

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. higher 1. Walters

Douglas J. Walters

Enclosures

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



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

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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(VIIA), 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.C), or is supported by the containment structure. The containment structure basemat may provide support to the NSSS components and containment internal structures.

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B BWR Containments

B1 Mark I Containments B1.1 Steel Containments

	Structure/	Region of	r	Environ-	Aging	A	1
Item	Component	Interest	Material	ment	Effect	Aging Mechanism	References
B1.1.1	Steel	Drywell;	Carbon	Inside	Loss of	Corrosion	10CFR50.55a
	Elements	Torus; Drywell Head;	Steel	and/or Outside Contain-	Material	•	ASME Section XI, Subsection
		Embedded Shell and Sand		ment			IWE 10CFR50,
		Pocket Regions; Drywell	•	<i>.</i>			Appendix J NUREG-1611
		Support Skirt; Torus Ring Girder,					Draft Regulatory Guide DQ-1076
	-	Seismic Restraints, and					
		Support Saddles/ Columns;					- -
		Vent Lines, Header, and System Supports;					
		Down- comers and Bracing;					
		ECCS Suction					
•	y	The scope of components					
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		Column Clould be		\frown			
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II CONTAINMENT STRUCTURES B BWR Containments

B1 Mark I Containments

B1.1 Steel Containments

Existing Aging Management Program (AMP)

400PR50.55a imposes the e requirements of ASME B&PV Code Section XI on reinforced and prestre concrete containments. Examination requirements of ASME Class MC pressure retaining components, metallic shell/liners of Class CC containments, integral attachments, scals 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 contains inservice inspection program for managing aging of steel containments and liners of concrete containments for license renewal.

NUREG-1611 thentifies 10CFR50.55e/IWE for managing the effects of convosion, 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 RVF as an aging management program.

ASME SECTION XI, Subsection INE/ LOCFR 50.562

Son Chapler RT for an evaluation of ASME Section XL, Subsection INE / OCFREG 550

Evaluation and Technical Basis For HUREG-1011, an application for License Renoval should reference ASME Code Section XI, Subsection IWE and associated modifications/additions specified in 10 CRR50.55a for managing aging of containment steel elements. In addition, an applicant should flescribe 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 (/0) 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 IWF-1000 specifics the components within the scope of IVE (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 porfions of containment are in accordance with IWL. IWE efempts 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-12\$2 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 inaccessivile areas. Examination requirements for containment supports are not within the scope of IWE. (2) Prevention Action: No preventive actions are specified; IWP 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.

> Examination Method" General Visual, Visual VT-3

common stee components when conditions 'n accessible ereas may not indicate esence of d result in gradation such accessible reas. The pplicant's ging nanagenent rogram to iddress this issue must be walmated. Relief from the requirements of IWE (1992 Edition with 1992 Addenda) must be evaluated to

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Cat. Parts Examined E-A Containment Vessel Surface

 CONTAINMENT STRUCTURES

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 Mark I Containments

 B1.1
 Steel Containments

 Structure/
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 • • Material • Environ-ment A 414 - 14 Aging Effect Aging Mechanism . References

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	Steel Containments		
Existing	Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
···		Cat Parts Exemined Exemination Method	
		E-B Containment Visual VT-1	
		Penetration	
		E-C Containment Visual VT-1, Volumetric Surfaces Requiring	
		Augmented Examination	
		E-D Seals, Gaskets, and Visual VT-3	
		Moisture Barriers	
		E-F Pressure Retaining Surface Dissimilar Metal	
		Welds	
		E-G Pressure Retaining Visual VT-1, Bolt torque	
		Bolting or tension jest	
		E-P All Pressure Retaining Components 10 CFR 59, Appendix J	
		Pressure boundary, (Containment Leak Rate	
		penetration bellows, Testing)	
		airlocks, scals	
		and gaskets)	
		 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 Hor 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	·

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

1	Structure/ Component	Region of Interest		Environ- ment	Aging Effect	Aging Mechanism]
Item	Component	Interest	Material	ment	Effect	Mechanism	References
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B1.1 Steel Containments Existing Aging Management Program		Furt
(AMP)	Evaluation and Technical Basis	Evalu
	Sategory D-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	ŀ
	examinations. When additional flaws or areas of	1
	degradation that exceed the acceptance standards are revealed, all of the remaining examinations within the	I
	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	1
	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 gegradation 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. TWE states that repairs and reexaminations	
	shall comply with the requirements of IWA-4000.	
	Rectaminations are required to be conducted in	ł
	accordance with the requirements of IWA-2000 and the	l
	recorded results must demonstrate that the repair meets	1

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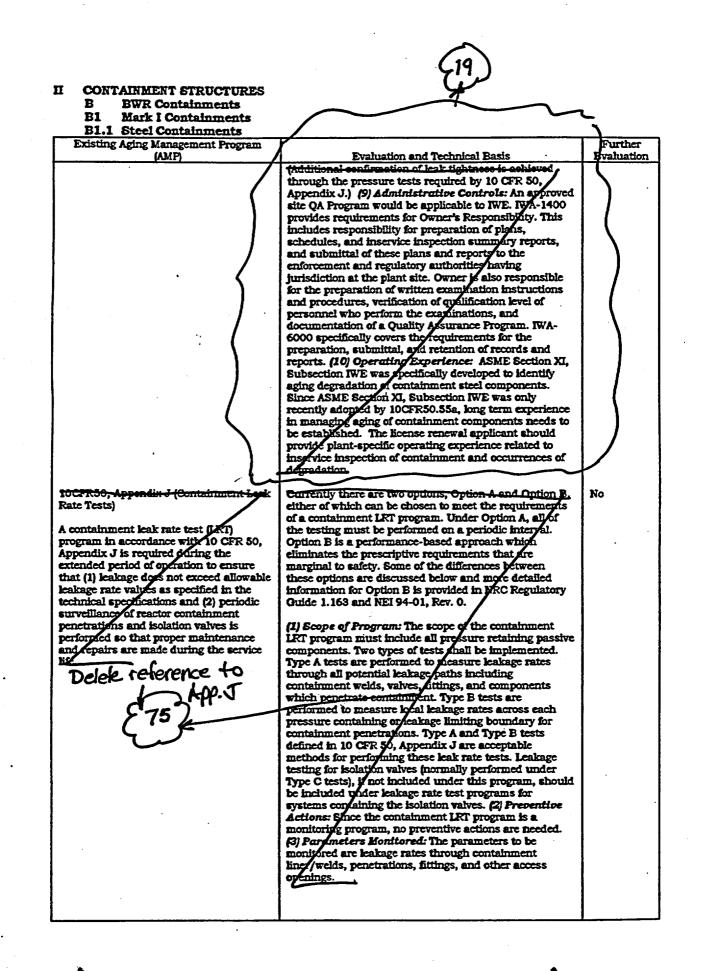
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B1 Mark I Containments B1.1 Steel Containments

B1.	1 Steel Cont	tainments			. <u></u>		
Item	Structure/ Component	Region of Interest	Material	Environ- ment	Aging Effect	Aging Mechanism	References
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							10CFR50.72
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Item Bubsystem Component Matorial Devision- Meteration Billert Mechanism References	<u> </u>	1 Steel Cor	itainments	· · · · · · · · · · · · · · · · · · ·				
	Item	Subsystem	Component	Material	Environ- ment	Aging Effect	Aging Mechanism	References
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BWR Containments Mark I Containments

(AMP)	Evaluation and Technical Basis	Evaluatio
(75)×	(f) Detection of desing Effects: A containance there program is effective in detecting degradation which compromises the containment pressure boundary, including scals 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) isselected. 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 are acceptable if they meet the requirements in 0 CFR 50, Appendix J and are in accordance with MSI/ANS-56.8-1994. (7) Corrective Actions: Whon leakage rates do not meet the acceptance criteria, corrective actions must be taken. (8) Confirmation Process: When control is must be taken. (8) Confirmation Process: When control is Results of the LRT program/must be documented as described in 10 CFR 50. Appendix J on demonstrate that the accordance with 10 CFR 50. Appendix J and MEI 94-01. If results are not acceptable, them an evaluation is required to identify the cause of the unacceptable performance and appropriate cornerive actions must be taken. (8) Confirmation Process: When cornerive actions are implemented to repair the condition causing the excessive leakage, confirmation by additi	

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B BWR Containments B1 Mark I Containments

B1.	1 Steel Con	tainments				Aging	٦
		Component	Material	Environ- ment	Aging Effect	Aging Mechanism References	
Item	Subsystem	Component	Material			Chaide DG 1076	Ť
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II CONTAINMENT STRUCTURES B BWR Containments B1 Mark I Containments

