed for the extended period of operation. A TLAA for the containment prestressing system which meets 10CFR54.21(c)(1)(ii) should have the following basic attributes: 1. Calculation of the minimum required prestressing force value (MRV) for each tendon group. 2. Calculated predicted lower limit (PLL) prestressing force for each group of tendons (See NRC R.G. 1.35.1). During each inspection, the measured prestressing forces in the sampled tendons are compared against the PLL. As discussed in IN 99-10, the trend lines shall be developed using a regression analysis considering individual tendon lift-off forces rather than the average lift-off forces for each group of tendons. 3. The PLL developed for the 40 year period of operation shall be extended to 60 years. The applicant has to demonstrate that the trend of the measured prestressing forces during the extended period remain above the PLL for each tendon group. If this can not be achieved, then a systematic plan of retensioning selected tendons should be developed which would result in the trend lines remaining above the PLL or a reanalysis of the containment demonstrating design adequacy is needed. If the approach described above is not feasible due to the lack of available tendon lift-off force data needed to develop trend lines, then a TLAA for containment prestressing forces performed in accordance with 10 CFR 54.21(c)(1)(iii) is acceptable. In this case, the TLAA must satisfy the ten (10) criteria for an acceptable aging management program and must specifically include the following: ***(3)Parameters Monitored:*** The parameters to be monitored are the prestressing forces in accordance with requirements specified in Subsection IWL of Section XI of the ASME Code as incorporated by reference in 10 CFR 50.55a. ***(5) Monitoring and Trending:*** The prestressing forces shall be plotted against time and trending lines developed for the period of extended operation. ***(6) Acceptance Criteria:*** The prestressing force trend lines must be shown to be above the prescribed lower limit (PLL) lines.	Yes. Methodology for TLAA must be evaluated.

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II CONTAINMENT STRUCTURES
B BWR Containments
B2 Mark II Containments
B2.2 Concrete Containments

Item	Structure/ Component	Region of Interest	Material	Environ-ment	Aging Effect	Aging Mechanism	References

II CONTAINMENT STRUCTURES
B BWR Containments
B2 Mark II Containments
B2.2 Concrete Containments

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
	~~(7) Corrective Actions:~~ If the trend lines cross the PLL at any time, then either retensioning of some tendons or a reanalysis of the containment will be needed. ***(10) Operating Experience:*** The program shall incorporate any operating experience that occurs at the plant requesting license renewal as well as other plants. Problems with the prestressing system described in NRC IN 99-10 (with the exception of temperature effects due to sun exposure) should also be incorporated into the TLAA DELETE #277	

B3. Mark III Containments

B3.1 Steel Containments
- B3.1.1 Steel Elements
- B3.1.2 Concrete Elements

B3.2 Concrete Containments
- B3.2.1 Concrete Elements
- B3.2.2 Steel Elements

B3. Mark III Containments

Systems, Structures, and Components

Review Table II B addresses the elements of BWR containment structures. Mark I containments, Mark II containments, Mark III containments, and common components are discussed separately under subheadings B1, B2, B3, and B4, respectively. This format follows the presentation format in Section 3.4 of the draft Standard Review Plan for License Renewal (SRP-LR). In Review Table II B3, Mark III Concrete containments are divided into three elements: concrete, steel, and prestressing system and Mark III Steel containments are divided into two elements: steel and concrete.

System Interfaces

Functional interfaces include the primary containment HVAC system(VII.F), containment isolation system(V.A), containment spray system(V.B), and containment heat removal system(V.C). Physical interfaces exist with any structure, system, or component which either penetrates the containment wall, such as the main steam system(VIII.A) and feedwater systems(VIII.B~~VIII.C~~); or is supported by the containment structure. The containment structure basemat may provide support to the NSSS components and containment internal structures.

II CONTAINMENT STRUCTURES
B BWR Containments
B3 Mark III Containments
B3.1 Steel Containments

Item	Structure/ Component	Region of Interest	Material	Environment	Aging Effect	Aging Mechanism	References
B3.1.1	Steel Elements	Containment Shell; Suppression Chamber Shell; Basemat Liner; Liner Anchors; ~~Embedded Shell Region~~ 2EC	Carbon Steel	Inside and/or Outside Containment	Loss of Material	Corrosion	*Same as B1.1.1, Corrosion Aging Mechanism*
B3.1.1	Steel Elements	Suppression Chamber Shell (Interior Surface)	Stainless Steel	Inside and/or Outside Containment	Crack Initiation and Growth	Stress Corrosion Cracking	*Same as B1.1.1, Stress Corrosion Cracking Aging Mechanism*

II CONTAINMENT STRUCTURES
B BWR Containments
B3 Mark III Containments
B3.1 Steel Containments

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
~~Same as B1.1.1, Corrosion Aging Mechanism~~ 10CFR50.55a / ASME Section XI, Subsection IWE	~~Same as B1.1.1, Corrosion Aging Mechanism~~ See Chapter XI for an evaluation of 10CFR50.55a / ASME Section XI, Subsection IWE	~~Same as B1.1.1, Corrosion Aging Mechanism~~ NO
~~Codes and Standards (10CFR50.55a), ASME Section XI, Subsection IWE~~	~~Aging effect will be managed by Examination Category E-P (10 CFR 50, Appendix J, Integrated Leak Rate Test).~~ See Chapter XI for an evaluation of 10CFR50, Appendix J.	No.

II CONTAINMENT STRUCTURES
B BWR Containments
B3 Mark III Containments
B3.1 Steel Containments

Item	Structure/ Component	Region of Interest	Material	Environment	Aging Effect	Aging Mechanism	References
B3.1.2	Concrete Elements	Basemat; Concrete Fill in Annulus	Concrete	Inside and/or Outside Containment	Increase in Porosity, Permeability; Scaling, Cracking, Spalling	Leaching of Calcium Hydroxide; Aggressive Chemical Attack	*Same as B1.2.1, Aggressive Chemical Attack Aging Mechanism*
B3.1.2	Concrete Elements	Basemat; Concrete Fill in Annulus	Concrete	Inside and/or Outside Containment	Expansion & Cracking	Reaction with Aggregates	*Same as B1.2.1, Reaction with Aggregates Aging Mechanism*
B3.1.2	Concrete Elements	Basemat and Reinforcing Steel	Concrete; Carbon Steel	Inside and/or Outside Containment	Cracking, Spalling, Loss of Bond, Loss of Material	Corrosion of Embedded Steel	*Same as B1.2.1, Corrosion of Embedded Steel Aging Mechanism*

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Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
Same as B1.2.1, Aggressive Chemical Attack Aging Mechanism	*Same as B1.2.1, Aggressive Chemical Attack Aging Mechanism*	*Same as B1.2.1, Aggressive Chemical Attack Aging Mechanism*
~~*Same as B1.2.1, Reaction with Aggregates Aging Mechanism*~~	~~*Same as B1.2.1, Reaction with Aggregates Aging Mechanism*~~	No
~~*Same as B1.2.1, Corrosion of Embedded Steel Aging Mechanism*~~	*Same as B1.2.1, Corrosion of Embedded Steel Aging Mechanism*	~~*Same as B1.2.1, Corrosion of Embedded Steel Aging Mechanism*~~ No

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10CFR50.55a/ ASME Section XI, Subsection IWL AND HERE

See Chapter X.1 for an evaluation of 10CFR50.55a/ ASME Section XI, Subsection IWL AND HERE

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II CONTAINMENT STRUCTURES
B BWR Containments
B3 Mark III Containments
B3.1 Steel Containments

Item	Structure/ Component	Region of Interest	Material	Environment	Aging Effect	Aging Mechanism	References
B3.1.2	Concrete Elements	Basemat	Concrete	Inside and/or Outside Containment	Cracks; Distortion; Increase in Component Stress Level	Settlement	*Same as B2.2.1, Settlement Aging Mechanism*
B3.1.2	Concrete Elements	Basemat; Concrete Fill in Annulus	Concrete	Inside and/or Outside Containment	Loss of Strength and Modulus	Elevated Temperature	*Same as B1.2.1, Elevated Temperature Aging Mechanism*

