CHAPTER II B

BOILING WATER REACTOR (BWR) CONTAINMENTS

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. 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.

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 that 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; Downcomers; ECCS Suction Header. Inspection of supports is addressed by ASME Section XI, Subsection IWF (see Chapter III B1.3)	Carbon Steel	Inside or Outside Containment	Loss of Material	Corrosion	10 CFR 50.55a ASME, Sect. XI, Subsection IWE 10 CFR Part 50, Appendix J

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

Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
10 CFR 50.55a/ASME Section XI, Subsection IWE	See Chapter XI.S1 for evaluation of 10 CFR 50.55a/ASME Section XI, Subsection IWE, except for inaccessible areas when conditions in accessible areas may not indicate the presence of or result in degradation to such inaccessible areas.	Yes. Evaluate plant-specific program for inaccessible areas when conditions in accessible areas may not indicate the presence of or result in degradation to such inaccessible areas.
10 CFR Part 50, Appendix J (Containment Leak Rate Tests)	See Chapter XI.S4 for evaluation of 10 CFR Part 50, Appendix J	No
Protective Coating Monitoring and Maintenance Program	See Chapter XI.S8 for evaluation of Protective Coating Monitoring and Maintenance Program.	No

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	Steel Elements	Torus, Vent Line, Vent Header, Vent Line Bellows, Downcomers (CLB fatigue analysis does not exist)	Stainless Steel, Carbon Steel	Inside or Outside Containment	Cracking	Cyclic Loading	10 CFR 50.55a ASME, Sect. XI, Subsection IWE 10 CFR Part 50, Appendix J
B1.1	Steel Elements	Torus, Vent Line, Vent Header, Vent Line Bellows, Downcomers (CLB fatigue analysis exists)	Stainless Steel, Carbon Steel	Inside or Outside Containment	Cumulative Fatigue Damage	Fatigue	Design Code of Record
B1.1.1	Steel Elements	Vent Line Bellows	Stainless Steel	Inside or Outside Containment	Crack Initiation and Growth	Stress Corrosion Cracking	10 CFR 50.55a ASME, Sect. XI, Subsection IWE 10 CFR Part 50, Appendix J NRC IN 92-20

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

Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
10 CFR 50.55a/ASME Section XI, Subsection IWE and 10 CFR Part 50, Appendix J	See Chapter XI.S1 for an evaluation of 10 CFR 50.55a/ASME Section XI, Subsection IWE and Chapter XI.S4 for an evaluation of 10 CFR Part 50, Appendix J. Evaluation of 10 CFR 50.55a/IWE is augmented as follows: ***(4) Detection of Aging Effects:*** VT-3 visual inspection may not detect fine cracks (one option may be to perform VT-1 visual inspections).	Yes, Applicant's program to address Attribute (4) needs to be evaluated
Components have been designed or evaluated for fatigue for a 40 year design life based on postulated cycles, according to the requirements of the code of record or later approved codes.	Fatigue is a time-limited aging analysis (TLAA) to be performed for the period of license renewal. See the Standard Review Plan, Section 4.6, "Containment Liner Plate and Penetration Fatigue Analysis" for acceptable methods for meeting the requirements of 10CFR54.21(c).	Yes, TLAA
10 CFR 50.55a/ASME Section XI, Subsection IWE and 10 CFR Part 50, Appendix J	See Chapter XI.S1 for an evaluation of 10 CFR 50.55a/ASME Section XI, Subsection IWE and Chapter XI.S4 for an evaluation of 10 CFR Part 50, Appendix J. Evaluation of 10 CFR 50.55a/IWE is augmented as follows: ***(3) Parameters Monitored or Inspected:*** Stress corrosion cracking (SCC) is a concern for dissimilar metal welds. In the case of bellows assemblies, SCC may cause aging effects particularly if the material is not shielded from a corrosive environment. Subsection IWE covers inspection of these items under examination categories E-B, E-F, and E-P (10 CFR Part 50, Appendix J pressure tests). 10 CFR 50.55a identifies examination categories E-B and E-F as optional during the current term of operation. For the extended period of operation, Examination Categories E-B & E-F, and augmented VT-1 visual examination of bellows assemblies and dissimilar welds are warranted to address this issue. ***(10) Operating Experience:*** IN 92-20 describes an instance of containment bellows cracking, resulting in loss of leak tightness.	No

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 Head; Downcomers Inspection of supports is addressed by ASME Section XI, Subsection IWF (see Chapter III B1.3).	Carbon Steel and Graphite Plate	Inside or Outside Containment	Fretting or Lockup	Mechanical Wear	10 CFR 50.55a ASME, Sect. XI, Subsection IWE