B1.1	Steel	Containments	
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B1.1 Steel Containments Existing Aging Management Program		Eusthen
(AMP)	Evaluation and Technical Basis	Further Evaluation
regram for Monitoring and Maintenance	To be credited as an acceptable aging management/	Xes-
of Protective Coatings -	program for License Renewal, a coatings monitoring and maintenance program must effectively address the	Applicant's
roper Maintenance of Coatings inside	following ten (10) criteria:	program
containment is essential to ensure		must bo
perability of post-accident safety	(1) Scope of Program: The minimum scope of the	evaluated.
ystems which rely on water recycled hrough the containment sump/frain	program should be Service Level I coatings, as defined in DG-1076. Inclusion of Service Level II and III poatings	
system. Degradation of coatings can lead	in the program would enable an applicant to take credit	
o clogging of strainers, which causes	for managing the effects of corrosion for most of the steel	
eduction in flow through the	structural elements included within the scope of License	
ump/drain system. This has been escribed in GL 98-04.	Renewal. (2) Preventive Action: A coatings monitoring and maintenance program is itself a preventive action.	
	(3) Parameters Monitored/Inspected: /Per DG-1076,	
laintenance of protective coatings	ASTM D5163-96 provides guidelines for establishing an	
pplied to carbon steel surfaces inside ontainment (i.e., lings, steel	in-service coating monitoring program for Service Level I	
ontainment shells, penetrations and	coatings. Both coatings degradation and evidence of corrosion should be monitored. (4) Detection of Aging	
atches) also serve to prevent or minimize	Effects: To be effective, visual inspection of the	
oss of material dyle to corrosion. Draft	condition of coatings should be conducted at the	
egulatory Guide DG-1076 provides a schnical basis for a coatings monitoring	beginning of each refueling outage. Early detection and timely correction of coating degradation which	
nd maintenance program which can be	eopardizes corrosion protection are key elements of an	
redited for managing the effects of	acceptable program. (5) Monitoring and Trending:	
orrosion on containment carbon steel	Frequent visual inspection (each refueling outage) for early signs of coatings degradation will permit trending	
Rememis	of the condition and allow for development of a timely	
pplicants for license renewal should	corrective plan. (6) Acceptance Criteria: The objective	
nclude a coatings monitoring and	of a monitoring and maintenance program for protective	
naistenance program as part of their votall program to manage aging of	coating is to prevent corrosion. Therefore, evidence of corrosion of coates surfaces must be considered	
ontainment structures	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)	
$(\Delta u_{\rm h})$	Operating Experience: In assessing the applicability of	
	existing plant-specific coatings programs to aging management for License Renewal, an applicant should	
(COMMENT)	review past operating experience for that program and	
1 that 1	ascertain whether it is achieving the desired outcome;	
- 15 /	i.e., to corrosion of carbon steel structural elements. This chould be discussed in the application.	
	the second be described at the applications	
		:

Them Component B1.1.1 Steel Elements TWS IS AOT A T AA A T AA 267 (260) B1.1.1 Steel	Region of Interest Material Vent Line Stainless Bellows Steel Vent Line Stainless Bellows Steel	and/or Outside Contain- ment	Aging Effect Cumilia- tive Fatigue Damage Damage Crack Initiation and Growth	Aging Mechanism Cyclic Loading	References NUREO-1611 Same as B1.1.1, Corrosion Aging Mechanism IN 92-20	
Elements $T\overline{WS}$ IS NOT A T AAA T $AAZo7 C^{10}Zb7 C^{10}DDDDDDDD$	Bellows Steel	Inside and/or Outside Contain- ment Inside and/or Outside Contain-	tive Fatigue Damage Crack Initiation and	Loading - Stress Corrosion	Same as B1.1.1, Corrosion Aging Mechanism	
		and/or Outside Contain-	Initiation and	Corrosion	Corrosion Aging Mechanism	
						· · · · · · · · · · · · · · · · · · ·
Elements He Do Co File Sy Su To So So So So So So So			Fretting/ Lockup	Mechanical Wear	10CFR50.55a ASME Section XI, Subsection IWE 10CFR50, Appendix J	
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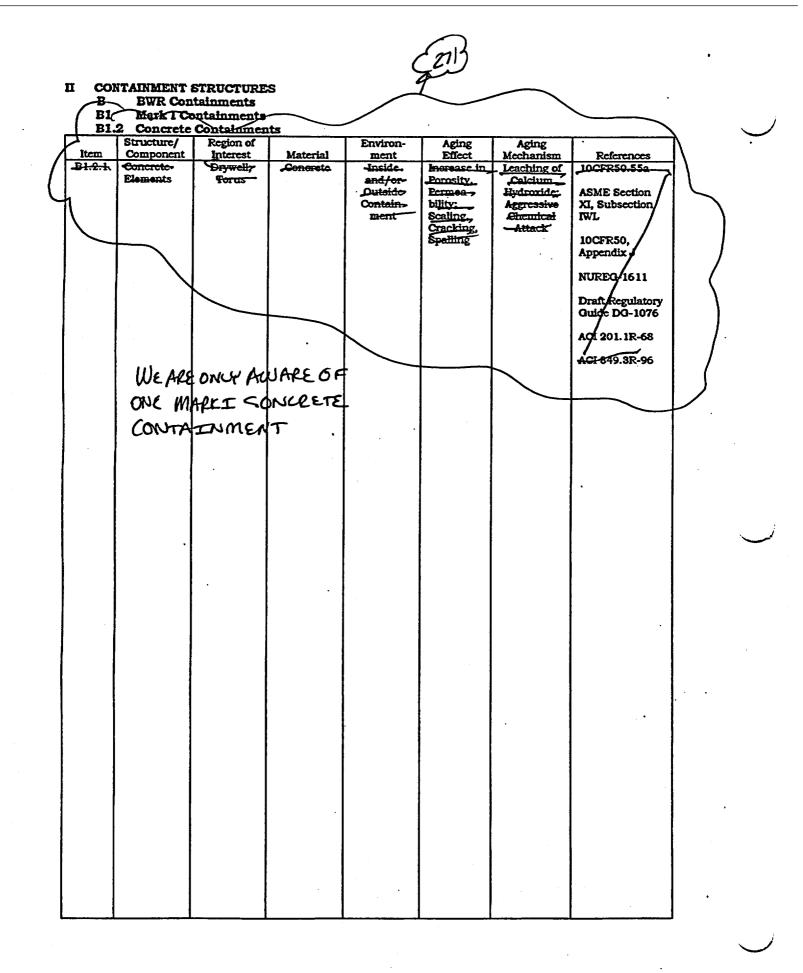
B BWR Containments

B1 Mark I Containments B1.1 Steel Containments

	B1.1 Steel Containments		
	Existing Aging Management Program	Evaluation and Technical Basis	Further Evaluation
	(AMP) 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	Yes. TLAA must be evaluated.
(A	Factor must not exceed 1.0. See Chapter EL for an evaluation of	ASME Section XI, Subscription
>	Same as D1.1.1, Corrosion Aging	Previous evaluation of 10 CFR 50.55a, TWE is	to a
	Mechanism IN 92-80 describes an instance of containment bollows cracking, resulting in loss of loak tightness. DCFRSD.55a / ASME Section KT, Subsection ISUE Const	augmented as follows: (2) 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	Planta specific, operating experience with creaking of contain- ment bellows should be eveluated
(Codes and Standards (10CFR50.55a), ASME Section XI, Subsection IWE	Aging effect will be managed by TWE See Chapter XI for an Ora watton of ASME Section XI, Subsection	No.
	(19)	INE/ 10 CPR SD. SSA	

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

Existing Aging Management Program (AMP)

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-16/1 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. Evaluation and Technical Basis Per NUREG-1611, an application for license renewal should reference ASME Code Section XI, Subsection IW 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.

COMMENT

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 IW1-1000 specifies the components within the scope of IWL (1992 with 1992 Addenda) for concrete containments. The components within the scope of IWI are reinforced concrete and unbonded post-tensioning systems of Class CC containments, as defined by QC-1000. Steel metallic liners are governed by IWE. IWL exempts from examination portions of the congrete 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 posttensioning 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, belical, and

NUREG-1611 spe cifies aging management of inaccessible areas for aggressive chemidal attack of concrete surfaces exposed to groundwater and for leaching of calcium hydroxide in concrete subject to floving water. The appliant's aging management program to address this issue thust be valuated.

Further

Evaluation

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	Structure/ Component	2 Concrete	B1 Mark I Containments	BWR Con	ビデムアビルロビナ
	Structure/ Region of Component Interest	Containment	ntainments	STRUCTURE: tainments	
	Material	ផ		0	2
	Environ- ment				
	Aging Effect				
•	Aging Mechanism				
	References				

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B B1 BWR Containments Mark I Containments

xisting Aging Management Program		Further
(AMP)	Evaluation and Technical Basis	Evaluation
	inverted LI for each inspection period. The required	
	inspection varies from 2 to 4 percent. Regarding the	
•	extent, all concrete surfaces receive a visual VT-30	
	examination. Selected areas, such as those that indicate	
	suspect conditions and areas surrounding tendor	
	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 requipements 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	
\frown	registered professional engineer experienced in	
	evaluating the inservice condition of structural concrete	
(11 7	and knowledgeable of the design and construction codes	
7 2 1)	and other criteria used in design and construction of	-
	concrete containments. Alternate acceptance criteria	
	based on ACI 349/3R is also acceptable. The acceptance	
\sim	standards for the unbonded post-tensioning system is quantitative in gature. For the post-tensioning system,	
С	quantitative acceptance criteria are given for tendon	
	force, tendon wire or strand samples, and corrosion	
	protection molium. (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	l
	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.	
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B BWR Containments

B1 Mark I Containments B1.2 Concrete Containments

Item	Structure/ Component	Containmer Region of Interest	Material	Environ- ment	Aging Effect	Aging Mechanism	References
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Evaluation and Technical Basis (9) Casyfamation Process: When areas of dependation are identified, an evaluation is performed to determine it repair or replacement is necessary. As part of this repairs on replacement is necessary. As part of this repairs on modifications are made, additional repairs on modifications are made, additional confirmation is achieved through presspic tests required by NL and 10 CFR 80, Appendix JJ (8) A Administration controls: An approved site QA Program would be applicable to IWL. IWA-1400 provides required by NL and 10 CFR 80, Appendix JJ (8) A Administration controls: An approved site QA Program would be applicable to IWL. IWA-1400 provides required by NL and 10 CFR 80, Appendix JJ (8) A Administration controls: An approved site QA Program would be applicable to IWL. IWA-1400 provides required by NL and 10 CFR 80, Appendix JJ (8) A Administration controls: An approved site QA Program would be applicable to IWL. IWA-1400 provides required by NL and 10 CFR 80, Appendix JJ (8) A Administration terperation of planes, schedulys, and inservice inspection for the enforcement and regulatory authorities having jurisduction at the plant site. Owner is also reports to the preformation of written ecommination histructions and procedures, verification of qualification for the preparation of a Quality Assumance Program. IWA-6000 specifically covers the requirements for the proper adopted by 10 CFR50.554, long term coperience in managing aging of containment conterter components. Since ASME Section XI, Subsection KU, was sapiled to the inservice inspection of containment conterter components and a provide plant-specific operating experience is a dopted by 10 CFR50.554, long term coperience is a dopted by 10 CFR50.554, long term coperience related to inservice inspection of containment conterter components and the provide plant-specific operating experience related to inservice inspection of containment contratue components and the provide plant-specific op B1.2 Concrete Containments xisting Aging Management Program CONTAINMENT STRUCTURES B BWR Containments B1 Mark I Containments (AMP) 벏