ADD TEXT PER 282 GENERIC

ASME III DIV 2, CC-3440 282

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
~~Same as B2.2.1, Settlement Aging Mechanism~~ No mandated Aging Management Program exists. NUREG-1611 identifies the need for a settlement monitoring program, if the prerequisite conditions exist. ACI 349R-96 provides guidance for addressing settlement. Note: Cracks, distortions, and increases in component stress levels may not require management because settlement is not plausible for the particular site	~~Same as B2.2.1, Settlement Aging Mechanism~~ Settlement is not addressed by 10CFR50.55a or IWL. NUREG-1611 specifies that a settlement monitoring program is needed for a containment structure / basemat resting on soil or piles, or if the site experiences significant changes in ground water conditions	~~Same as B2.2.1, Settlement Aging Mechanism~~ Yes. If applicable, the applicants aging management program to address this issue must be evaluated.
~~Same as B1.2.1, Elevated Temperature Aging Mechanism~~ No mandated aging management program exists. NUREG-1611 identifies the need for plant specific evaluation; if the prerequisite conditions exists.	~~Same as B1.2.1, Elevated Temperature Aging Mechanism~~ The implementation of 10CFR50.55a and IWL would not be able to identify the loss of strength and modulus due to elevated temperature. Thus, for any portions of concrete containment that exceed specified limits, further evaluations are warranted. NUREG-1611 specifies the temperature limits, both general (150°F) and local (200°F) above which a plant specific evaluation is needed.	~~Same as B1.2.1, Elevated Temperature Aging Mechanism~~

II CONTAINMENT STRUCTURES
B BWR Containments
B3 Mark III Containments
B3.2 Concrete Containments

Item	Structure/ Component	Region of Interest	Material	Environment	Aging Effect	Aging Mechanism	References
B3.2.1	Concrete Elements	Dome, Wall, Basemat	Concrete	Inside and/or Outside Containment	Scaling; Cracking, Spalling	Freeze/ Thaw	*Same as B1.2.1, Aggressive Chemical Attack Aging Mechanism*
B3.2.1	Concrete Elements	Dome, Wall, Basemat	Concrete	Inside and/or Outside Containment	Increase in Porosity, Permeability; Scaling, Cracking, Spalling	Leaching of Calcium Hydroxide; Aggressive Chemical Attack	*Same as B1.2.1, Aggressive Chemical Attack Aging Mechanism*

II CONTAINMENT STRUCTURES
B BWR Containments
B3 Mark III Containments
B3.2 Concrete Containments

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
~~*Same as B1.2.1, Aggressive Chemical Attack Aging Mechanism*~~ 10CFR50.55a/ ASME Section XI, Subsection IWL	*Same as B1.2.1, Aggressive Chemical Attack Aging Mechanism* See Chapter XI for an evaluation of 10CFR50.55a/ ASME Section XI, Subsection IWL	No
~~*Same as B1.2.1, Aggressive Chemical Attack Aging Mechanism*~~	~~*Same as B1.2.1, Aggressive Chemical Attack Aging Mechanism*~~	*Same as B1.2.1, Aggressive Chemical Attack Aging Mechanism* NO

II CONTAINMENT STRUCTURES
B BWR Containments
B3 Mark III Containments
B3.2 Concrete Containments

Item	Structure/ Component	Region of Interest	Material	Environment	Aging Effect	Aging Mechanism	References
B3.2.1	Concrete Elements	Dome, Wall, Basemat	Concrete	Inside and/or Outside Containment	Expansion & Cracking	Reaction with Aggregates	*Same as B1.2.1, Reaction with Aggregates Aging Mechanism*
B3.2.1	Concrete Elements	Dome, Wall, Basemat, Reinforcing Steel	Concrete; Carbon Steel	Inside and/or Outside Containment	Cracking, Spalling, Loss of Bond, Loss of Material	Corrosion of Embedded Steel	*Same as B1.2.1, Corrosion of Embedded Steel Aging Mechanism*

II CONTAINMENT STRUCTURES
B BWR Containments
B3 Mark III Containments
B3.2 Concrete Containments

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
~~Same as B1.2.1, Reaction with Aggregates Aging Mechanism~~ 10CFR50.55a/ASME Section XI, Subsection IWL	~~Same as B1.2.1, Reaction with Aggregates Aging Mechanism~~ See Chapter XI for an evaluation of 10CFR50.55a/ASME Section XI, Subsection IWL	No
~~Same as B1.2.1, Corrosion of Embedded Steel Aging Mechanism~~	~~Same as B1.2.1, Corrosion of Embedded Steel Aging Mechanism~~	~~Same as B1.2.1, Corrosion of Embedded Steel Aging Mechanism~~ No

II CONTAINMENT STRUCTURES
B BWR Containments
B3 Mark III Containments
B3.2 Concrete Containments

Item	Structure/ Component	Region of Interest	Material	Environment	Aging Effect	Aging Mechanism	References
B3.2.1	Concrete Elements	Basemat ADD: AND PILES 283	Concrete	Inside and/or Outside Containment	Cracks; Distortion; Increase in Component Stress Level	Settlement	*Same as B2.2.1, Settlement Aging Mechanism*
B3.2.1	Concrete Elements	Dome, Wall, Basemat	Concrete	Inside and/or Outside Containment	Loss of Strength and Modulus	Elevated Temperature ADD TEXT PER 282	*Same as B1.2.1, Elevated Temperature Aging Mechanism* ASME III Div. 2, CC-3440 282

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
~~Same as B2.2.1, Settlement Aging Mechanism~~ No mandated Aging Management Program exists. NUREG-1611 identifies the need for a settlement monitoring program, if the prerequisite conditions exist. ACI 349.3R-96 provides guidance for addressing settlement. NOTE: Cracks, distortions, and increases in component stress levels may not require aging management because settlement is not plausible for the particular site.	~~Same as B2.2.1, Settlement Aging Mechanism.~~ Settlement is not addressed by 10CFR50.55a or IWL. NUREG-1611 specifies that a settlement monitoring program is needed for a containment structure/basemat resting on soil or piles, or if the site experiences significant changes in ground water conditions.	~~Same as B2.2.1, Settlement Aging Mechanism~~ Yes. If applicable, the applicants aging management program to address this issue must be evaluated.
~~Same as B1.2.1, Elevated Temperature Aging Mechanism~~ No mandated aging management program exists NUREG-1611 identifies the need for plant-specific evaluation if the prerequisite conditions exist.	~~Same as B1.2.1, Elevated Temperature Aging Mechanism~~ The implementation of 10CFR50.55a and IWL would not be able to identify the loss of strength and modulus due to elevated temperature. Thus, for any portions of concrete containment that exceed specified temperature limits, further evaluations are warranted. NUREG-1611 specifies the temperature limits, both general (150°F) and local (200°F) above which a plant specific evaluation is needed.	~~Same as B1.2.1, Elevated Temperature Aging Mechanism~~ Yes If applicable, the applicants aging management program to address the issue must be evaluated.