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

Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
10 CFR 50.55a/ASME Section XI, Subsection IWE	See Chapter XI.S1 for an evaluation of 10 CFR 50.55a/ 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. 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 that 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
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; Region Shielded by Diaphragm Floor Inspection of supports is addressed by ASME Section XI, Subsection IWF (see Chapter III B1.3).	Carbon Steel	Inside or Outside Containment	Loss of Material	Corrosion	10 CFR 50.55a ASME, Sect. XI, Subsection IWE 10 CFR Part 50, Appendix J

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

Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
10 CFR 50.55a/ASME Section XI, Subsection IWE	See Chapter XI.S1 for evaluation of 10 CFR 50.55a/ASME Section XI, Subsection IWE, except for inaccessible areas when conditions in accessible areas may not indicate the presence of or result in degradation to such inaccessible areas.	Yes. Evaluate plant-specific program for inaccessible areas when conditions in accessible areas may not indicate the presence of or result in degradation to such inaccessible areas.
10 CFR Part 50, Appendix J (Containment Leak Rate Tests)	See Chapter XI.S4 for evaluation of 10 CFR Part 50, Appendix J	No
Protective Coating Monitoring and Maintenance Program	See Chapter XI.S8 for evaluation of Protective Coating Monitoring and Maintenance Program.	No

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	Suppression Pool Shell, Unbraced Downcomers (CLB fatigue analysis does not exist)	Carbon Steel	Inside or Outside Containment	Cracking	Cyclic Loading	10 CFR 50.55a ASME, Sect. XI, Subsection IWE 10 CFR Part 50, Appendix J
B2.1.1	Steel Elements	Suppression Pool Shell, Unbraced Downcomers (CLB fatigue analysis exists)	Carbon Steel	Inside or Outside Containment	Cumulative Fatigue Damage	Fatigue	Design Code of Record
B2.1.1	Steel Elements	Drywell Head; Downcomer Pipes Inspection of supports is addressed by ASME Section XI, Subsection IWF (see Chapter III B1.3).	Carbon Steel	Inside or Outside Containment	Fretting or Lockup	Mechanical Wear	10 CFR 50.55a ASME, Sect. XI, Subsection IWE

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

Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
10 CFR 50.55a/ASME Section XI, Subsection IWE and 10 CFR Part 50, Appendix J	See Chapter XI.S1 for an evaluation of 10 CFR 50.55a/ASME Section XI, Subsection IWE and Chapter XI.S4 for an evaluation of 10 CFR Part 50, Appendix J. Evaluation of 10 CFR 50.55a/IWE is augmented as follows: ***(4) Detection of Aging Effects:*** VT-3 visual inspection may not detect fine cracks (one option may be to perform VT-1 visual inspections).	Yes, Applicant's program to address Attribute (4) needs to be evaluated
Components have been designed or evaluated for fatigue for a 40 year design life based on postulated cycles, according to the requirements of the code of record or later approved codes.	Fatigue is a time-limited aging analysis (TLAA) to be performed for the period of license renewal. See the Standard Review Plan, Section 4.6, "Containment Liner Plate and Penetration Fatigue Analysis" for acceptable methods for meeting the requirements of 10CFR54.21(c).	Yes, TLAA
10 CFR 50.55a/ASME Section XI, Subsection IWE	See Chapter XI for an evaluation of 10 CFR 50.55a/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	Outside Containment	Increase in Porosity, Permeability	Leaching of Calcium Hydroxide	10 CFR 50.55a ASME, Sect. XI, Subsection IWL
B2.2.1	Concrete Elements	Containment; Basemat	Concrete	Inside or Outside Containment	Increase in Porosity and Permeability, Cracking, Loss of Material (spalling, scaling)	Aggressive Chemical Attack	10 CFR 50.55a ASME, Sect. XI, Subsection IWL

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

Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
10 CFR 50.55a/ASME Section XI, Subsection IWL	See Chapter XI.S2 for an evaluation of 10 CFR 50.55a/ASME Section XI, Subsection IWL, except for inaccessible areas when conditions in accessible areas may not indicate the presence of or result in degradation to such inaccessible areas.	Yes. Evaluate plant-specific program for inaccessible areas when conditions in accessible areas may not indicate the presence of or result in degradation to such inaccessible areas.
10 CFR 50.55a/ASME Section XI, Subsection IWL	See Chapter XI.S2 for an evaluation of 10 CFR 50.55a/ASME Section XI, Subsection IWL, except for inaccessible areas when conditions in accessible areas may not indicate the presence of or result in degradation to such inaccessible areas.	Yes. Evaluate plant-specific program for inaccessible areas when conditions in accessible areas may not indicate the presence of or result in degradation to such inaccessible areas.