II B1-23

(B1 (B1.	2 Concrete	Containments	ES { Z			· <u>·····</u> ·····	
Item	Structure/ Component	Region of Interest	Material	Environ- ment	Aging Effect	Aging Mechanism	References
B1.2.1	Concrete	Drywell;	Concrete	Inside	Expansion	Reaction	Same as B1.2.7
	Elements	Torus		and/or Outside Contain- ment	ð: Cracking	with Aggregates	Aggressive Chemical Atlack Aging Mechanism
31.2.1	Concrete	Drywell;	Concrete,	Inside	Cracking, Spalling,	Corrosion of	Same as B1.2.1,
	Elements	Torus, and Reinforcing Steel	Carbon Steel	and/or Outside Contain- ment	Spalling, Loss of Bond, Loss of Material	Embedded Steel	Aggressive Chemical Attack Aging Mechanism
					-		
31.2.1	Concrete Elements	Drywell; Torus	Concrete	Inside and/or Outside Contain- ment	Loss of Strength and Modulus, Change in Poisson's Ratio	Elevated Tempera- ture (>150 •F general; >200 •F local)	NUREQ-1611
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Π	CONTAINMENT STRUCTURES	(AL-)	
	B BWR Containments	T COMMENT 271)	
	B1 Mark I Containments	T COMMENT d ()	
	B1.2 Concrete Containments		
	Existing Aging Management Program		Further
	(AMP)	Evaluation and Technical Basis	Evaluation
	me.as B1.2.1. Aggressive Chemical	-Same as B1:2.1, Aygressive Chemical Attack Aging	No.
A#	ack Aging Mechanism	Mechanism	
I			
	REG-1611 identifies CFR50.55a/IWL for managing the		
	ects of reaction with aggregates, and		
	olves staff's concern about delayed		
	urrences.		
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-	me as B1.2.1, Aggressive Chemical	Same as B1.2.1, Aggressive Chemical Attack Aging	Yes.
	ack Aging Mechanism	Mechanism, except inaccessible areas must be	
		addressed	NUREG-
			1611
NU	REG-1611 identifies		specifies
	CFR50.55a/IWL for managing the		aging
	cts of corrosion of embedded steel,		manage- ment of
	ept for inaccessible areas when there		inaccessible
	no indications of degradation for essible areas.		areas for
acc	essidie areas.		corrosion of
			embedded
1			steel
			exposed to
			aggressive environ-
			ment. The
1			applicant's
1			aging
1			manage-
1			ment
1 ·			program to address
1			this issue
1		•	must be
1			evaluated.
			Yes.
No	mandated Aging Management gram exists. NUREG-1611 identifies	The implementation of 10 CFR 50.55a and IWL would not be able to identify the loss of strength and modulus	165.
the	need for plant-specific evaluation, if	due to elevated temperature. Thus, for any portions of	К
the	prerequisite conditions exist.	concrete containment that exceed specified temperature	applicable,
1		limits, further evaluations are warranted. NUREG-1611	the
1		specifies the temperature limits, both general (150 •F)	applicant's
1		and local (200 °F), above which a plant-specific	aging
1		evaluation is needed.	manage-
1			ment program to
1			address
1			this issue
1			must be
1			evaluated.
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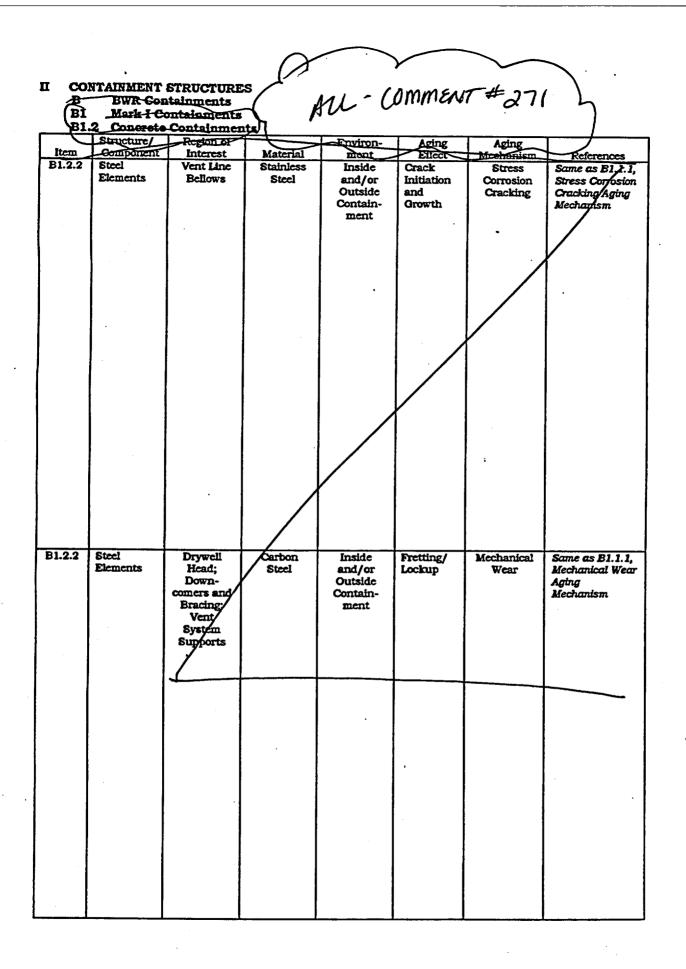
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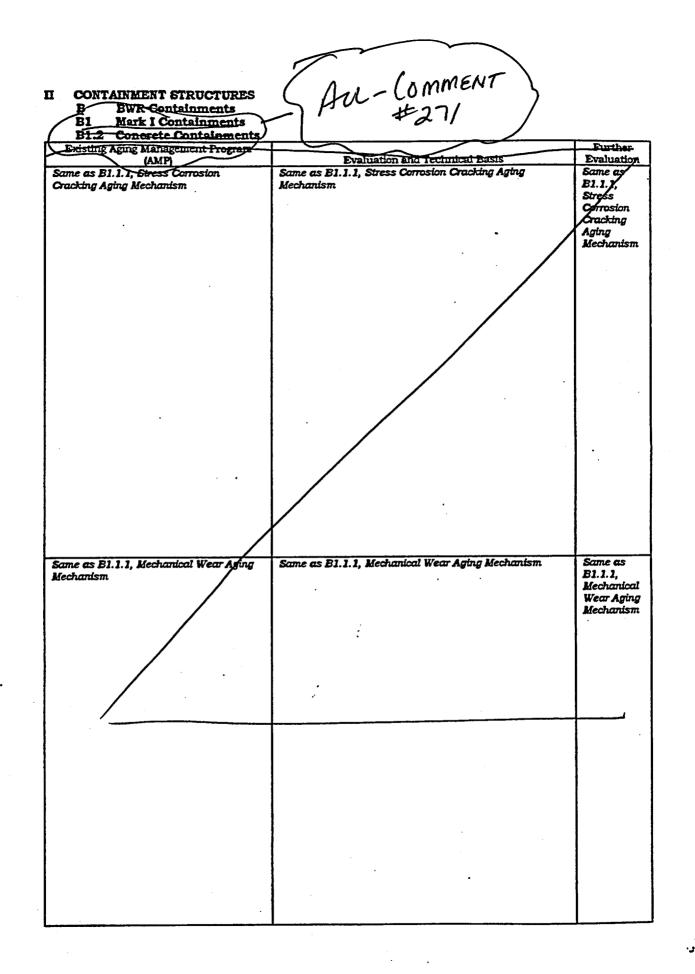
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,BI	BWR Cor Mark I Co 2 Concrete	STRUCTURE Itainments Intainments Containmen	(All-	\sim	vr#27	
Atem	Structure/	Region of Interest	Material	Environ- ment	Aging Effect	Aging Mechanism	References
(B1.2.2	Steel	Drywell	Carbon	Inside	Loss of	Corrosion	Same as BL1.1,
	Elements	Liner; Torus Liner; Liner Anchors; Drywell Head; Vent Lines, Header, and System Supports; Down- comers and Bracing	Steel	end/or Outside Contain- ment	Material		Correston Aging Mechanism NRC IN 97-10
B1.2.2	Steel Elements	Vent Line Bellows	Stainless Steel	Inside and/or Outside Contain- ment	Cumula- tive Fatigue Damage	Cyclic Loading	Same as B1.1.1, Cyclic Loading Aging Mechanism

AU- COMMENT #271 CONTAINMENT STRUCTURES Π **BWR Containments** B **B1** Mark I-Containments_ B1.2 Concrete Containments Further Existing Aging Management Program **Evaluation and Technical Basis** Evaluation (AMP) Same as Same as B1.1.1, Corrosion Aging Same as B1.1.1, Corrosion Aging Mechanism B1.1.1, Mechanism Corresion 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, Cyclic Loading Aging Mechanism Same as Same as B1.1.1, Cyclic Loading Aging B1.1.1, Mechanism Cyclic Loading Aging Mechanism

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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

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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 Interface .С.

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Functional jaterfaces include the primary containment HVAC system(VII.f), containment isolation system(V.M, 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.f) 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.