Item	Structure/ Component	Region of Interest	Material	Environment	Aging Effect	Aging Mechanism	References
B3.2.2	Steel Elements	Containment Liner, Suppression Chamber Liner, Basemat Liner, Liner Anchors	Carbon Steel	Inside and/or Outside Containment	Loss of Material	Corrosion	*Same as B1.1.1, Corrosion Aging Mechanism*
B3.2.2	Steel Elements	Suppression Chamber Liner (Interior Surface)	Stainless Steel	Inside and/or Outside Containment	Crack Initiation and Growth	Stress Corrosion Cracking	*Same as B2.2.2, Stress Corrosion Cracking Aging Mechanism*

II CONTAINMENT STRUCTURES
B BWR Containments
B3 Mark III Containments
B3.2 Concrete Containments

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
~~Same as B1.1.1, Corrosion Aging Mechanism~~ 10CFR50.55a and ASME Section XI, Subsection IWE.	~~Same as B1.1.1, Corrosion Aging Mechanism~~ See Chapter XI for an evaluation of 10CFR50.55a ASME Section XI, Subsection IWE	~~Same as B1.1.1, Corrosion Aging Mechanism~~ No
~~Same as B2.2.2, Stress Corrosion Cracking Aging Mechanism~~ 10 10CFR50, Appendix J	~~Same as B2.2.2, Stress Corrosion Cracking Aging Mechanism~~ See Chapter XI for an evaluation of 10CFR50, Appendix J	~~Same as B2.2.2, Stress Corrosion Cracking Aging Mechanism~~ No

B4. Common Components

B4.1 Penetration Sleeves, Penetration Bellows, Dissimilar Metal Welds
B4.2 Personnel Airlock, Equipment Hatch, CRD Hatch
B4.3 Subfoundation Layer
B4.4 Seals and Gaskets

B4. Common Components

Systems, Structures, and Components

Review Table II B addresses the elements of BWR containment structures. Mark I containments, Mark II containments, Mark III containments, and common components are discussed separately under subheadings B1, B2, B3, and B4, respectively. This format follows the presentation format in Section 3.4 of the draft Standard Review Plan for License Renewal (SRP-LR). Common components in Review Table II B4 include penetation sleeves and bellows; dissimilar metal welds; personnel airlock; equipment hatch; CRD hatch; subfoundation layer; and seals/gaskets.

System Interfaces

Functional interfaces include the primary containment HVAC system(VII.~~F~~), containment isolation system(V.~~A~~), containment spray system(V.~~B~~), and containment heat removal system(V.~~C~~). Physical interfaces exist with any structure, system, or component which either penetrates the containment wall, such as the main steam system(VIII.~~A~~) and feedwater systems(VIII.~~B~~,VIII.~~C~~), or is supported by the containment structure. The containment structure basemat may provide support to the NSSS components and containment internal structures.

.C .A .F3 .E?

.B2 .D2

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II CONTAINMENT STRUCTURES
B BWR Containments
B4 Common Components

Item	Structure/ Component	Region of Interest	Material	Environment	Aging Effect	Aging Mechanism	References
B4.1	—	Penetration Sleeves; ~~Penetration Bellows; Dissimilar Metal Welds~~	Carbon Steel	Inside and/or Outside Containment	Loss of Material	Corrosion	*Same as B1.1.1, Corrosion Aging Mechanism*
B4.1	—	Penetration Sleeves; Penetration Bellows; Dissimilar Metal Welds	Carbon Steel and Stainless Steel	Inside and/or Outside Containment	Cumulative Fatigue Damage	Cyclic Loading	*Same as B1.1.1, Cycling Loading Aging Mechanism*

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See Comment # 285

WILL ADDRESS AS PART OF TLAA EFFORT

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
~~*Same as B1.1.1, Corrosion Aging Mechanism*~~ 10CFR50.55a/ASME Section XI, Subsection IWE	~~*Same as B1.1.1, Corrosion Aging Mechanism*~~ See Chapter XI for an evaluation of 10CFR50.55a/ASME Section XI, Subsection IWE	~~*Same as B1.1.1, Corrosion Aging Mechanism*~~ No
Same as B1.1.1, Cycling Loading Aging Mechanism	*Same as B1.1.1, Cycling Loading Aging Mechanism*	*Same as B1.1.1, Cycling Loading Aging Mechanism*

II CONTAINMENT STRUCTURES
B BWR Containments
B4 Common Components

Item	Structure/ Component	Region of Interest	Material	Environment	Aging Effect	Aging Mechanism	References
B4.1	—	Penetration Sleeves; Penetration Bellows; Dissimilar Metal Welds	~~Carbon Steel and~~ Stainless Steel	Inside and/or Outside Containment	Crack Initiation and Growth	Stress Corrosion Cracking	*Same as B1.1.1, Stress Corrosion Cracking Aging Mechanism*
B4.2	—	Personnel Airlock; Equipment Hatch; CRD Hatch	Carbon Steel	Inside and/or Outside Containment	Loss of Material	Corrosion	*Same as B1.1.1, Corrosion Aging Mechanism*

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
~~*Same as B1.1.1, Stress Corrosion Cracking Aging Mechanism*~~	~~*Same as B1.1.1, Stress Corrosion Cracking Aging Mechanism*~~	~~*Same as B1.1.1, Stress Corrosion Cracking Aging Mechanism*~~ XI.M
10CFR50.55a/ASME Section XI, Subsection IWE (20)	See Chapter XI for an evaluation of 10CFR50.55a/ASME Section XI, Subsection IWE (20)	
Same as B1.1.1, Corrosion Aging Mechanism	*Same as B1.1.1, Corrosion Aging Mechanism*	~~*Same as B1.1.1, Corrosion Aging Mechanism*~~ XI.M

Item	Structure/ Component	Region of Interest	Material	Environment	Aging Effect	Aging Mechanism	References
B4.2	—	Personnel Airlock; Equipment Hatch; CRD Hatch	Carbon Steel	Inside and/or Outside Containment	Fretting/ Lockup	Mechanical Wear of Locks/ Hinges and Closure Mechanisms	*Same as B1.1.1, Mechanical Wear Aging Mechanism*
B4.3	—	Subfoundation Layer	Porous Concrete	Underground	Reduction in Foundation Strength	Erosion of Porous Concrete Subfoundation	NUREG-1611 NRC IN 97-11 NRC IN 98-26

II CONTAINMENT STRUCTURES
B BWR Containments
B4 Common Components

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
~~*Same as B1.1.1, Mechanical Wear Aging Mechanism*~~ 10CFR50.55a/ASME Section XI, Subsection IWE	~~*Same as B1.1.1, Mechanical Wear Aging Mechanism*~~ See Chapter XI for an evaluation of 10CFR50.55a/ ASME Section XI, Subsection IWE	~~*Same as B1.1.1, Mechanical Wear Aging Mechanism*~~ No
No specific Aging Management Program exists. NUREG-1611 identifies erosion of porous concrete subfoundation as a potential aging mechanism.	Erosion of cement from porous concrete subfoundations beneath containment basemats is described in IN 97-11. IN 98-26 identifies Maintenance Rule Structures Monitoring for managing this aging effect, if applicable. (See Chapter III.A, Class 1 Structures for evaluation of Maintenance Rule Structures Monitoring)	Yes. If applicable, plant-specific evaluation is required.

II CONTAINMENT STRUCTURES
B BWR Containments
B4 Common Components

Item	Structure/ Component	Region of Interest	Material	Environment	Aging Effect	Aging Mechanism	References
B4.4	---	Seals & Gaskets	Various	Inside and/or Outside Containment	Loss of Sealing	Deterioration of Joint Sealants, Gaskets, O-rings	10CFR50.55a ASME Section XI, Subsection IWE 10CFR50, Appendix J

II CONTAINMENT STRUCTURES
B BWR Containments
B4 Common Components

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
~~Codes and Standards~~ (10CFR50.55a), ASME Section XI, Subsection IWE	~~Aging effect will be managed by IWE.~~ Leak tightness will be monitored by Appendix J Leak Rate Tests. See ~~Sect~~ Chapter XI for an evaluation of 10CFR50.55a/ ASME Section XI, Subsection IWE.	No.

References

American Concrete Institute, ACI 201.1R-68, "Guide for Making a Condition Survey of Concrete in Service," Revised 1984.

American Concrete Institute, ACI 349.3R-96, "Evaluation of Existing Nuclear Safety-Related Concrete Structures," March 1996.

American National Standard Institute, ANSI/ANS 56.8-1994, "Containment System Leakage Testing Requirements."

American Society of Mechanical Engineers, ASME Section XI, *Rules for Inservice Inspection of Nuclear Power Plant Components*, Subsection IWE, *Requirements for Class MC and Metallic Liners of Class CC Components of Light-Water Cooled Power Plants*, 1992 Edition with 1992 Addenda. The ASME Boiler and Pressure Vessel Code, The American Society of Mechanical Engineers, New York, NY.