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 or Outside Containment	Expansion & Cracking	Reaction with Aggregates	10 CFR 50.55a ASME, Sect. XI, Subsection IWL
B2.2.1	Concrete Elements	Containment; Basemat; Reinforcing Steel	Concrete; Carbon Steel	Inside or Outside Containment	Cracking, Loss of Bond, and Loss of Material (spalling, scaling)	Corrosion of Embedded Steel	10 CFR 50.55a ASME, Sect. XI, Subsection IWL

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

Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
10 CFR 50.55a/ASME Section XI, Subsection IWL	See Chapter XI.S2 for an evaluation of 10 CFR 50.55a/ASME Section XI, Subsection IWL	No.
10 CFR 50.55a/ASME Section XI, Subsection IWL	See Chapter XI.S2 for an evaluation of 10 CFR 50.55a/ASME Section XI, Subsection IWL, except for inaccessible areas when conditions in accessible areas may not indicate the presence of or result in degradation to such inaccessible areas.	Yes. Evaluate plant-specific program for inaccessible areas when conditions in accessible areas may not indicate the presence of or result in degradation to such inaccessible areas.

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	All	Concrete	Inside or Outside Containment	Cracks; Distortion; Increase in Component Stress Level	Settlement	10 CFR 50.55a ASME, Sect. XI, Subsection IWL ACI349.3R-96
B2.2.1	Concrete Elements	Foundation	Concrete	Flowing Water Under Foundation	Reduction in Foundation Strength	Erosion of Porous Concrete Subfoundation	NRC IN 97-11 NRC IN 98-26
B2.2.1	Concrete Elements	Containment; Concrete Fill in Annulus; Basemat	Concrete	Inside or Outside Containment	Loss of Strength and Modulus	Elevated Temperature (>150°F general; >200°F local)	10 CFR 50.55a ASME, Sect. XI, Subsection IWL

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

Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
Plant-Specific Program	The initial Licensing Basis for some plants included a program to monitor settlement. If no settlement was evident during the first decade or so, the NRC may have given the licensee approval to discontinue the program. However, if a de-watering system is relied upon for control of settlement, then the licensee needs to ensure proper functioning of the de-watering system through the period of extended operation.	Yes. If applicable.
Plant-Specific Program	Erosion of cement from porous concrete subfoundations beneath containment basemats is described in IN 97-11. IN 98-26 proposes Maintenance Rule Structures Monitoring for managing this aging effect, if applicable. See Chapter XI.S6 for evaluation of Structures Monitoring Program. If a de-watering system is relied upon for control of erosion of cement from porous concrete subfoundations, then the licensee needs to ensure proper functioning of the de-watering system through the period of extended operation.	Yes. If applicable.
Plant-Specific Program	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. Subsection CC-3400 of ASME Section III, Division 2, specifies the concrete temperature limits for normal operation or any other long-term period. The temperatures shall not exceed 150 ^{0}F except for local areas, such as around penetrations, which are not allowed to exceed 200 ^{0}F.	Yes. If applicable.

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 Inspection of supports is addressed by ASME Section XI, Subsection IWF (see Chapter III B1.3).	Carbon Steel	Inside or Outside Containment	Loss of Material	Corrosion	10 CFR 50.55a ASME, Sect. XI, Subsection IWE 10 CFR Part 50, Appendix J

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

Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
10 CFR 50.55a/ASME Section XI, Subsection IWE	See Chapter XI.S1 for evaluation of 10 CFR 50.55a/ASME Section XI, Subsection IWE, except for inaccessible areas when conditions in accessible areas may not indicate the presence of or result in degradation to such inaccessible areas.	Yes. Evaluate plant-specific program for inaccessible areas when conditions in accessible areas may not indicate the presence of or result in degradation to such inaccessible areas.
10 CFR Part 50, Appendix J (Containment Leak Rate Tests)	See Chapter XI.S4 for evaluation of 10 CFR Part 50, Appendix J	No
Protective Coating Monitoring and Maintenance Program	See Chapter XI.S8 for evaluation of Protective Coating Monitoring and Maintenance Program.	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	Suppression Chamber Liner (Interior Surface)	Stainless Steel	Inside or Outside Containment	Crack Initiation and Growth	Stress Corrosion Cracking	10 CFR 50.55a ASME, Sect. XI, Subsection IWE 10 CFR Part 50, Appendix J
B2.2.2	Steel Elements	Vent Header, Downcomers (CLB fatigue analysis does not exist)	Carbon Steel	Inside or Outside Containment	Cracking	Cyclic Loading	10 CFR 50.55a ASME, Sect. XI, Subsection IWE 10 CFR Part 50, Appendix J
B2.2.2	Steel Elements	Vent Header, Downcomers (CLB fatigue analysis exists)	Carbon Steel	Inside or Outside Containment	Cumulative Fatigue Damage	Fatigue	Design Code of Record