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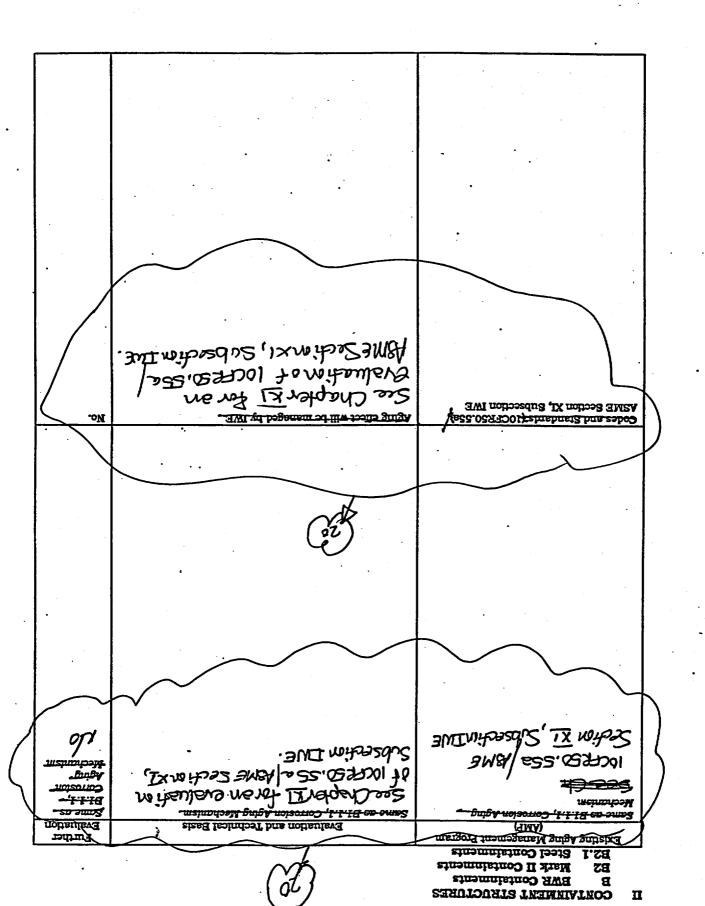
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B BWR Containments

B2 Mark II Containments B2.1 Steel Containments

	.1 Steel Con		the second s				
	Structure/	Region of		Environ-	Aging	Aging	
Item B2.1.1	Component Steel	Interest Drywell;	Material Carbon	ment	Effect	Mechanism	References
D2.1.1	Elements	Suppres-	Steel	Inside and/or	Loss of Material	Corrosion	Same as B1.1.1, Corrosion Aging
		sion		Outside			Mechanism
1		Chamber;		Contain-			
1		Drywell	[ment			
1		Head; Embedded	1			-	
		Shell and					
		Sand			-		
		Focket					
		Regions;		· ·			· · ·
	1	Support Skirt;					
		Downcomer					
		Pipes &					
		Bracing;	ſ				
		Region Shielded by					
		Diaphragm					
		Floor					
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		•					
B2.1.1	Steel	Drywell	Carbon	Inside	Fretting/	Mechanical	Same as B1.1.1,
	Elements	Head;	Steel	and/or	Lockup	Wear	Mechanical Wear
		Downcomer Pipes &		Outside Contain-			Aging Mechanism
		r ince co		Contami-	1		Mechanis
	· ·			ment			
		Bracing		ment			
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CONTAINMENT STRUCTURES B BWR Containments B2 Mark II Containments B2 Concrete Containments Π

B B2 B2 2

BZ-Z	Concrete	Containment	£.

D/		containme	nts				
Item	Structure/ Component	Region of Interest	36-4-1-1	Environ-	Aging	Aging	1 7
B2.2.1		Contain-	Material Concrete	ment	Effect	Mechanism	References
	Elements	ment;	Concrete	Inside	Increase in	Leaching of	Same as B1.2.1,
		Basemat		and/or	Porosity,	Calcium	Aggressive
		Dascinal	1	Outside	Permea-	Hydroxide;	Chemical Attack
1 .			· ·	Contain-	bility;	Aggressive	Aging
			1	ment	Scaling,	Chemical	Mechanism
1.					Cracking,	Attack	
		1	•	1	Spalling		
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E2.2.1	Concrete	Contain-	Concrete	Inside	Expansion	Reaction	Same as B1.2.1,
1	Elements	_ment;		and/or	&	with	Reaction with
1	· ·	Basemat	•	Outside	Cracking	Aggregates	Aggregates Aging
				Contain-			Mechanism
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B2.2.1	Concrete	Contain-	Concrete;	Inside	Cracking,	Corresion of	Same as B1.2.1,
	Elements	ment;	Carbon	and/or	Spalling,	Embedded	Corrosion of
l ·		Basemat;	Steel	Outside	Loss of	Steel	Embedded Steel
1.	ř I	Reinforcing	[Contain-	Bond,		Aging
		Steel		' ment	Loss of	·	Mechanism
· · ·					Material		н. -
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Embedded Steel Aging Mechanism ş And A Ľ li 2 ð Evaluation and Technical Basis Same as BI.2.1, Agressible Chamical Acade Agring Hectionian See Chapter KI for Sin Cualuation See Chapter KI for Sin Cualuation of 10 crosso. 56a / Jushe Sectim El, Sulosection INUL. nth Aggr 5 8 13.18 o Same ao B1.2.1 Nechanism Ken K B2.2 Concrete Containments Existing Aging Management Frogram Eamo as B1.3.1, Agyressive Chemical ABME Josechim Ilul CONTAINMENT STRUCTURES B BWR Containments B2 Mark II Containments B2.2 Concrete Containments with Aggrega 10CPR50.55a Seef:w 区 9 B1 3 1. R Same as B1.2. Steel Aging Mo Aging ㅂ ۲,

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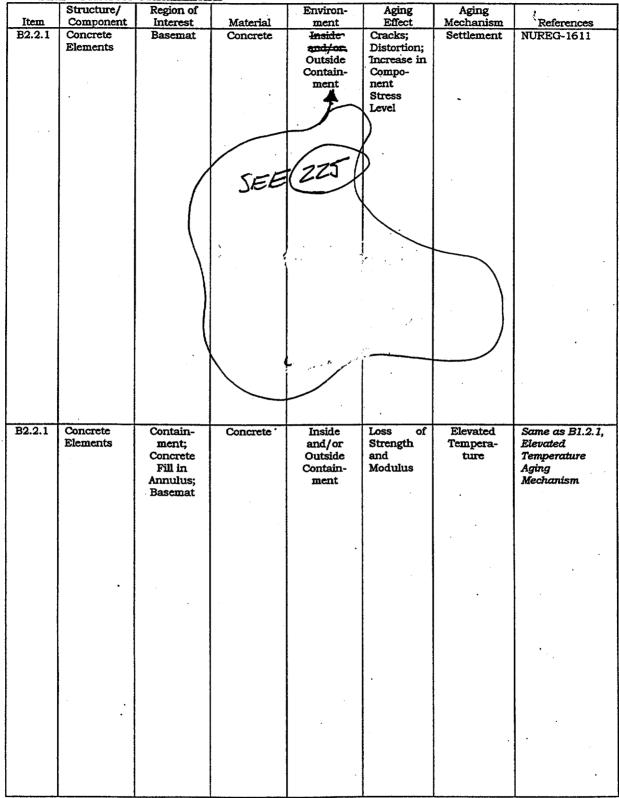
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II CONTAINMENT STRUCTURES

B BWR Containments

B2 Mark II Containments

B2.2 Concrete Containments



No mandated Aging Management Program exists. NUREO-1611 identifies the need for a settlement monitoring program, if the prerequisite conditions exist. ACI 349.3R-96 provides guidance for addressing settlement. Ħ ouss. NUREG-1611 Management Program myenrend No mandaled Aging Aging Nochanism Note: Cracks, distortions, and prerequisite conditions dentifies the need for olant-speatic Shess levels may not Mercases in Component Da Hundreste *tsill* because require management not plausible B BWR Containments B2 Mark II Containments B2.2 Concrete Containments Existing Aging Management Program CONTAINMENT STRUCTURES B1.3.1, Elevated Temperature Stle settlement is libe for the AWP itthe Specified 4 Containmont that exceed and INIL would not be able to 150°F for the ciplustions are torany partions of concrete and modulus due to **Sans** Evaluation and Technical Basis Settlement is not addressed by 10 CFR 50.55a or IWL. NUREO-1611 specifies that a settlement monitoring program is needed for a containment structure/basemat resting on soil or plies, or if the site experiences He tendors Nunanta significant changes in ground water conditions identify the loss of strength The implementation of local sources plevated temperature. Thus veeded. **IIB2-9** as 51.2.1, Elevated Temperature Aging Koohani Haint. Checking land B live limits, k local 1 Hunderature NURG - 1611 specifies rolitem leve) above w down dever Draft December 6, 1999 limits, 22 Same as Tauboudthis issue must be evaluated. program to address manage-ment Evaluation Yes. applicant's aging ę R applicable pamoar 3 Further ondines in

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II B2-10

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	B3 23 23 23 23 23 23 23 23 23 23 23 23 23	E E E E
Elements		
suppres- sion Liner (Interior Surface)	Interest Drywell, Suppres- sion Chamber and Basemat Liners; Liners; Drywell Head; Pipes & Bracing	NTAINMENT STRUCTURES BWR Containments Mark II Containments 2 Concrete Containments Structure/ Region of
Startics	Garbon Steel	
and/or Outside ment	ment Inside Outside Contain- ment	Environ-
Grack and Growth	Effect Loss of Material	Aging
Stress Cracking	Mechanism Carrosion	Aging
Same as B1.1.1, Stress Carrosian Oraching Aging Mechanism	References Same as B1.2.2, Carrosion Aging Mechanism	

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CONTAINMENT STRUCTURES Π **BWR Containments** в **B2** Mark II Containments B2.2 Concrete Containments Existing Aging Management Program (AMP) Further Evaluation and Technical Basis Evaluation Same as B1.2.2, Corrosion Aging. Same as B1.2.2. Corrosion Aging Mechanism Samo-ac Mochanism___ See Chapter XI for an Evaluation of locales. 55a B1.2.2, Correction 10CFRSO.SSS/ASME Section III, Subsection IWE Aging Mcchanism ASME Section XI, Subsection No TINE Codes and Standards (10CFR50.55a), Aging effect will be managed by Examination Category E-P (10 CFR 50, Appendix J, Integrated Leak Rate Test). No. ASME Section XI, Subsection IWE ŝ, See Chapter XI for an. Ovaluation of IOCFRED, Appondis J.