American Society of Mechanical Engineers, ASME Section XI, *Rules for Inservice Inspection of Nuclear Power Plant Components*, Subsection IWL, *Requirements for Class CC Concrete Components of Light-Water Cooled Power Plants*, 1992 Edition with 1992 Addenda. The ASME Boiler and Pressure Vessel Code, The American Society of Mechanical Engineers, New York, NY.

American Society for Testing and Materials, ASTM D5163-96, "Standard Guide for Establishing Procedures to Monitor the Performance of Safety Related Coatings in an Operating Nuclear Power Plant."

Code of Federal Regulations: 10CFR50, Appendix J, "Primary Reactor Containment Leakage Testing for Water Cooled Power Reactors."

Code of Federal Regulations: 10CFR50.55a, "Codes and Standards."

Code of Federal Regulations: 10CFR50.72, "Immediate Notification Requirements for Operating Nuclear Power Reactors."

Code of Federal Regulations: 10CFR50.73, "Licensee Event Report System."

Code of Federal Regulations: 10CFR54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants."

NRC Generic Letter 98-04, "Potential for Degradation of the Emergency Core Cooling System and the Containment Spray System After a Loss-Of-Coolant Accident Because of Construction and Protective Coating Deficiencies and Foreign Material in Containment," July 14, 1998.

NRC Information Notice 92-20, "Inadequate Local Leak Rate Testing," March 3, 1992.

NRC Information Notice 97-10, "Liner Plate Corrosion in Concrete Containment," March 13, 1997.

NRC Information Notice 97-11, "Cement Erosion from Containment Subfoundations at Nuclear Power Plants," March 21, 1997.

NRC Information Notice 98-26, "Settlement Monitoring and Inspection of Plant Structures Affected by Degradation of Porous Concrete Subfoundations," July 24, 1998.

NRC Information Notice 99-10, "Degradation of Prestressing Tendon Systems in Prestressed Concrete Containments," April 13, 1999.

NRC Regulatory Guide 1.35.1, "Determining Prestressing Forces for Inspection of Prestressed Concrete Containments," July 1990.

NRC Regulatory Guide 1.163, "Performance-Based Containment Leak-Test Program," September 1995.

NRC Draft Regulatory Guide DG-1076, "Service Level I, II, and III Protective Coatings Applied to Nuclear Power Plants," February 1999.

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

NUREG-1611, "Aging Management of Nuclear Power Plant Containments for License Renewal," September 1997.

Nuclear Energy Institute, NEI 94-01, "Industry Guideline for Implementing Performance-Based Option of 10CFR Part 50, Appendix J," Revision 0, July 26, 1995.

GALL REPORT-CIVIL/STRUCTURAL COMMENTS
SECTION IIB

Comment Number	GALL Section	ITEM NO.	Page	COMMENT
13	Various	Sys. Interface	II B1-3 II B2-3	System Interfaces Section, the references to interfaces do not match the GALL Table of Contents. The references should be changed to the following: Containment HVAC system (VII.F3), containment isolation system (V.C), containment spray system (V.A), and containment heat removal system (V.E), main steam system (VIII.B1), and feedwater system (VIII.D1).
263	B1	B1.1.1	II B1-4	The scope should be consistent with the scope defined by IWE.
19	ALL			The discussion of 50.55a and IWE is contained in proposed GALLChapter XI.
264	B1	B1.1.1	II B1-5	The "Further Evaluation" column implies there are additional requirements for inservice inspection of inaccessible areas when there are no indications of degradation for (adjacent, nearby) accessible areas. These implications should be removed. BASIS: Implying such requirements is tantamount to additional rulemaking over and above 10 CFR 50.55a without adhering to the rulemaking process This same comment applies to other portions of the report related to inservice inspection of inaccessible areas.
226	B1	B1.1.1	II B1-5	The last item in "Further Evaluation" states that Relief from IWE must be evaluated to determine their significance to license renewal. If the basis for relief is adequate for the current license, it would be adequate for the period of extended operation. Recommend deleting this last paragraph from the Further Evaluation column.
75	B1	B1.1.1	II B1-11 II B1-15	The discussion of Appendix J and Coatings Programs should be deleted. BASIS: IWE is acceptable as a stand-alone program.
267	B1	B1.1.1	II B1-16	This item should not be considered as a TLAA. BASIS: Containment Bellows are designed to B31.1 or Class 2 of ASME Section III. None of these Design Basis Codes require a fatigue analysis, implicit or explicit.
268	B1	B1.1.1	II B1-16	The only items subject to a fatigue analysis within the current licensing basis for BWRs, are the components affected by the MARK 1 and MARK 2 Containment Loads program to address LOCA Blowdown loads, Chugging and SRV discharge loads. The typical components affected are the suppression pool, vent header, torus penetrations and attached piping. The plant specific analyses assumed a cyclic life for 40 years of projected SRV discharges. This issue also has been identified as a potential TLAA for BWRs. The EPRI-NEI Industry Report for the BWR Containment provides the details and references for this generic issue. We will capture this item in our effort to identify TLAAs for inclusion in the Standard Review Plan.
270	B1	B1.1.1	II B1-16	The components identified are more likely covered under ASME XI-IWF, Component Supports, and not IWE or Appendix J. Recommend considering these items in GALL Chapter III, Section B1.
327	B1	B1.1.1	II B1-17	The Evaluation and Technical Basis column contains a potential requirement for augmented VT-1 inspection as a supplement to the requirements of ASME Section XI,

GALL REPORT-CIVIL/STRUCTURAL COMMENTS
SECTION IIB

				Subsection IWE, Examination Categories E-F and E-B. BASIS: This supplementary requirement is not justified.
271	B1	B1.2.1	II B1-18	The section dealing with BWR Mark I Concrete containments should be deleted. BASIS: There is only one BWR with a MARK 1 Concrete Containment and we question the need to evaluate that single containment in the GALL report. For purposes of GALL, we believe the evaluation of BWR MARK 1 concrete containment is similar to the evaluation provided for a PWR concrete containment.
276	B2	B2.1.1	II B2-4	Cyclic Loading and fatigue needs to be identified as a TLAA. We will capture this item during our review of TLAAs to include in the Standard Review Plan.,.
20	Generic			GENERIC COMMENT: When sections reference back to previous sections we suggest repeating the text from the referenced section. In most cases, the reference is to an aging management program in which case the evaluation is in proposed GALL Chapter XI.
225	B2	B2.2.1	II B2-8	Environment should be "Outside Containment." BASIS:
246	B2	B2.2.1	II B2-9	There are licensees (typically those with plants situated on soil or on piles) whose Current Licensing Basis includes settlement and therefore, have a settlement monitoring program in place. If no settlement was evident during the first decade or so, the NRC may have given the licensee approval to discontinue the program. In these cases, no further proof of absence of settlement should be required.
277	B2	B2.2.3	II B2-12	Delete Item B2.2.3. BASIS: There are no BWR Mark 2 Containments with unbonded prestressing systems.
280	B3	B3.1.1	II B3-4	There are no "Embedded Shell Regions" in the Mark 3 design. Delete reference to this item.
281	B3	B3.1.2	II B3-6	Delete item.B3.1.2 BASIS: The concrete fill in the Mark 3 annulus is not subject to Leaching of Calcium hydroxide or aggressive chemicals as it is protected by the outer reinforced concrete shell from exterior exposure and by the steel shell from interior exposure.
282	B3	B3.1.2	II B3-8	In addition to the temperature limits given for continuous exposure (<150F general and <200F local), the provisions of the Design Code, ASME Section III Division 2, CC-3440, for occasional abnormal exposure should also be included here (350F for concrete surface and 650F for steam impingement).
283	B3	B3.2.1	II B3-14	In addition to the Basemat, Piles need to be addressed for settlement.
284	B4	B4.1	II B4-4	Delete Penetration Bellows from the Region Of interest column. Bellows are made of stainless steel and are not subject to corrosion.
285	B4	B4.1	II B4-4	Cyclic loading only applies to some penetrations and torus-attached piping which are required to have a fatigue analysis under the Containment Loads Program. We will address this item in our effort to identify TLAAs for inclusion in the Standard Review Plan.
286	B4	B4.1	II B4-6	Delete Carbon steel from the Material column, stress corrosion cracking is not an aging mechanism for carbon steel.