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

Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
10 CFR 50.55a/ASME Section XI, Subsection IWE and 10 CFR Part 50, Appendix J	See Chapter XI.S1 for an evaluation of 10 CFR 50.55a/ASME Section XI, Subsection IWE and Chapter XI.S4 for an evaluation of 10 CFR Part 50, Appendix J.	No.
10 CFR 50.55a/ASME Section XI, Subsection IWE and 10 CFR Part 50, Appendix J	See Chapter XI.S1 for an evaluation of 10 CFR 50.55a/ASME Section XI, Subsection IWE and Chapter XI.S4 for an evaluation of 10 CFR Part 50, Appendix J. Evaluation of 10 CFR 50.55a/IWE is augmented as follows: ***(4) Detection of Aging Effects:*** VT-3 visual inspection may not detect fine cracks (one option may be to perform VT-1 visual inspections).	Yes, Applicant's program to address Attribute (4) needs to be evaluated
Components have been designed or evaluated for fatigue for a 40 year design life based on postulated cycles, according to the requirements of the code of record or later approved codes.	Fatigue is a time-limited aging analysis (TLAA) to be performed for the period of license renewal. See the Standard Review Plan, Section 4.6, "Containment Liner Plate and Penetration Fatigue Analysis" for acceptable methods for meeting the requirements of 10CFR54.21(c).	Yes, TLAA

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 Inspection of supports is addressed by ASME Section XI, Subsection IWF (see Chapter III B1.3).	Carbon Steel	Inside or Outside Containment	Fretting or Lockup	Mechanical Wear	10 CFR 50.55a ASME, Sect. XI, Subsection IWE
B2.2.2	Prestress-ing System	Tendons and Anchorage Components	Carbon Steel	Inside or Outside Containment	Loss of Material	Corrosion of Tendons/ Anchorage Components	10 CFR 50.55a ASME, Sect. XI, Subsection IWL NUREG-1522 IN 99-10

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

Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
10 CFR 50.55a/ASME Section XI, Subsection IWE	See Chapter XI.S1 for an evaluation of 10 CFR 50.55a/ASME Section XI, Subsection IWE	No.
10 CFR 50.55a/ASME Section XI Subsection IWL (Does not apply to bonded post-tensioning systems)	See Chapter XI.S2 for an evaluation of 10 CFR 50.55a/ASME Section XI, Subsection IWL The staff notes, as documented in NUREG-1522 and IN 99-10, detrimental conditions exist in some tendon access galleries that are conducive to corrosion of tendon anchorage components. Because excessive moisture and humidity can significantly accelerate the corrosion of tendon anchorage components, managing the condition and environment in the tendon access gallery is a prudent way to manage the degradation of bearing plates and other vertical tendon anchorage components.	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
B2.2.3	Prestress-ing System	Tendons and Anchorage Compo-nents	Carbon Steel	Inside or Outside Contain-ment	Loss of Prestress	Relaxation; Shrinkage; Creep; Elevated Temperature	10 CFR 50.55a ASME, Sect. XI, Subsection IWL Regulatory Guide 1.35.1

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

Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
Loss Of Tendon Prestress is a TLAA.	Loss of tendon prestress is a time-limited aging analysis (TLAA) to be performed for the period of license renewal. See the Standard Review Plan, Section 4.5, "Concrete Containment Tendon Prestress" for acceptable methods for meeting the requirements of 10CFR54.21(c)(1)(i) and (ii). See Chapter X of this report for meeting the requirements of 10CFR54.21(c)(1)(iii). For periodic monitoring of prestress, see Chapter XI.S2.	Yes, TLAA

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. In Review Table II B3, Mark III Concrete containments are divided into two elements: concrete and steel; 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 that 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 or Outside Containment	Loss of Material	Corrosion	10 CFR 50.55a ASME, Sect. XI, Subsection IWE 10 CFR Part 50, Appendix J

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

Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
10 CFR 50.55a/ASME Section XI, Subsection IWE	See Chapter XI.S1 for evaluation of 10 CFR 50.55a/ASME Section XI, Subsection IWE, except for inaccessible areas when conditions in accessible areas may not indicate the presence of or result in degradation to such inaccessible areas.	Yes. Evaluate plant-specific program for inaccessible areas when conditions in accessible areas may not indicate the presence of or result in degradation to such inaccessible areas.
10 CFR Part 50, Appendix J (Containment Leak Rate Tests)	See Chapter XI.S4 for evaluation of 10 CFR Part 50, Appendix J	No
Protective Coating Monitoring and Maintenance Program	See Chapter XI.S8 for evaluation of Protective Coating Monitoring and Maintenance Program.	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
B3.1.1	Steel Elements	Suppression Chamber Shell (Interior Surface)	Stainless Steel	Inside or Outside Containment	Crack Initiation and Growth	Stress Corrosion Cracking	10 CFR 50.55a ASME, Sect. XI Subsection IWE 10 CFR Part 50, Appendix J
B3.1.2	Concrete Elements	Basemat	Concrete	Outside Containment	Increase in Porosity, Permeability	Leaching of Calcium Hydroxide	10 CFR 50.55a ASME, Sect. XI Subsection IWL