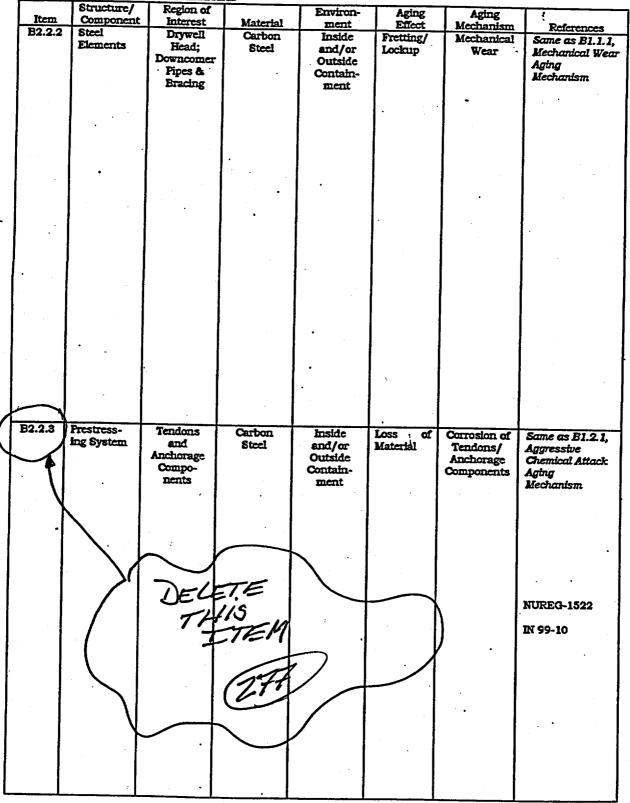
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II CONTAINMENT STRUCTURES

B BWR Containments

B2 Mark II Containments

B2.2 Concrete Containments



Π **CONTAINMENT STRUCTURES BWR Containments** R **B2** Mark II Containments **B2.2** Concrete Containments Existing Aging Management Program Further Evaluation 1 (AMP) **Evaluation and Technical Basis** Same us B1.1.1, Mechanical Wear Aging Mechanism Dame as B1.1.1, Mechanical Wear Aging-Same as Mechanism. B1.1.1,-See Chapter RI for an evaluation Mechanice IDCFR50,552/ASME Wear Aging of 1069850.55a/ABME Sectionxi, Section KI, Subsection Mechanism TWE Subsection INE NO Same as B1.2.1, Aggressive Chemical Attack Aging Same as B1.2.1, Aggressive Chemical No. Attack Aging Mechanism 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. Managing the condition and environment in the tendon Yes. NUREG-1522 and IN 99-10 describe conditions in tendon access galieries access gallery (e.g., moisture and humidity) is a prudent Plantspecific way to manage the degradation (i.e., corrosion) of conducive to corrosion of tendon considerabearing plates and other vertical tendon anchorage anchorage components. tion of the components. tendon access gallery should be evaluated. ELETE 27

II CONTAINMENT STRUCTURES

B BWR Containments

B2 Mark II Containments

	B2		Containments	5				\frown	
	B2.	2 Concret	Containmen	ts	\leq		\sim		
/	Item	Subsystem	Component		Environ-	Aging Effect	Aging	- '-	
	-B2.2.3	Prestress.	Tendons and	Material Carbon	ment	Loss of	Mechanism Relaxation:	References	
1	-52.2.0	ing System-	Anchemice		and/or	Prestress	Shrinkage;		- I
{	1		Compo-		Outside-		Creep:	ABME Scotion	
			Compo- ficnts		Contain-		Creep: Elevated	XI. Subsection	
					ment		Temperature	IWL	
		· ·					•		
								NUREG-1611	
]			10CFR54	
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								Guide 1:95-1	
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B BWR Containments		
B2 Mark II Containments		
B2.2 Concrete Containments		
Existing Aging Management Program	Destantion and Destanted Daris	Further
(AMP)	Evaluation and Technical Basis	Evaluation
Codes HIM Standards (10GFR50.552),	Arevious evaluation of 10 CFR 50.55a, FWL is augmented	210,
ASME Section XI, Subsection IWL	as follows:	Provided
	(T) Manifester and Transform	Regulatory Guide
New 1005250 SEe and TUT do not such	(5) Monitoring and Trending: 10 CFR 50.55a and IWL do not provide guidance on how	1.35.1 5
Note: 10CFR50.55a and IWL do not apply to bonded post-tensioning systems.	to calculate expected tendon prestressing forces that are	followed.
to bonded post-tensioning systems.	needed to compare against the measured tendon lift off	Otherwise
NUREG-1611 identifies both	forces. This guidance is provided in NRC Regulatory	plant
10CFR50.55a/IWL and TLAA to manage	Guide 1.35.1.	specific
loss of prestress		evaluation
		is 7
		necessary.
		7
Tendon Surveillance Program requires	To ensure that the structural and functional adequacy of	Yes.
TIAA	the containment are maintained, a TLAA for the tendon	1
	prestressing forces is needed for the extended period of	Methodo-
	operation. A TLAA for the containment prestressing	logy for
	system which meets 10CFR54.21(c)(1)(ii) should have	TLAA must
	the following basic attributes:	be
		evaluated
	1. Calculation of the minimum required prestressing	
	force value (MRV) for each tendon group.	
	2. Calculated predicted lower light (PLL) prestressing	
	force for each group of tendons/(See NRC R.G. 1.35.1).	
David MI	During each inspection, the measured prestressing	
ISIETE AUG	forces in the sampled tendons are compared against the FLL. As discussed in IN 99-10, the trend lines shall be	
19000	developed using a regression analysis considering	
1 +=	individual tendon lift-off forces rather than the average	
DELETE AU - #277 /	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	
$\square \land \square$	demonstrate that the frend 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.	
	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)(I)(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.	
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CONTAINMENT STRUCTURES

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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
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Π CONTAINMENT STRUCTURES

BWR Containments Mark II Containments В

B2 B2.2 Concrete Containments

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
	Evaluation and Technical Basis [7] Corrective Actions: If the trend times crease PL 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 TLA DELETE If 277	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

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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.FVIII.G); or is supported by the containment structure. The containment structure basemat may provide support to the NSSS components and containment internal structures.

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B	3 Mark III 3.1 Steel Co	l'STRUCTUR ntainments Containmen ptainments	- · · · ·				· .
Item	Structure/ Component	Region of		Environ-	· Aging Effect	Aging	<u> </u>
B3.1.		Interest Contain-	Material Carbon	Inside		Mechanism	References
	Elements	ment Shell; Suppres- sion Chamber Shell; Basemat Liner; Liner Anchors; Embedded Shell Region	arbon Bicel	Inside and/or Outside Contain- ment	Loss of Material	Corresion	Same as B1.1.1, Corrosion Aging Mechanism
		280					
B3.1.1	Steel						
	Elements	Suppres- sion Chamber Shell (Interior Surface)	Stainless Steel	Inside and/or Outside Contain- ment	Crack Initiation and Growth	Stress Corrosion Cracking	Same as B1.1.1, Stress Corrosion Gracking Aging Mechanism

ASHE Ħ Section KI, Subsection 1065850.552 dantsn CONTAINMENT STRUCTURES B BWR Containments B3 Mark III Containments B3.1 Steel Containments Existing Aging Management Program EL L L Carros ġ ards (10CFR50.55a) n fyig ASME Aging affect will be managed by Examination Category/ E-P (10 CFR 50, Appendix J, Integrated Leak Rate Test). Appendity J. ASME Soction KI Evaluation and Technical Basis See Chapter XI for an evaluation walustion of Sé Chapter 9 10CFZSO, X , Subsection Ine locres, SSa するか No Aging-Mechanism Further Evaluation Bane as Birl. 1, Ganastan 6

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B3.1.2	B3.1.2	
Concrete Elements	Concrete Elements	
Basemat and Steel Steel	Basemat; Omorete Fill in Annulus	Mark II Containments Steel Containments uncurve Region of morrete Basemat; concrete Basemat; curve Basemat; concrete Fill In Sull II Concrete Fill In Manulus
Concarte; Carbon Steel	Concrete	s Material Concrete
Inside and/or Outside Contain- ment	Inside and/or Outside Contain- ment	Environ- ment Inside and/or Outside Contain- ment
Gracking, Spalling, Loss of Loss of Material Material	Expansion & Cracking	Aging Effect Increase in Perrosity, Perrosity, Scaling, Scaling, Spalling
Corrosion of Embedded Steel	Reaction with Aggregates	Aging Mechanism Leaching of Calcium Hydroxide; Aggressive Chemical Attack
Same as B1.2.1, Carroston of Embedded Steel Aging Mechanism	Same as B1.2.1, Reaction with Aggregates Aging Mechanism	References Same as B1.2.1, Aggressive Chemical Attack Aging Mechanism