CHAPTER II B

BOILING WATER REACTOR (BWR) CONTAINMENTS

Major BWR Containments

B1. Mark I Containments

B2. Mark II Containments

B3. Mark III Containments

B4. Common Components

B1. Mark I Containments

B1.1 Steel Containments

B1.1.1 Steel Elements

B1.2 Concrete Containments

B1.2.1 Concrete Elements

B1.2.2 Steel Elements

B1. Mark I Containments

Systems, Structures, and Components

Review Table II B addresses the elements of BWR containment structures. Mark I containments, Mark II containments, Mark III containments, and common components are discussed separately under subheadings B1, B2, B3, and B4, respectively. This format follows the presentation format in Section 3.4 of the draft Standard Review Plan for License Renewal (SRP-LR). Mark I Concrete containments in Review Table II B1 are divided into three elements: concrete, steel, and prestressing system.

System Interfaces

Functional interfaces include the primary containment HVAC system(VII.F3), containment isolation system(V.C), containment spray system(V.A), and containment heat removal system(V.E). Physical interfaces exist with any structure, system, or component which either penetrates the containment wall, such as the main steam system(VIII.B2) and feedwater systems(VIII.D2), or is supported by the containment structure. The containment structure basemat may provide support to the NSSS components and containment internal structures.

II CONTAINMENT STRUCTURES
B BWR Containments
B1 Mark I Containments
B1.1 Steel Containments

Item	Structure/ Component	Region of Interest	Material	Environment	Aging Effect	Aging Mechanism	References
B1.1.1	Steel Elements	Drywell; Torus; Drywell Head; Embedded Shell and Sand Pocket Regions; Drywell Support Skirt; Torus Ring Girder, Seismic Restraints, and Support Saddles/ Columns; Vent Lines, Header, and System Supports; Down-comers and Bracing; ECCS Suction Header. The scope of components identified in this column should be consistent with ASME Section XI, Subsection IWE.	Carbon Steel	Inside and/or Outside Contain-ment	Loss of Material	Corrosion	10CFR50.55a ASME Section XI, Subsection IWE 10CFR50, Appendix J NUREG-1611 Draft Regulatory Guide DG-1076

II CONTAINMENT STRUCTURES
B BWR Containments
B1 Mark I Containments
B1.1 Steel Containments

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
10CFR50.55a/ASME Section XI, Subsection IWE	See Chapter XI for an evaluation of 10CFR50.55a/ASME Code Section XI, Subsection IWE.	No

II CONTAINMENT STRUCTURES

B BWR Containments

B1 Mark I Containments

B1.1 Steel Containments

Item	Structure/ Component	Region of Interest	Material	Environ-ment	Aging Effect	Aging Mechanism	References

II CONTAINMENT STRUCTURES
B BWR Containments
B1 Mark I Containments
B1.1 Steel Containments

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation

II CONTAINMENT STRUCTURES

B BWR Containments

B1 Mark I Containments

B1.1 Steel Containments

Item	Structure/ Component	Region of Interest	Material	Environ-ment	Aging Effect	Aging Mechanism	References

II CONTAINMENT STRUCTURES
B BWR Containments
B1 Mark I Containments
B1.1 Steel Containments

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation

II CONTAINMENT STRUCTURES
B BWR Containments
B1 Mark I Containments
B1.1 Steel Containments

Item	Structure/ Component	Region of Interest	Material	Environ-ment	Aging Effect	Aging Mechanism	References
							10CFR50.72 10CFR50.73 10CFR50, Appendix J Regulatory Guide 1.163 NEI 94-01 ANSI/ANS 56.8-1994

II CONTAINMENT STRUCTURES
B BWR Containments
B1 Mark I Containments
B1.1 Steel Containments

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation

II CONTAINMENT STRUCTURES
B BWR Containments
B1 Mark I Containments
B1.1 Steel Containments

Item	Subsystem	Component	Material	Environment	Aging Effect	Aging Mechanism	References

II CONTAINMENT STRUCTURES

B BWR Containments

B1 Mark I Containments

B1.1 Steel Containments

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation

II CONTAINMENT STRUCTURES

B BWR Containments

B1 Mark I Containments

B1.1 Steel Containments

Item	Subsystem	Component	Material	Environment	Aging Effect	Aging Mechanism	References

II CONTAINMENT STRUCTURES
B BWR Containments
B1 Mark I Containments
B1.1 Steel Containments

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation

II CONTAINMENT STRUCTURES
B BWR Containments
B1 Mark I Containments
B1.1 Steel Containments

Item	Structure/ Component	Region of Interest	Material	Environ-ment	Aging Effect	Aging Mechanism	References
B1.1.1	Steel Elements	Vent Line Bellows	Stainless Steel	Inside and/or Outside Contain-ment	Crack Initiation and Growth	Stress Corrosion Cracking	*Same as B1.1.1, Corrosion Aging Mechanism* IN 92-20
B1.1.1	Steel Elements	Drywell Head; Down-comers	Carbon Steel and Graphite Plate	Inside and/or Outside Contain-ment	Fretting/ Lockup	Mechanical Wear	10CFR50.55a ASME Section XI, Subsection IWE 10CFR50, Appendix J

II CONTAINMENT STRUCTURES
B BWR Containments
B1 Mark I Containments
B1.1 Steel Containments

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
10CFR50.55a/ASME Section XI, Subsection IWE	See Chapter XI for an evaluation of 10CFR50.55a/ASME Section XI, Subsection IWE.	No
10CFR50.55a/ASME Section XI, Subsection IWE	See Chapter XI for an evaluation of 10CFR50.55a/ASME Section XI, Subsection IWE	No.

B2. Mark II Containments

B2.1 Steel Containments
B2.1.1 Steel Elements

B2.2 Concrete Containments
B2.2.1 Concrete Elements
B2.2.2 Steel Elements
B2.2.3 Prestressing System

B2. Mark II Containments

Systems, Structures, and Components

Review Table II B addresses the elements of BWR containment structures. Mark I containments, Mark II containments, Mark III containments, and common components are discussed separately under subheadings B1, B2, B3, and B4, respectively. This format follows the presentation format in Section 3.4 of the draft Standard Review Plan for License Renewal (SRP-LR). In Review Table II B2, Mark II Concrete containments are divided into three elements: concrete, steel, and prestressing system and Mark II Steel containments are divided into two elements: steel and concrete.

System Interfaces

Functional interfaces include the primary containment HVAC system(VII.F3), containment isolation system(V.C), containment spray system(V.A), and containment heat removal system(V.E). Physical interfaces exist with any structure, system, or component which either penetrates the containment wall, such as the main steam system(VIII.A) and feedwater systems(VIII.D2), or is supported by the containment structure. The containment structure basemat may provide support to the NSSS components and containment internal structures.

II CONTAINMENT STRUCTURES
B BWR Containments
B2 Mark II Containments
B2.1 Steel Containments

Item	Structure/ Component	Region of Interest	Material	Environment	Aging Effect	Aging Mechanism	References
B2.1.1	Steel Elements	Drywell; Suppression Chamber; Drywell Head; Embedded Shell and Sand Pocket Regions; Support Skirt; Downcomer Pipes & Bracing; Region Shielded by Diaphragm Floor	Carbon Steel	Inside and/or Outside Containment	Loss of Material	Corrosion	*Same as B1.1.1, Corrosion Aging Mechanism*
B2.1.1	Steel Elements	Drywell Head; Downcomer Pipes & Bracing	Carbon Steel	Inside and/or Outside Containment	Fretting/ Lockup	Mechanical Wear	*Same as B1.1.1, Mechanical Wear Aging Mechanism*

II CONTAINMENT STRUCTURES
B BWR Containments
B2 Mark II Containments
B2.1 Steel Containments

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
10CFR50.55a/ASME Section XI, Subsection IWE	See Chapter XI for an evaluation of 10CFR50.55a/ASME Section XI, Subsection IWE	No
10CFR50.55a/ASME Section XI, Subsection IWE	See Chapter XI for an evaluation of 10CFR50.55a/ASME Section XI, Subsection IWE	No.