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

Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
10 CFR 50.55a/ASME Section XI, Subsection IWE and 10 CFR Part 50, Appendix J	See Chapter XI.S1 for an evaluation of 10 CFR 50.55a/ASME Section XI, Subsection IWE and Chapter XI.S4 for an evaluation of 10 CFR Part 50, Appendix J.	No
10 CFR 50.55a/ASME Section XI, Subsection IWL	See Chapter XI.S2 for an evaluation of 10 CFR 50.55a/ASME Section XI, Subsection IWL, except for inaccessible areas when conditions in accessible areas may not indicate the presence of or result in degradation to such inaccessible areas.	Yes. Evaluate plant-specific program for inaccessible areas when conditions in accessible areas may not indicate the presence of or result in degradation to such inaccessible areas.

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 or Outside Containment	Increase in Porosity and Permeability, Cracking, Loss of Material (spalling, scaling)	Aggressive Chemical Attack	10 CFR 50.55a ASME, Sect. XI Subsection IWL
B3.1.2	Concrete Elements	Basemat; Concrete Fill in Annulus	Concrete	Inside or Outside Containment	Expansion & Cracking	Reaction with Aggregates	10 CFR 50.55a ASME, Sect. XI Subsection IWL
B3.1.2	Concrete Elements	Basemat and Reinforcing Steel	Concrete; Carbon Steel	Inside or Outside Containment	Cracking, Loss of Bond, and Loss of Material (spalling, scaling)	Corrosion of Embedded Steel	10 CFR 50.55a ASME, Sect. XI Subsection IWL

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

Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
10 CFR 50.55a/ASME Section XI, Subsection IWL	See Chapter XI.S2 for an evaluation of 10 CFR 50.55a/ASME Section XI, Subsection IWL, except for inaccessible areas when conditions in accessible areas may not indicate the presence of or result in degradation to such inaccessible areas.	Yes. Evaluate plant-specific program for inaccessible areas when conditions in accessible areas may not indicate the presence of or result in degradation to such inaccessible areas.
10 CFR 50.55a/ASME Section XI, Subsection IWL	See Chapter XI.S2 for an evaluation of 10 CFR 50.55a/ASME Section XI, Subsection IWL	No.
10 CFR 50.55a/ASME Section XI, Subsection IWL	See Chapter XI.S2 for an evaluation of 10 CFR 50.55a/ASME Section XI, Subsection IWL, except for inaccessible areas when conditions in accessible areas may not indicate the presence of or result in degradation to such inaccessible areas.	Yes. Evaluate plant-specific program for inaccessible areas when conditions in accessible areas may not indicate the presence of or result in degradation to such inaccessible areas.

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 or Outside Containment	Cracks; Distortion; Increase in Component Stress Level	Settlement	10 CFR 50.55a ASME, Sect. XI Subsection IWL ACI 349.3R-96
B3.1.2	Concrete Elements	Foundation	Concrete	Flowing Water Under Foundation	Reduction in Foundation Strength	Erosion of Porous Concrete Subfoundation	NRC IN 97-11 NRC IN 98-26
B3.1.2	Concrete Elements	Basemat; Concrete Fill in Annulus	Concrete	Inside or Outside Containment	Loss of Strength and Modulus	Elevated Temperature (>150°F general; >200°F local)	10 CFR 50.55a ASME, Sect. XI Subsection IWL

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

Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
Plant-Specific Program	The initial Licensing Basis for some plants included a program to monitor settlement. If no settlement was evident during the first decade or so, the NRC may have given the licensee approval to discontinue the program. However, if a de-watering system is relied upon for control of settlement, then the licensee needs to ensure proper functioning of the de-watering system through the period of extended operation.	Yes. If applicable.
Plant-Specific Program	Erosion of cement from porous concrete subfoundations beneath containment basemats is described in IN 97-11. IN 98-26 proposes Maintenance Rule Structures Monitoring for managing this aging effect, if applicable. See Chapter XI.S6 for evaluation of Structures Monitoring Program. If a de-watering system is relied upon for control of erosion of cement from porous concrete subfoundations, then the licensee needs to ensure proper functioning of the de-watering system through the period of extended operation.	Yes. If applicable.
Plant-Specific Program	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. Subsection CC-3400 of ASME Section III, Division 2, specifies the concrete temperature limits for normal operation or any other long-term period. The temperatures shall not exceed 150 ^{0}F except for local areas, such as around penetrations, which are not allowed to exceed 200 ^{0}F.	Yes. If applicable.