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

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Delete 281 Ħ Same as Bi.L.i, Roa Aging Mechanism Subsection IIVI AME Section XI, Same as B1.2.1, Aggressive Chemical Attack Aging Mechanism CONTAINMENT STRUCTURES B EWR Containments B3 Mark III Containments B3.1 Steel Containments Existing Aging Management Program INGFRED, SSa HAVE AS D AWW with Aggregates Same as B1.2.1, Carros Mechanism on evaluation of Incres. 52 Same as B1.2.1, Reaction with Aggregates Aging Mochanism Asme Sectim KL, Subsection III Evaluation and Technical Basis Same as B1.2.1, Aggressive Chemical Attack Aging Mechanism ſſ ž hapter x 1 for Hall AZ S of Embedded Steel Aging Correston of Embedded Sieel Aging Ngerantsm Further Evaluation Same as B1.2.1, Aggressive Chemical Attack Aging Mechanism El.2.1 ĸ Xa

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II CONTAINMENT STRUCTURES B BWR Containments B3 Mark III Containments

B3.1	Steel	Contai	nments

	.1 Steel Con							•
	Structure/	Region of		Environ-	Aging	Aging	1.	ר
Item	Component	Interest	Material	ment	Aging Effect	Aging Mechanism	References	
B3.1.2		Basemat	Concrete	Inside	Cracks;	Settlement	Same as B2.2.1,	-
	Elements			and/or	Distortion;		Settlement Aging	
1			1	Outside	Increase in		Mechanism	
			1	Contain-	Compo-	· ·	ALECHUMUSTI	
				ment	nent			
					Stress			1 .
			1		Level	1 -		ł
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B3.1.2	Concrete	Basemat:	Concrete	Incide	Torn of	Ellerer to d		
B3.1.2	Concrete Elements	Basemat; Concrete	Concrete	Inside and (or	Loss of Strength	Elevated	Same as B1.2.1,	
B3.1.2	Concrete Elements	Concrete	Concrete	and/or	Strength	Tempera-	Elevated	
B3.1.2	Concrete Elements	Concrete Fill in	Concrete	and/or Outside	Strength and		Elevated Temperature	
B3.1.2	Concrete Elements	Concrete	Concrete	and/or Outside Contain-	Strength	Tempera-	Elevated Temperature Aging	
B3.1.2	Concrete Elements	Concrete Fill in	Concrete	and/or Outside	Strength and	Tempera-	Elevated Temperature	
B3.1.2	Concrete Elements	Concrete Fill in	Concrete	and/or Outside Contain-	Strength and	Tempera-	Elevated Temperature Aging	
B3.1.2	Concrete Elements	Concrete Fill in	Concrete	and/or Outside Contain-	Strength and	Tempera-	Elevated Temperature Aging	
B3.1.2	Concrete Elements	Concrete Fill in	Concrete	and/or Outside Contain-	Strength and Modulus	Tempera- ture	Elevated Temperature Aging	
B3.1.2	Concrete Elements	Concrete Fill in	Concrete	and/or Outside Contain-	Strength and Modulus	Tempera- ture	Elevated Temperature Aging	
B3.1.2	Concrete Elements	Concrete Fill in	Concrete	and/or Outside Contain-	Strength and Modulus	Tempera- ture	Elevated Temperature Aging Mechanism	
B3.1.2	Concrete Elements	Concrete Fill in	Concrete	and/or Outside Contain-	Strength and Modulus	Tempera- ture	Elevated Temperature Aging Mechanism	
B3.1.2	Concrete Elements	Concrete Fill in	Concrete	and/or Outside Contain-	Strength and Modulus	Tempera- ture	Elevated Temperature Aging Mechanism	ALL
B3.1.2	Concrete Elements	Concrete Fill in	Concrete	and/or Outside Contain-	Strength and Modulus ADC PE	Tempera- ture	Elevated Temperature Aging Mechanism	
B3.1.2	Concrete Elements	Concrete Fill in	Concrete	and/or Outside Contain-	Strength and Modulus ADC PE	Tempera- ture	Elevated Temperature Aging Mechanism	
B3.1.2	Concrete Elements	Concrete Fill in	Concrete	and/or Outside Contain-	Strength and Modulus ADC PE	Tempera- ture	Elevated Temperature Aging Mechanism	
B3.1.2	Concrete Elements	Concrete Fill in	Concrete	and/or Outside Contain- ment	Strength and Modulus ADC PE	Tempera- ture	Elevated Temperature Aging Mechanism	10
B3.1.2	Concrete Elements	Concrete Fill in	Concrete	and/or Outside Contain- ment	Strength and Modulus ADC PE	Tempera- ture	Elevated Temperature Aging Mechanism	E P
B3.1.2	Concrete Elements	Concrete Fill in	Concrete	and/or Outside Contain- ment	Strength and Modulus ADC PE	Tempera- ture TEXT	Elevated Temperature Aging Mechanism (ASME) Di V. 2-1 Di V. 2-1 M-344	
B3.1.2	Concrete Elements	Concrete Fill in	Concrete	and/or Outside Contain- ment	Strength and Modulus ADC PE	Tempera- ture TEXT	Elevated Temperature Aging Mechanism (ASME) Di V. 2-1 Di V. 2-1 M-344	CA 11
B3.1.2	Concrete Elements	Concrete Fill in	Concrete	and/or Outside Contain- ment	Strength and Modulus ADC PE	Tempera- ture TEXT	Elevated Temperature Aging Mechanism (ASME) Di V. 2-1 Di V. 2-1 M-344	CA I
B3.1.2	Concrete Elements	Concrete Fill in	Concrete	and/or Outside Contain- ment	Strength and Modulus ADC PE	Tempera- ture TEXT	Elevated Temperature Aging Mechanism (ASME) Di V. 2-1 Di V. 2-1 M-344	
B3.1.2	Concrete Elements	Concrete Fill in	Concrete	and/or Outside Contain- ment	Strength and Modulus ADC PE	Tempera- ture TEXT	Elevated Temperature Aging Mechanism (ASME) Di V. 2-1 Di V. 2-1 M-344	
B3.1.2	Concrete Elements	Concrete Fill in	Concrete	and/or Outside Contain- ment	Strength and Modulus ADC PE	Tempera- ture TEXT	Elevated Temperature Aging Mechanism	
B3.1.2	Concrete Elements	Concrete Fill in	Concrete	and/or Outside Contain- ment	Strength and Modulus ADC PE	Tempera- ture TEXT	Elevated Temperature Aging Mechanism (ASME) Di V. 2-1 Di V. 2-1 M-344	
B3.1.2	Concrete Elements	Concrete Fill in	Concrete	and/or Outside Contain- ment	Strength and Modulus ADC PE	Tempera- ture TEXT	Elevated Temperature Aging Mechanism (ASME) Di V. 2-1 Di V. 2-1 M-344	
B3.1.2	Concrete Elements	Concrete Fill in	Concrete	and/or Outside Contain- ment	Strength and Modulus ADC PE	Tempera- ture TEXT	Elevated Temperature Aging Mechanism (ASME) Di V. 2-1 Di V. 2-1 M-344	
B3.1.2	Concrete Elements	Concrete Fill in	Concrete	and/or Outside Contain- ment	Strength and Modulus ADC PE	Tempera- ture TEXT	Elevated Temperature Aging Mechanism (ASME) Di V. 2-1 Di V. 2-1 M-344	
B3.1.2	Concrete Elements	Concrete Fill in	Concrete	and/or Outside Contain- ment	Strength and Modulus ADC PE	Tempera- ture TEXT	Elevated Temperature Aging Mechanism (ASME) Di V. 2-1 Di V. 2-1 M-344	
B3.1.2	Concrete Elements	Concrete Fill in	Concrete	and/or Outside Contain- ment	Strength and Modulus ADC PE	Tempera- ture TEXT	Elevated Temperature Aging Mechanism (ASME) Di V. 2-1 Di V. 2-1 M-344	
B3.1.2	Concrete Elements	Concrete Fill in	Concrete	and/or Outside Contain- ment	Strength and Modulus ADC PE	Tempera- ture	Elevated Temperature Aging Mechanism (ASME) Di V. 2-1 Di V. 2-1 M-344	

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CONTAINMENT STRUCTURES BWR Containments в Mark III Containments **B**3 B3.1 Steel Containments Further Existing Aging Management Program Evaluation (AMP) **Evaluation and Technical Basis** Same as B2.2.1. Settlement Aging Mechanism Same c ame as B2.2.1, Settlement Aging -Settlement is not addressed by B2.2.1, Settlement Mochanism 10CFRSD. 552 OI IWL. NURES-No mandated Aging Management Aging Mechanism 1611 specifies that a Program exists. NUREE-1611 les. Settlement monitoring program identifies the need for a is needed for a containment Tf applicable, structure y basemat resting settlement monitoring the applicants on soilor piles, or if the program, if the prefequiorte conditions site experiences significant Oqim management Brust, ACI 3493R-96 changes in ground water provides quidance for addres-Drognam to Sing settlement. address this conditions your must be Norr: Cracks, distortions, and evaluate micreases in component Stress levels may not M guine manage mont because settlement is not plausible for the particular site Elevated Temperature Aging Mechanism Same-as Aging Mechanism B1.2.1, The implementation of 10CFRSD.553 and INC Would Elevajed ho mandated aging Temperapore Aging Management program Exists. NUREG-1011 not be able to identify the loss Techanism of strongth and modulus due to elevated temperature. Thus, identifies the need for any portions of concrete tor plant specific 1st exceed evaluation; if the containment prerequisite' conditions specified limits, kurther evaluations are we warranted. OLISK . E6-1611 specifics the perature limets, both general (150°F) and local (200°F) sbove which a plant specify evaluation is needed.