II CONTAINMENT STRUCTURES
B BWR Containments
B2 Mark II Containments
B2.2 Concrete Containments

Item	Structure/ Component	Region of Interest	Material	Environment	Aging Effect	Aging Mechanism	References
B2.2.1	Concrete Elements	Containment; Basemat	Concrete	Inside and/or Outside Containment	Increase in Porosity, Permeability; Scaling, Cracking, Spalling	Leaching of Calcium Hydroxide; Aggressive Chemical Attack	*Same as B1.2.1, Aggressive Chemical Attack Aging Mechanism*
B2.2.1	Concrete Elements	Containment; Basemat	Concrete	Inside and/or Outside Containment	Expansion & Cracking	Reaction with Aggregates	*Same as B1.2.1, Reaction with Aggregates Aging Mechanism*
B2.2.1	Concrete Elements	Containment; Basemat; Reinforcing Steel	Concrete; Carbon Steel	Inside and/or Outside Containment	Cracking, Spalling, Loss of Bond, Loss of Material	Corrosion of Embedded Steel	*Same as B1.2.1, Corrosion of Embedded Steel Aging Mechanism*

II CONTAINMENT STRUCTURES
B BWR Containments
B2 Mark II Containments
B2.2 Concrete Containments

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
10CFR50.55a/ASME Section XI, Subsection IWL	See Chapter XI for an evaluation of 10CFR50.55a/ASME Section XI, Subsection IWL	nO
10CFR50.55a/ASME Section XI, Subsection IWL	See Chapter XI for an evaluation of 10CFR50.55a/ASME Section XI, Subsection IWL	No
10CFR50.55a/ASME Section XI, Subsection IWL	See Chapter XI for an evaluation of 10CFR50.55a/ASME Section XI, Subsection IWL	No

II CONTAINMENT STRUCTURES
B BWR Containments
B2 Mark II Containments
B2.2 Concrete Containments

Item	Structure/ Component	Region of Interest	Material	Environment	Aging Effect	Aging Mechanism	References
B2.2.1	Concrete Elements	Basemat	Concrete	Outside Containment	Cracks; Distortion; Increase in Component Stress Level	Settlement	NUREG-1611
B2.2.1	Concrete Elements	Containment; Concrete Fill in Annulus; Basemat	Concrete	Inside and/or Outside Containment	Loss of Strength and Modulus	Elevated Temperature	*Same as B1.2.1, Elevated Temperature Aging Mechanism*

II CONTAINMENT STRUCTURES
B BWR Containments
B2 Mark II Containments
B2.2 Concrete Containments

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
No mandated Aging Management Program exists. NUREG-1611 identifies the need for a settlement monitoring program, if the prerequisite conditions exist. ACI 349.3R-96 provides guidance for addressing settlement. Note: Cracks, distortions, and increses in component stress levels may not require management because settlement is not plausible for the particular site.	Settlement is not addressed by 10 CFR 50.55a or IWL. NUREG-1611 specifies that a settlement monitoring program is needed for a containment structure/basemat resting on soil or piles, or if the site experiences significant changes in ground water conditions.	Yes. If applicable, the applicant's aging manage-ment program to address this issue must be evaluated.
No mandated aging management program exits. NUREG-1611 identifies the need for plant-specific evaluation; if the prerequisite conditions exist.	The implementation of 10CFr50.55a and IWL would not be able to identify the loss of strength and mosulus due to elevated temperature. Thus, for any portions of concrete containment that exceed specified temperature limits, further evaluations are warranted. NUREG-1611 specifies the temperature limits, both general (150°F) and local (200°F) above which a plant specific evaluation is needed.	*Same as B1.2.1, Elevated Tempera-ture Aging Mechanism*

II CONTAINMENT STRUCTURES
B BWR Containments
B2 Mark II Containments
B2.2 Concrete Containments

Item	Structure/ Component	Region of Interest	Material	Environment	Aging Effect	Aging Mechanism	References
B2.2.2	Steel Elements	Drywell, Suppression Chamber and Basemat Liners; Liner Anchors; Drywell Head; Downcomer Pipes & Bracing	Carbon Steel	Inside and/or Outside Containment	Loss of Material	Corrosion	*Same as B1.2.2, Corrosion Aging Mechanism*
B2.2.2	Steel Elements	Suppression Chamber Liner (Interior Surface)	Stainless Steel	Inside and/or Outside Containment	Crack Initiation and Growth	Stress Corrosion Cracking	*Same as B1.1.1, Stress Corrosion Cracking Aging Mechanism*

II CONTAINMENT STRUCTURES
B BWR Containments
B2 Mark II Containments
B2.2 Concrete Containments

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
10CFR50.55a/ASME Section XI, Subsection IWE	See Chapter XI for an evaluation of 10CFR50.55a/ASME Section XI, Subsection IWE	No
10CFR50.55a/ASME Section XI, Subsection IWE	See Chapter XI for an evaluation of 10CFR50.55a/ASME Section XI, Subsection IWE and an evaluation of 10CFR50, Appendix J.	No.

II CONTAINMENT STRUCTURES
B BWR Containments
B2 Mark II Containments
B2.2 Concrete Containments

Item	Structure/ Component	Region of Interest	Material	Environment	Aging Effect	Aging Mechanism	References
B2.2.2	Steel Elements	Drywell Head; Downcomer Pipes & Bracing	Carbon Steel	Inside and/or Outside Containment	Fretting/ Lockup	Mechanical Wear	*Same as B1.1.1, Mechanical Wear Aging Mechanism*

II CONTAINMENT STRUCTURES
B BWR Containments
B2 Mark II Containments
B2.2 Concrete Containments

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
10CFR50.55a/ASME Section XI, Subsection IWE	See Chapter XI for an evaluation of 10CFR50.55a/ASME Section XI, Subsection IWE	No

II CONTAINMENT STRUCTURES
B BWR Containments
B2 Mark II Containments
B2.2 Concrete Containments

Item	Subsystem	Component	Material	Environment	Aging Effect	Aging Mechanism	References

II CONTAINMENT STRUCTURES
B BWR Containments
B2 Mark II Containments
B2.2 Concrete Containments

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation

II CONTAINMENT STRUCTURES
B BWR Containments
B2 Mark II Containments
B2.2 Concrete Containments

Item	Structure/ Component	Region of Interest	Material	Environ-ment	Aging Effect	Aging Mechanism	References

II CONTAINMENT STRUCTURES
B BWR Containments
B2 Mark II Containments
B2.2 Concrete Containments

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation

B3. Mark III Containments

B3.1 Steel Containments
- B3.1.1 Steel Elements
- B3.1.2 Concrete Elements

B3.2 Concrete Containments
- B3.2.1 Concrete Elements
- B3.2.2 Steel Elements

B3. Mark III Containments

Systems, Structures, and Components

Review Table II B addresses the elements of BWR containment structures. Mark I containments, Mark II containments, Mark III containments, and common components are discussed separately under subheadings B1, B2, B3, and B4, respectively. This format follows the presentation format in Section 3.4 of the draft Standard Review Plan for License Renewal (SRP-LR). In Review Table II B3, Mark III Concrete containments are divided into three elements: concrete, steel, and prestressing system and Mark III Steel containments are divided into two elements: steel and concrete.

System Interfaces

Functional interfaces include the primary containment HVAC system(VII.F3), containment isolation system(V.C), containment spray system(V.A), and containment heat removal system(V.E). Physical interfaces exist with any structure, system, or component which either penetrates the containment wall, such as the main steam system(VIII.B2) and feedwater systems(VIII.D2), or is supported by the containment structure. The containment structure basemat may provide support to the NSSS components and containment internal structures.