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	Outside Containment	Loss of Material (spalling, scaling) and Cracking	Freeze/Thaw	10 CFR50.55a ASME, Sect. XI, Subsection IWL
B3.2.1	Concrete Elements	Dome, Wall, Basemat	Concrete	Outside Containment	Increase in Porosity, Permeability	Leaching of Calcium Hydroxide	10 CFR50.55a ASME, Sect. XI, Subsection IWL
B3.2.1	Concrete Elements	Dome, Wall, Basemat	Concrete	Inside or Outside Containment	Increase in Porosity and Permeability, Cracking, Loss of Material (spalling, scaling)	Aggressive Chemical Attack	10 CFR50.55a ASME, Sect. XI, Subsection IWL

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

Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
10 CFR 50.55a/ASME Section XI, Subsection IWL	See Chapter XI.S2 for evaluation of 10 CFR 50.55a/ASME Section XI, Subsection IWL	No
10 CFR 50.55a/ASME Section XI, Subsection IWL	See Chapter XI.S2 for an evaluation of 10 CFR 50.55a/ASME Section XI, Subsection IWL, except for inaccessible areas when conditions in accessible areas may not indicate the presence of or result in degradation to such inaccessible areas.	Yes. Evaluate plant-specific program for inaccessible areas when conditions in accessible areas may not indicate the presence of or result in degradation to such inaccessible areas.
10 CFR 50.55a/ASME Section XI, Subsection IWL	See Chapter XI.S2 for an evaluation of 10 CFR 50.55a/ASME Section XI, Subsection IWL, except for inaccessible areas when conditions in accessible areas may not indicate the presence of or result in degradation to such inaccessible areas.	Yes. Evaluate plant-specific program for inaccessible areas when conditions in accessible areas may not indicate the presence of or result in degradation to such inaccessible areas.

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 or Outside Containment	Expansion & Cracking	Reaction with Aggregates	10 CFR50.55a ASME, Sect. XI, Subsection IWL
B3.2.1	Concrete Elements	Dome, Wall, Basemat, Reinforcing Steel	Concrete; Carbon Steel	Inside or Outside Containment	Cracking, Loss of Bond, and Loss of Material (spalling, scaling)	Corrosion of Embedded Steel	10 CFR50.55a ASME, Sect. XI, Subsection IWL

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

Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
10 CFR 50.55a/ASME Section XI, Subsection IWL	See Chapter XI.S2 for an evaluation of 10 CFR 50.55a/ASME Section XI, Subsection IWL	No.
10 CFR 50.55a/ASME Section XI, Subsection IWL	See Chapter XI.S2 for an evaluation of 10 CFR 50.55a/ASME Section XI, Subsection IWL, except for inaccessible areas when conditions in accessible areas may not indicate the presence of or result in degradation to such inaccessible areas.	Yes. Evaluate plant-specific program for inaccessible areas when conditions in accessible areas may not indicate the presence of or result in degradation to such inaccessible areas.

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	All	Concrete	Inside or Outside Containment	Cracks; Distortion; Increase in Component Stress Level	Settlement	10 CFR50.55a ASME, Sect. XI, Subsection IWL ACI 349.3R-96
B3.2.1	Concrete Elements	Foundation	Concrete	Flowing Water Under Foundation	Reduction in Foundation Strength	Erosion of Porous Concrete Subfoundation	NRC IN 97-11 NRC IN 98-26
B3.2.1	Concrete Elements	Dome, Wall, Basemat	Concrete	Inside or Outside Containment	Loss of Strength and Modulus	Elevated Temperature (>150°F general; >200°F local)	10 CFR50.55a ASME, Sect. XI, Subsection IWL

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

Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
Plant-Specific Program	The initial Licensing Basis for some plants included a program to monitor settlement. If no settlement was evident during the first decade or so, the NRC may have given the licensee approval to discontinue the program. However, if a de-watering system is relied upon for control of settlement, then the licensee needs to ensure proper functioning of the de-watering system through the period of extended operation.	Yes. If applicable.
Plant-Specific Program	Erosion of cement from porous concrete subfoundations beneath containment basemats is described in IN 97-11. IN 98-26 proposes Maintenance Rule Structures Monitoring for managing this aging effect, if applicable. See Chapter XI.S6 for evaluation of Structures Monitoring Program. If a de-watering system is relied upon for control of erosion of cement from porous concrete subfoundations, then the licensee needs to ensure proper functioning of the de-watering system through the period of extended operation.	Yes. If applicable.
Plant-Specific Program	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. Subsection CC-3400 of ASME Section III, Division 2, specifies the concrete temperature limits for normal operation or any other long-term period. The temperatures shall not exceed 150 ^{0}F except for local areas, such as around penetrations, which are not allowed to exceed 200 ^{0}F.	Yes. If applicable.