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

Г		Structure/	e Containmer	1	<u></u>			
	Item	Component	Region of		Environ-	Aging	Aging	11
ŀ	B3.2.1	Concrete		Material	ment	Effect	Mcchanism	References
	D0.4.1	Elements	Dome, Wall,	Concrete	Inside	Scaling;	Freeze/	Same as B1.2.1,
		Elements	Basemat		and/or	Cracking,	Thaw	Aggressive
			1		Outside	Spalling	A	Chemical Attack
			ļ		Contain-		1	Aging
			1		ment			Mechanism
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	B3.2.1	Concrete	Dome, Wall,	Concrete	Inside	Increase in	Leaching of	Same as B1.2.1,
	B3.2.1	Concrete Elements	Dome, Wall, Basemat	Concrete	and/or	Porosity,	Calcium	Same as B1.2.1, Aggressive
	B3.2.1	Concrete Elements	Dome, Wall, Basemat	Concrete	and/or Outside	Porosity, Permea-	Calcium Hydroxide;	Aggressive Chemical Attack
	B3.2.1	Concrete •Elements	Dome, Wall, Basemat	Concrete	and/or Outside Contain-	Porosity, Permea- bility;	Calcium Hydroxide; Aggressive	Aggressive Chemical Atlack Aging
	B3.2.1	Concrete •Elements	Dome, Wall, Basemat	Concrete	and/or Outside	Porosity, Permea- bility; Scaling,	Calcium Hydroxide; Aggressive Chemical	Aggressive Chemical Attack
	B3.2.1	Concrete •Elements	Dome, Wall, Basemat	Concrete	and/or Outside Contain-	Porosity, Permea- bility; Scaling, Cracking,	Calcium Hydroxide; Aggressive	Aggressive Chemical Atlack Aging
	B3.2.1	Concrete Elements	Dome, Wall, Basemat	Concrete	and/or Outside Contain-	Porosity, Permea- bility; Scaling,	Calcium Hydroxide; Aggressive Chemical	Aggressive Chemical Atlack Aging
	B3.2.1	Concrete Elements	Dome, Wall, Basemat	Concrete	and/or Outside Contain-	Porosity, Permea- bility; Scaling, Cracking,	Calcium Hydroxide; Aggressive Chemical	Aggressive Chemical Atlack Aging
	B3.2.1	Concrete Elements	Dome, Wall, Basemat	Concrete	and/or Outside Contain-	Porosity, Permea- bility; Scaling, Cracking,	Calcium Hydroxide; Aggressive Chemical	Aggressive Chemical Atlack Aging
	B3.2.1	Concrete Elements	Dome, Wall, Basemat	Concrete	and/or Outside Contain-	Porosity, Permea- bility; Scaling, Cracking,	Calcium Hydroxide; Aggressive Chemical	Aggressive Chemical Atlack Aging
	B3.2.1	Concrete Elements	Dome, Wall, Basemat	Concrete	and/or Outside Contain-	Porosity, Permea- bility; Scaling, Cracking,	Calcium Hydroxide; Aggressive Chemical	Aggressive Chemical Atlack Aging
	B3.2.1	Concrete -Elements	Dome, Wall, Basemat	Concrete	and/or Outside Contain-	Porosity, Permea- bility; Scaling, Cracking,	Calcium Hydroxide; Aggressive Chemical	Aggressive Chemical Atlack Aging
	B3.2.1	Concrete •Elements	Dome, Wall, Basemat	Concrete	and/or Outside Contain-	Porosity, Permea- bility; Scaling, Cracking,	Calcium Hydroxide; Aggressive Chemical	Aggressive Chemical Atlack Aging
	B3.2.1	Concrete •Elements	Dome, Wall, Basemat	Concrete	and/or Outside Contain-	Porosity, Permea- bility; Scaling, Cracking,	Calcium Hydroxide; Aggressive Chemical	Aggressive Chemical Atlack Aging
	B3.2.1	Concrete Elements	Dome, Wall, Basemat	Concrete	and/or Outside Contain-	Porosity, Permea- bility; Scaling, Cracking,	Calcium Hydroxide; Aggressive Chemical	Aggressive Chemical Atlack Aging
	B3.2.1	Concrete Elements	Dome, Wall, Basemat	Concrete	and/or Outside Contain-	Porosity, Permea- bility; Scaling, Cracking,	Calcium Hydroxide; Aggressive Chemical	Aggressive Chemical Atlack Aging
	B3.2.1	Concrete	Dome, Wall, Basemat	Concrete	and/or Outside Contain-	Porosity, Permea- bility; Scaling, Cracking,	Calcium Hydroxide; Aggressive Chemical	Aggressive Chemical Atlack Aging
	B3.2.1	Concrete	Dome, Wall, Basemat	Concrete	and/or Outside Contain-	Porosity, Permea- bility; Scaling, Cracking,	Calcium Hydroxide; Aggressive Chemical	Aggressive Chemical Atlack Aging
	B3.2.1	Concrete Elements	Dome, Wall, Basemat	Concrete	and/or Outside Contain-	Porosity, Permea- bility; Scaling, Cracking,	Calcium Hydroxide; Aggressive Chemical	Aggressive Chemical Atlack Aging
	B3.2.1	Concrete	Dome, Wall, Basemat	Concrete	and/or Outside Contain-	Porosity, Permea- bility; Scaling, Cracking,	Calcium Hydroxide; Aggressive Chemical	Aggressive Chemical Atlack Aging
	B3.2.1	Concrete -Elements	Dome, Wall, Basemat	Concrete	and/or Outside Contain-	Porosity, Permea- bility; Scaling, Cracking,	Calcium Hydroxide; Aggressive Chemical	Aggressive Chemical Atlack Aging
	B3.2.1	Concrete Elements	Dome, Wall, Basemat	Concrete	and/or Outside Contain-	Porosity, Permea- bility; Scaling, Cracking,	Calcium Hydroxide; Aggressive Chemical	Aggressive Chemical Atlack Aging
	B3.2.1	Concrete	Dome, Wall, Basemat	Concrete	and/or Outside Contain-	Porosity, Permea- bility; Scaling, Cracking,	Calcium Hydroxide; Aggressive Chemical	Aggressive Chemical Atlack Aging
	B3.2.1	Concrete	Dome, Wall, Basemat	Concrete	and/or Outside Contain-	Porosity, Permea- bility; Scaling, Cracking,	Calcium Hydroxide; Aggressive Chemical	Aggressive Chemical Atlack Aging
	B3.2.1	Concrete	Dome, Wall, Basemat	Concrete	and/or Outside Contain-	Porosity, Permea- bility; Scaling, Cracking,	Calcium Hydroxide; Aggressive Chemical	Aggressive Chemical Atlack Aging
	B3.2.1	Concrete	Dome, Wall, Basemat	Concrete	and/or Outside Contain-	Porosity, Permea- bility; Scaling, Cracking,	Calcium Hydroxide; Aggressive Chemical	Aggressive Chemical Atlack Aging
	B3.2.1	Concrete	Dome, Wall, Basemat	Concrete	and/or Outside Contain-	Porosity, Permea- bility; Scaling, Cracking,	Calcium Hydroxide; Aggressive Chemical	Aggressive Chemical Atlack Aging
	B3.2.1	Concrete	Dome, Wall, Basemat	Concrete	and/or Outside Contain-	Porosity, Permea- bility; Scaling, Cracking,	Calcium Hydroxide; Aggressive Chemical	Aggressive Chemical Atlack Aging
	B3.2.1	Concrete Elements	Dome, Wall, Basemat	Concrete	and/or Outside Contain-	Porosity, Permea- bility; Scaling, Cracking,	Calcium Hydroxide; Aggressive Chemical	Aggressive Chemical Atlack Aging
	B3.2.1	Concrete Elements	Dome, Wall, Basemat	Concrete	and/or Outside Contain-	Porosity, Permea- bility; Scaling, Cracking,	Calcium Hydroxide; Aggressive Chemical	Aggressive Chemical Atlack Aging

Π CONTAINMENT STRUCTURES В **BWR** Containments **B3** Mark III Containments B3.2 Concrete Containments Existing Aging Management Program Further (AMP) **Evaluation and Technical Basis** Evaluation Same as B1.2.1 Aggressive Chemical Same as B1.2.1, Aggressive Chemical Attack Aging No Attack Aging Mechanism Mechanism See Chapter XI for an 10CPX50.55 a/ ASME Section XI, evaluation of 10CFRSD.552/ ASME Section XI, Subsection Subsection FUL IWL Same as B1.2.1, Aggressive Chemical Attack Aging Mechanism. Same as B1.2.1, Aggressive Chemical Attack Aging Same as B1.2.1, Aggressive Chemical Mochantsm Attack Aging Mechanism NO

	Perferences	Same as B1.2.1, Reaction with Aggregates Aging Mechanism	Same as B1.2.1, Corrosion of Embedded Steel Aging Mechanism
	Aging Mechanism	Reaction with Aggregates	Carrosion of Embedded Steel
	Aging Effect	Expansion Cracking	Cracting. Spalling. Bond, of Loss of Material of
	Environ- ment	Inside and/or Contain- ment ment	Instite and/or Contain- ment ment
ts tt	Material	Concrete	Contracte Carbon Steel
CONTAINMENT STRUCTURES B BWR Containments B3 Mark III Containments B3.2 Concrete Containments	Region of Interest	Concrete Dome, Well, C Elements Basemat C	Dome, Wall, Basemat, Reinforcing Steel
DNTAINMEN' BWR Co Mark III 2 Concrete			Dements
н Ва Ва Ва Ва Сом Сом Сом Сом Сом Сом Сом Сом Сом Сом	lten I		B3.2.1

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II B3-12

Π CONTAINMENT STRUCTURES **BWR Containments** В **B**3 Mark III Containments B3.2 Concrete Containments Aisting Aging Management Program Further Į (AMP) Evaluation and Technical Basis Evaluation Same as B1.2.1, Reaction with Aggregates Same as B1.2.1, Reaction with Aggregates Aging . No Aging Mechanism-Mechanism See Chapter XI for an evaluation of IOCFRED. 552/ABME Section KI, Subsection EWL 10CFR9.552/ASME Section XI, Subsection INL Same as B1.2.1, Corrosion of Embedded Steel Aging Mechanism Same as B1.2.1, Corrosion of Embedded Steel Aging-Bame as Mechanism B1.2.1, Corresion of Embedded Steel Aging Mechanism do