II CONTAINMENT STRUCTURES

B BWR Containments

B3 Mark III Containments

B3.1 Steel Containments

Item	Structure/ Component	Region of Interest	Material	Environment	Aging Effect	Aging Mechanism	References
B3.1.1	Steel Elements	Containment Shell; Suppression Chamber Shell; Basemat Liner; Liner Anchors	Carbon Steel	Inside and/or Outside Containment	Loss of Material	Corrosion	*Same as B1.1.1, Corrosion Aging Mechanism*
B3.1.1	Steel Elements	Suppression Chamber Shell (Interior Surface)	Stainless Steel	Inside and/or Outside Containment	Crack Initiation and Growth	Stress Corrosion Cracking	*Same as B1.1.1, Stress Corrosion Cracking Aging Mechanism*

II CONTAINMENT STRUCTURES
B BWR Containments
B3 Mark III Containments
B3.1 Steel Containments

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
10CFR50.55a/ASME Section XI, Subsection IWE	See Chapter XI for an evaluation of 10CFR50.55a/ASME Section XI, Subsection IWE	No
10CFR50.55a/ASME Section XI, Subsection IWE	See Chapter XI for an evaluation of 10CFR50.55a/ASME Section XI, Subsection IWE and 10CFR50, Appendix J. Aging effect will be managed by Examination Category E-P (10 CFR 50, Appendix J, Integrated Leak Rate Test).	No.

II CONTAINMENT STRUCTURES
B BWR Containments
B3 Mark III Containments
B3.1 Steel Containments

Item	Structure/ Component	Region of Interest	Material	Environ-ment	Aging Effect	Aging Mechanism	References
B3.1.2	Concrete Elements	Basemat; Concrete Fill in Annulus	Concrete	Inside and/or Outside Contain-ment	Expansion & Cracking	Reaction with Aggregates	*Same as B1.2.1, Reaction with Aggregates Aging Mechanism*
B3.1.2	Concrete Elements	Basemat and Reinforcing Steel	Concrete; Carbon Steel	Inside and/or Outside Contain-ment	Cracking, Spalling, Loss of Bond, Loss of Material	Corrosion of Embedded Steel	*Same as B1.2.1, Corrosion of Embedded Steel Aging Mechanism*

II CONTAINMENT STRUCTURES
B BWR Containments
B3 Mark III Containments
B3.1 Steel Containments

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
10CFR50.55a/ASME Section XI, Subsection IWL	See Chapter XI for an evaluation of 10CFR50.55a/ASME Section XI, Subsection IWL	No
10CFR50.55a/ASME Section XI, Subsection IWL	See Chapter XI for an evaluation of 10CFR50.55a/ASME Section XI, Subsection IWL	No

II CONTAINMENT STRUCTURES

B BWR Containments

B3 Mark III Containments

B3.1 Steel Containments

Item	Structure/ Component	Region of Interest	Material	Environment	Aging Effect	Aging Mechanism	References
B3.1.2	Concrete Elements	Basemat	Concrete	Inside and/or Outside Containment	Cracks; Distortion; Increase in Component Stress Level	Settlement	*Same as B2.2.1, Settlement Aging Mechanism*
B3.1.2	Concrete Elements	Basemat; Concrete Fill in Annulus	Concrete	Inside and/or Outside Containment	Loss of Strength and Modulus	Elevated Temperature Also includes temperature limits for abnormal exposure (350°F for concrete surface and 650°F for steam impingment)	*Same as B1.2.1, Elevated Temperature Aging Mechanism* ASME III, Div. 2, CC-3440

II CONTAINMENT STRUCTURES
B BWR Containments
B3 Mark III Containments
B3.1 Steel Containments

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
No mandated Aging Management Program exists. NUREG-1611 identifies the need for a settlement monitoring program, if the prerequisite conditions exist. ACI 349.3R-96 provides guidance for addressing settlement. Note: Cracks, distortions, and increses in component stress levels may not require management because settlement is not plausible for the particular site.	Settlement is not addressed by 10 CFR 50.55a or IWL. NUREG-1611 specifies that a settlement monitoring program is needed for a containment structure/basemat resting on soil or piles, or if the site experiences significant changes in ground water conditions.	Yes. If applicable, the applicant's aging manage-ment program to address this issue must be evaluated.
No mandated aging management program exits. NUREG-1611 identifies the need for plant-specific evaluation; if the prerequisite conditions exist.	The implementation of 10CFr50.55a and IWL would not be able to identify the loss of strength and mosulus due to elevated temperature. Thus, for any portions of concrete containment that exceed specified temperature limits, further evaluations are warranted. NUREG-1611 specifies the temperature limits, both general (150°F) and local (200°F) above which a plant specific evaluation is needed.	*Same as B1.2.1, Elevated Tempera-ture Aging Mechanism*

II CONTAINMENT STRUCTURES
B BWR Containments
B3 Mark III Containments
B3.2 Concrete Containments

Item	Structure/ Component	Region of Interest	Material	Environment	Aging Effect	Aging Mechanism	References
B3.2.1	Concrete Elements	Dome, Wall, Basemat	Concrete	Inside and/or Outside Containment	Scaling, Cracking, Spalling	Freeze/ Thaw	*Same as B1.2.1, Aggressive Chemical Attack Aging Mechanism*
B3.2.1	Concrete Elements	Dome, Wall, Basemat	Concrete	Inside and/or Outside Containment	Increase in Porosity, Permeability; Scaling, Cracking, Spalling	Leaching of Calcium Hydroxide; Aggressive Chemical Attack	*Same as B1.2.1, Aggressive Chemical Attack Aging Mechanism*

II CONTAINMENT STRUCTURES
B BWR Containments
B3 Mark III Containments
B3.2 Concrete Containments

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
10CFR50.55a/ASME Section XI, Subsection IWL	See Chapter XI for an evaluation of 10CFR50.55a/ASME Section XI, Subsection IWL	No
10CFR50.55a/ASME Section XI, Subsection IWL	See Chapter XI for an evaluation of 10CFR50.55a/ASME Section XI, Subsection IWL	No

II CONTAINMENT STRUCTURES
B BWR Containments
B3 Mark III Containments
B3.2 Concrete Containments

Item	Structure/ Component	Region of Interest	Material	Environment	Aging Effect	Aging Mechanism	References
B3.2.1	Concrete Elements	Dome, Wall, Basemat	Concrete	Inside and/or Outside Containment	Expansion & Cracking	Reaction with Aggregates	*Same as B1.2.1, Reaction with Aggregates Aging Mechanism*
B3.2.1	Concrete Elements	Dome, Wall, Basemat, Reinforcing Steel	Concrete; Carbon Steel	Inside and/or Outside Containment	Cracking, Spalling, Loss of Bond, Loss of Material	Corrosion of Embedded Steel	*Same as B1.2.1, Corrosion of Embedded Steel Aging Mechanism*

II CONTAINMENT STRUCTURES
B BWR Containments
B3 Mark III Containments
B3.2 Concrete Containments

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
10CFR50.55a/ASME Section XI, Subsection IWL	See Chapter XI for an evaluation of 10CFR50.55a/ASME Section XI, Subsection IWL	No
10CFR50.55a/ASME Section XI, Subsection IWL	See Chapter XI for an evaluation of 10CFR50.55a/ASME Section XI, Subsection IWL	No

II CONTAINMENT STRUCTURES
B BWR Containments
B3 Mark III Containments
B3.2 Concrete Containments

Item	Structure/ Component	Region of Interest	Material	Environment	Aging Effect	Aging Mechanism	References
B3.2.1	Concrete Elements	Basemat and piles	Concrete	Inside and/or Outside Containment	Cracks; Distortion; Increase in Component Stress Level	Settlement	*Same as B2.2.1, Settlement Aging Mechanism*
B3.2.1	Concrete Elements	Dome, Wall, Basemat	Concrete	Inside and/or Outside Containment	Loss of Strength and Modulus	Elevated Temperature Also includes temperature limits for abnormal exposure (350°F for concrete surface and 650°F for steam impingment.	*Same as B1.2.1, Elevated Temperature Aging Mechanism* ASME III, Div.2, CC-3440

II CONTAINMENT STRUCTURES
B BWR Containments
B3 Mark III Containments
B3.2 Concrete Containments

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
No mandated Aging Management Program exists. NUREG-1611 identifies the need for a settlement monitoring program, if the prerequisite conditions exist. ACI 349.3R-96 provides guidance for addressing settlement. Note: Cracks, distortions, and increses in component stress levels may not require management because settlement is not plausible for the particular site.	Settlement is not addressed by 10 CFR 50.55a or IWL. NUREG-1611 specifies that a settlement monitoring program is needed for a containment structure/basemat resting on soil or piles, or if the site experiences significant changes in ground water conditions.	Yes. If applicable, the applicant's aging manage-ment program to address this issue must be evaluated.
No mandated aging management program exits. NUREG-1611 identifies the need for plant-specific evaluation; if the prerequisite conditions exist.	The implementation of 10CFr50.55a and IWL would not be able to identify the loss of strength and mosulus due to elevated temperature. Thus, for any portions of concrete containment that exceed specified temperature limits, further evaluations are warranted. NUREG-1611 specifies the temperature limits, both general (150°F) and local (200°F) above which a plant specific evaluation is needed.	Yes. If applicable, the applicant's aging manage-ment program to address this issue must be evaluated.