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 or Outside Containment	Loss of Material	Corrosion	10 CFR50.55a ASME, Sect. XI, Subsection IWE 10 CFR Part 50, Appendix J

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

Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
10 CFR 50.55a/ASME Section XI, Subsection IWE	See Chapter XI.S1 for evaluation of 10 CFR 50.55a/ASME Section XI, Subsection IWE, except for inaccessible areas when conditions in accessible areas may not indicate the presence of or result in degradation to such inaccessible areas.	Yes. Evaluate plant-specific program for inaccessible areas when conditions in accessible areas may not indicate the presence of or result in degradation to such inaccessible areas.
10 CFR Part 50, Appendix J (Containment Leak Rate Tests)	See Chapter XI.S4 for evaluation of 10 CFR Part 50, Appendix J	No
Protective Coating Monitoring and Maintenance Program	See Chapter XI.S8 for evaluation of Protective Coating Monitoring and Maintenance Program.	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
B3.2.2	Steel Elements	Suppression Chamber Liner (Interior Surface)	Stainless Steel	Inside or Outside Containment	Crack Initiation and Growth	Stress Corrosion Cracking	10 CFR50.55a ASME, Sect. XI, Subsection IWE 10 CFR Part 50, Appendix J

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

Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
10 CFR 50.55a/ASME Section XI, Subsection IWE and 10 CFR Part 50, Appendix J	See Chapter XI.S1 for an evaluation of 10 CFR 50.55a/ASME Section XI, Subsection IWE and Chapter XI.S4 for an evaluation of 10 CFR Part 50, Appendix J.	No

B4. Common Components

B4.1 Penetration Sleeves, Penetration Bellows, Dissimilar Metal Welds

B4.2 Personnel Airlock, Equipment Hatch, Control Rod Drive (CRD) Hatch

B4.3 Seals, Gaskets, and Moisture Barriers

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. Common components in Review Table II B4 include penetation sleeves and bellows; dissimilar metal welds; personnel airlock; equipment hatch; CRD hatch; seals, gaskets, and moisture barriers.

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 that 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	All	Carbon Steel, Dissimilar Metal Welds	Inside or Outside Containment	Loss of Material	Corrosion	10 CFR50.55a ASME, Sect. XI, Subsection IWE 10 CFR Part 50, Appendix J

II CONTAINMENT STRUCTURES
B BWR Containments
B4 Common Components

Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
10 CFR 50.55a/ASME Section XI, Subsection IWE	See Chapter XI.S1 for evaluation of 10 CFR 50.55a/ASME Section XI, Subsection IWE.	No
10 CFR Part 50, Appendix J (Containment Leak Rate Tests)	See Chapter XI.S4 for evaluation of 10 CFR Part 50, Appendix J	No
Protective Coating Monitoring and Maintenance Program	See Chapter XI.S8 for evaluation of Protective Coating Monitoring and Maintenance Program.	No

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	All	Carbon Steel, Stainless Steel, Dissimilar Metal Welds	Inside or Outside Containment	Cumulative Fatigue Damage	Fatigue	Design Code of Record
B4.1	Penetration Sleeves, Penetration Bellows	All	Stainless Steel and Dissimilar Metal Welds	Inside or Outside Containment	Crack Initiation and Growth	Stress Corrosion Cracking, Cyclic Loading	10 CFR 50.55a ASME, Sect. XI, Subsection IWE 10 CFR Part 50, Appendix J NRC IN 92-20