II CONTAINMENT STRUCTURES
B BWR Containments
B3 Mark III Containments
B3.2 Concrete Containments

Item	Structure/ Component	Region of Interest	Material	Environment	Aging Effect	Aging Mechanism	References
B3.2.2	Steel Elements	Containment Liner, Suppression Chamber Liner, Basemat Liner, Liner Anchors	Carbon Steel	Inside and/or Outside Containment	Loss of Material	Corrosion	*Same as B1.1.1, Corrosion Aging Mechanism*
B3.2.2	Steel Elements	Suppression Chamber Liner (Interior Surface)	Stainless Steel	Inside and/or Outside Containment	Crack Initiation and Growth	Stress Corrosion Cracking	*Same as B2.2.2, Stress Corrosion Cracking Aging Mechanism*

II CONTAINMENT STRUCTURES
B BWR Containments
B3 Mark III Containments
B3.2 Concrete Containments

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
10CFR50.55a/ASME Code Section XI, Subsection IWE.	See Chapter XI for an evaluation of 10CFR50.55a/ASME Code Section XI, Subsection IWE.	No
10CFR50.55a/ASME Code Section XI, Subsection IWE. 10CFR50, Appendix J	See Chapter XI for an evaluation of 10CFR50.55a/ASME Code Section XI, Subsection IWE and an evaluation of 10CFR 50, Appendix J.	No

B4. Common Components

B4.1 Penetration Sleeves, Penetration Bellows, Dissimilar Metal Welds
B4.2 Personnel Airlock, Equipment Hatch, CRD Hatch
B4.3 Subfoundation Layer
B4.4 Seals and Gaskets

B4. Common Components

Systems, Structures, and Components

Review Table II B addresses the elements of BWR containment structures. Mark I containments, Mark II containments, Mark III containments, and common components are discussed separately under subheadings B1, B2, B3, and B4, respectively. This format follows the presentation format in Section 3.4 of the draft Standard Review Plan for License Renewal (SRP-LR). Common components in Review Table II B4 include penetation sleeves and bellows; dissimilar metal welds; personnel airlock; equipment hatch; CRD hatch; subfoundation layer; and seals/gaskets.

System Interfaces

Functional interfaces include the primary containment HVAC system(VII.F3), containment isolation system(V.C), containment spray system(V.A), and containment heat removal system(V.E). Physical interfaces exist with any structure, system, or component which either penetrates the containment wall, such as the main steam system(VIII.B2) and feedwater systems(VIII.D2), or is supported by the containment structure. The containment structure basemat may provide support to the NSSS components and containment internal structures.

II CONTAINMENT STRUCTURES
B BWR Containments
B4 Common Components

Item	Structure/ Component	Region of Interest	Material	Environment	Aging Effect	Aging Mechanism	References
B4.1	---	Penetration Sleeves; Penetration Bellows	Carbon Steel	Inside and/or Outside Containment	Loss of Material	Corrosion	*Same as B1.1.1, Corrosion Aging Mechanism*
B4.1	---	Penetration Sleeves; Penetration Bellows; Dissimilar Metal Welds	Carbon Steel and Stainless Steel	Inside and/or Outside Containment	Cumulative Fatigue Damage	Cyclic Loading	*Same as B1.1.1, Cycling Loading Aging Mechanism*

II CONTAINMENT STRUCTURES
B BWR Containments
B4 Common Components

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
10CFR50.55a/ASME Code Section XI, Subsection IWE.	See Chapter XI for an evaluation of 10CFR50.55a/ASME Code Section XI, Subsection IWE.	No
Same as B1.1.1, Cycling Loading Aging Mechanism	*Same as B1.1.1, Cycling Loading Aging Mechanism*	*Same as B1.1.1, Cycling Loading Aging Mechanism*

II CONTAINMENT STRUCTURES
B BWR Containments
B4 Common Components

Item	Structure/ Component	Region of Interest	Material	Environment	Aging Effect	Aging Mechanism	References
B4.1	---	Penetration Sleeves; Penetration Bellows; Dissimilar Metal Welds	Stainless Steel	Inside and/or Outside Containment	Crack Initiation and Growth	Stress Corrosion Cracking	*Same as B1.1.1, Stress Corrosion Cracking Aging Mechanism*
B4.2	---	Personnel Airlock; Equipment Hatch; CRD Hatch	Carbon Steel	Inside and/or Outside Containment	Loss of Material	Corrosion	*Same as B1.1.1, Corrosion Aging Mechanism*

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
10CFR50.55a/ASME Code Section XI, Subsection IWE.	See Chapter XI for an evaluation of 10CFR50.55a/ASME Code Section XI, Subsection IWE.	No
10CFR50.55a/ASME Code Section XI, Subsection IWE.	See Chapter XI for an evaluation of 10CFR50.55a/ASME Code Section XI, Subsection IWE.	No

Item	Structure/ Component	Region of Interest	Material	Environment	Aging Effect	Aging Mechanism	References
B4.2	---	Personnel Airlock; Equipment Hatch; CRD Hatch	Carbon Steel	Inside and/or Outside Containment	Fretting/ Lockup	Mechanical Wear of Locks/ Hinges and Closure Mechanisms	*Same as B1.1.1, Mechanical Wear Aging Mechanism*
B4.3	---	Subfoundation Layer	Porous Concrete	Underground	Reduction in Foundation Strength	Erosion of Porous Concrete Subfoundation	NUREG-1611 NRC IN 97-11 NRC IN 98-26

II CONTAINMENT STRUCTURES
B BWR Containments
B4 Common Components

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
10CFR50.55a/ASME Section XI, Subsection IWE	See Chapter XI for an evaluation of 10CFR50.55a/ASME Section XI, Subsection IWE	No
No specific Aging Management Program exists. NUREG-1611 identifies erosion of porous concrete subfoundation as a potential aging mechanism.	Erosion of cement from porous concrete subfoundations beneath containment basemats is described in IN 97-11. IN 98-26 identifies Maintenance Rule Structures Monitoring for managing this aging effect, if applicable. (See Chapter III.A, Class 1 Structures for evaluation of Maintenance Rule Structures Monitoring)	Yes. If applicable, plant-specific evaluation is required.

II CONTAINMENT STRUCTURES

B BWR Containments

B4 Common Components

Item	Structure/ Component	Region of Interest	Material	Environment	Aging Effect	Aging Mechanism	References
B4.4	---	Seals & Gaskets	Various	Inside and/or Outside Containment	Loss of Sealing	Deterioration of Joint Sealants, Gaskets, O-rings	10CFR50.55a ASME Section XI, Subsection IWE 10CFR50, Appendix J

II CONTAINMENT STRUCTURES
B BWR Containments
B4 Common Components

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
10CFR50.55a/ASME Section XI, Subsection IWE	See Chapter XI for an evaluation of 10CFR50.55a/ASME Section XI, Subsection IWE. Leak tightness will be monitored by Appendix J Leak Rate Tests.	No.

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