II CONTAINMENT STRUCTURES
B BWR Containments
B4 Common Components

Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
Components have been designed or evaluated for fatigue for a 40 year design life based on postulated cycles, according to the requirements of the code of record or later approved codes.	Fatigue is a time-limited aging analysis (TLAA) to be performed for the period of license renewal. See the Standard Review Plan, Section 4.6, "Containment Liner Plate and Penetration Fatigue Analysis" for acceptable methods for meeting the requirements of 10CFR54.21(c).	Yes, TLAA
10 CFR 50.55a/ASME Section XI, Subsection IWE and 10 CFR Part 50, Appendix J	See Chapter XI.S1 for an evaluation of 10 CFR 50.55a/ASME Section XI, Subsection IWE and Chapter XI.S4 for an evaluation of 10 CFR Part 50, Appendix J. Evaluation of 10 CFR 50.55a/IWE is augmented as follows: ***(4) Detection of Aging Effects:*** Stress corrosion cracking (SCC) is a concern for dissimilar metal welds. In the case of bellows assemblies, SCC may cause aging effects particularly if the material is not shielded from a corrosive environment. Subsection IWE covers inspection of these items under examination categories E-B, E-F, and E-P (10 CFR Part 50, Appendix J pressure tests). 10 CFR 50.55a identifies examination categories E-B and E-F as optional during the current term of operation. For the extended period of operation, Examination Categories E-B & E-F, and augmented VT-1 visual examination of bellows assemblies and dissimilar welds are warranted to address this issue. For cracking due to cyclic loading of penetration sleeves and penetration bellows, VT-3 visual inspection may not detect fine cracks (one option may be to perform VT-1 visual inspections). ***(10) Operating Experience:*** IN 92-20 describes an instance of containment bellows cracking, resulting in loss of leak tightness.	Yes, Applicant's program to address Attribute (4) needs to be evaluated

II CONTAINMENT STRUCTURES
B BWR Containments
B4 Common Components

Item	Structure/Component	Region of Interest	Material	Environment	Aging Effect	Aging Mechanism	References
B4.2	Personnel Airlock; Equipment Hatch; CRD Hatch	All	Carbon Steel	Inside or Outside Containment	Loss of Material	Corrosion	10 CFR 50.55a ASME, Sect. XI, Subsection IWE 10 CFR Part 50, Appendix J

II CONTAINMENT STRUCTURES
B BWR Containments
B4 Common Components

Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
10 CFR 50.55a/ASME Section XI, Subsection IWE	See Chapter XI.S1 for evaluation of 10 CFR 50.55a/ASME Section XI, Subsection IWE.	No
10 CFR Part 50, Appendix J (Containment Leak Rate Tests)	See Chapter XI.S4 for evaluation of 10 CFR Part 50, Appendix J	No
Protective Coating Monitoring and Maintenance Program	See Chapter XI.S8 for evaluation of Protective Coating Monitoring and Maintenance Program.	No

II CONTAINMENT STRUCTURES
B BWR Containments
B4 Common Components

Item	Structure/Component	Region of Interest	Material	Environment	Aging Effect	Aging Mechanism	References
B4.2	Personnel Airlock; Equipment Hatch; CRD Hatch	All	Carbon Steel	Inside or Outside Containment	Fretting or Lockup	Mechanical Wear of Locks/ Hinges and Closure Mechanisms	10 CFR 50.55a ASME, Sect. XI, Subsection IWE
B4.3	Seals, Gaskets, & Moisture Barriers (caulking, flashing, and other sealants)	All	Various	Inside or Outside Containment	Loss of Sealing; Leakage Through Containment	Deterioration of Seals, Gaskets, & Moisture Barriers (caulking, flashing, and other sealants)	10 CFR 50.55a ASME, Sect. XI, Subsection IWE 10 CFR Part 50, Appendix J

II CONTAINMENT STRUCTURES
B BWR Containments
B4 Common Components

Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
10 CFR 50.55a/ ASME Section XI, Subsection IWE	See Chapter XI.S1 for an evaluation of 10 CFR 50.55a/ ASME Section XI, Subsection IWE	No.
10 CFR 50.55a/ ASME Section XI, Subsection IWE	See Chapter XI.S1 for an evaluation of 10 CFR 50.55a/ASME Section XI, Subsection IWE Leak tightness will be monitored by 10 CFR Part 50, Appendix J Leak Rate Tests for pressure boundary, seals and gaskets (including O-rings).	No.

References

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

American Society of Mechanical Engineers, ASME Section III, *Rules for Construction of Nuclear Power Plant Components*, Division 2, *Code for Concrete Reactor Vessels and Containments*, 1992 Edition with 1992 Addenda or later edition, as approved in 10 CFR 50.55a, 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 IWE, *Requirements for Class MC and Metallic Liners of Class CC Components of Light-Water Cooled Power Plants*, 1992 Edition with 1992 Addenda or later edition, as approved in 10 CFR 50.55a, 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 or later edition, as approved in 10 CFR 50.55a, The ASME Boiler and Pressure Vessel Code, The American Society of Mechanical Engineers, New York, NY.

Code of Federal Regulations: 10 CFR Part 50, Appendix J, *Primary Reactor Containment Leakage Testing for Water Cooled Power Reactors*, 2000.

Code of Federal Regulations: 10 CFR 50.55a, *Codes and Standards, 2000*.

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.

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.