	II CO B	DNTAINMENT	STRUCTUR	ES					
	B3	Mark III	Containments	ts	· .	•			
	B3	.2 Concrete	Containmen	its				•	
	Item	Structure/ Component	Region of Interest	Material	Environ- ment	Aging Effect	Aging Mechanism	References	7
	B3.2.1	Concrete Elements	Easemat ADD:	Concrete	Inside and/or Outside	Cracks; Distortion; Increase in	Settlement	Same as B2.2.1, Settlement Aging	1
				(Contain-	Compo- nent		Mechanism	
			AND PILES			Stress Level	•		
			1-2000						
			00	F)	•				
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	•	•							
	B3.2.1	Concrete Elements	Dome, Wall, Basemat	Concrete	Inside and/or Outside	Loss of Strength and	Elevated Tempera- ture	Same as B1.2.1, Elevated Temperature	
					Contain- ment	Modulus	מחה	nging Mechanism	
I							TEXT		
					•	. (.	DEL 1202) J.	
)(ASMEL	P
					•		. (ASME I Div. Z, CC-3-44	þ
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						$ \cdot \rangle$	\mathcal{A}		
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L			<u> </u>						

II B3-14

Gist and manages in component prcreguisite AI WITEMERS need for plant-specific NURES-1411 identities the Management program exists No mandated agine equina management incouse Sisters the monitaring None: Cracks, distortions ACT 349.312-96 provid Guidence for addressing the prerequisite NUREG-1611 Identifies the Management - unghedun Need for a settemon No mondated Aging Henrent Hen walk Existing Aging the particular Site e as B3.2. 1, Settlement Aging B **B**3.2 CONTAINMENT STRUCTURES levels may not require Mark III Containments Concrete Containments ging Management Program (MMP) **BWR Containments** Likouted Temps program, if Program exists, conditions する provides and any portions or Warnenited. antainment σ and this mount would not and modulus due to la containment st identify the loss of Monitoring program is needed for further evoluations are specified temperature limits, Conditions. site resting on soil or Smi spectize that a settemen \$ specifies the temperature changes in ground white Y Evaluation and Technical Basis Same us B2.2.1, Settlement AyDY Mechanica the implementation of loars ssa tomperature, ocfegi,552 or INL. Nulle bethement is not addressed needed. Man Bist Ervaled fem よ experietues ~ Anati 1000°4 が 101-932m JEnna that fondre thus, hudure. oiles, or if evaluation about which existed strength P re Ka Ka signitiont JOG F ন ableto Ś presental 191 a F popliable. Hieapplice Banne us BL 2:1, Executed Emplera-ture Agrigo Mechanism Heaplian nosi ß og ing man Frapplichthe, aling buduariu Bioluctul must be this issue 可 b addros mindianou <u>n</u> valuation 4 0m Parther TANK -

II B3-15

	{ References	Same as B1.1.1, Carrostan Aging Mechanism	Same as B2.2.2, Stress Corroston Oracking Aging Mechanism Wechanism
TAINMENT STRUCTURES BWR Containments Mark III Containments Concrete Containments	Aging Mechanism	Corrosion	Stress Corrosion Graciting
	Aging Effect	Loss of Material	Crack Initiation and Crowth Crack
	Environ- ment	Inside end/or Contain- ment ment	Inside and/or Contain- ment ment
	Material	Carbon Steel n	Stathless Stock L Stock L
	Region of Interest	Contain- Bent Liner, Suppres- Bonder Liner, Liner Anchors	Suppres- ston Liner Interior Surfacej
	Structure/ Component	Steel Elements	Steel Elements
H B B B B B B B B B B B B B B B B B B B	Item		B3.22

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II B3-16

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CONTAINMENT STRUCTURES Π B **BWR Containments** B3 Mark III Containments **B3.2** Concrete Containments Existing Aging Management Program Further ŧ AMP Evaluation and Technical Basis Evaluation Same us B1.1.1, Corrosion Aging R1 1 1. Gormsion Aging Mechanism Same as B1.1.1, See Chapter KI for an 10cFESD, SS2 and Corresion Aging Mechanism praluation of 100FRSD.553/ ASME Section XI, No ASME Section XI, Subsection Subsection INE. INE Same as B3.7.2, Stress Corresion Cracking Aging Mechanism Same as B2.2.2, Stress Corrosion Cracking Aging_ Same a Michanism B2.2.2 Stress Compsion Cracking Aging Mechanism See Chapter XI for an eveluation of 10 CFR 50, Appendix J No 1000000, Appendix J

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 Flan 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.

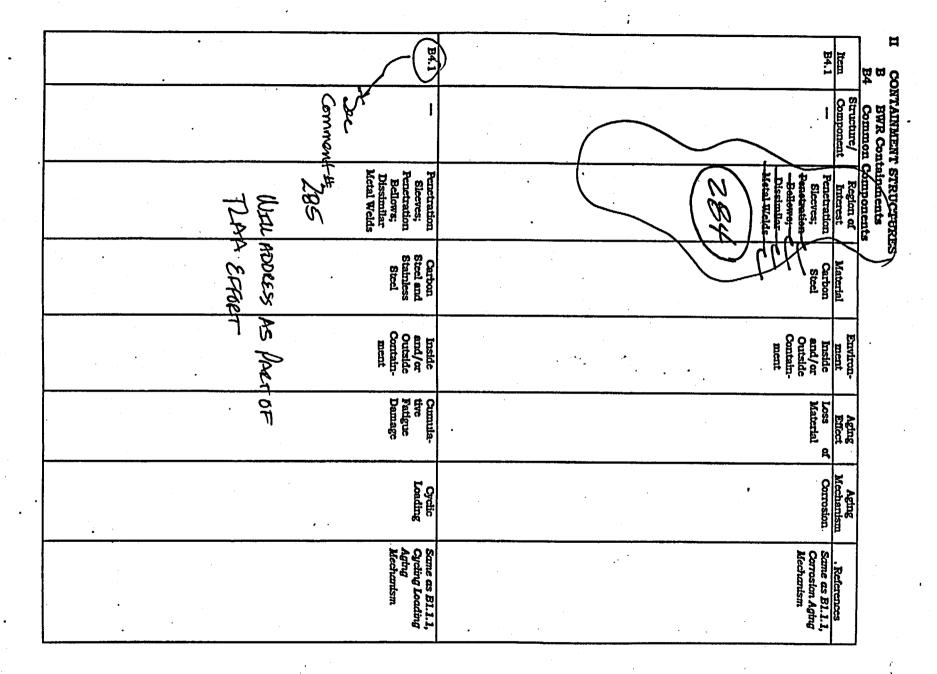
System Interfaces C

Functional interfaces include the primary containment HVAC system(VII.-I), containment isolation system(V.I), containment spray system(V.I), 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.C), or is supported by the containment structure. The containment structure basemat may provide support to the NSSS components and containment internal structures.

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II B4-4

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CONTAINMENT STRUCTURES Π В **BWR Containments** Common Components **B4** Existing Aging Management Program Further (AMP) Evaluation and Technical Basis Evaluation Same as B1.1.1, Corrosion Aging Same as B1.1.1, Corrosion Aging Mechanism Same-as See Chapter XI for an evaluation of 106FRSD. 552/ASME Section XI, Subsection INE Mechanism B1.1.1, Corrosion 10 CFR SD. SSA/ASME Aging Mechanism Section XI, Subsection IWE No Same as B1.1.1, Cycling Loading Aging Same as B1.1.1, Cycling Loading Aging Mechanism Same as Mechanism B1.1.1, Cycling Loading Aging Mechanism

, References Same as B1.1.1, Stress Carrosian Cracidng Aging Mechanism Same as B1.1.1, Corrosion Aging Mechanism Aging Mechanism Stress Corrosion Cracking Corroston . Я Aging Effect Crack Crack Aratitation and Crowth Loss Material ment inside and/or outside Contath-Inside and/or Outside Contain-ment Environ 286 Material Generation Stainless Steel . Carbon Steel CONTAINMENT STRUCTURES B BWR Containments B4 Common Components Structure/ Region of M.1 -- Penetration Harterst M Penetration Bellows; Dissimilar Micial Weids Personnel Ahrlock, Equipment Hatch; CRD B4.2 Ħ

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II B4-6

Π CONTAINMENT STRUCTURES BWR Containments B **B4** Common Components Existing Aging Management Program Further (AMP **Evaluation and Technical Basis** Evaluation Same as B1.1.1, Stress Corrosion Same as B1.1.1, Stress Corrosion Cracking Aging-Game as Cracking Aging Mechanism Mechanism-B1.1.1, Stress Corrosjón Craciting Aging Mechanism Klo See Chapter XI for an evaluation of 100FR501552/ Asme sockion KI, Subsection FWE 10CFR50.552/ABME Section XI, Subsection Due Same as B1.141, Corrosion Aging Same as B1.1.1, Corrosion Aging Mechanism Same as Mechanism B1.1.1, Correston Aging Mechanism NG

Π CONTAINMENT STRUCTURES B BWR Containments

B	4 Common	Components					
	Structure/	Region of	T	Environ-	Aging	Aging	
Item	Component	Interest	Material	ment	Aging Effect	Mechanism	References
B4.2	-	Personnel Airlock; Equipment	Carbon Steel	Inside and/or Outside	Fretting/ Lockup	Mechanical Wear of Locks/	Same as B1.1.1, Mechanical Wear Aging
		Hatch; CRD Hatch		Contain- ment		Hinges and Closure Mechanisms	Mechanism
					. .	•	
						•	
						•	
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				•		•	
B4.3	-	Subfounda- tion Layer	Porous Concrete	Under- ground	Reduction in Founda-	Erosion of Porous Concrete	NUREG-1611 NRC IN 97-11
					tion Strength	Subfounda- tion	NRC IN 98-26
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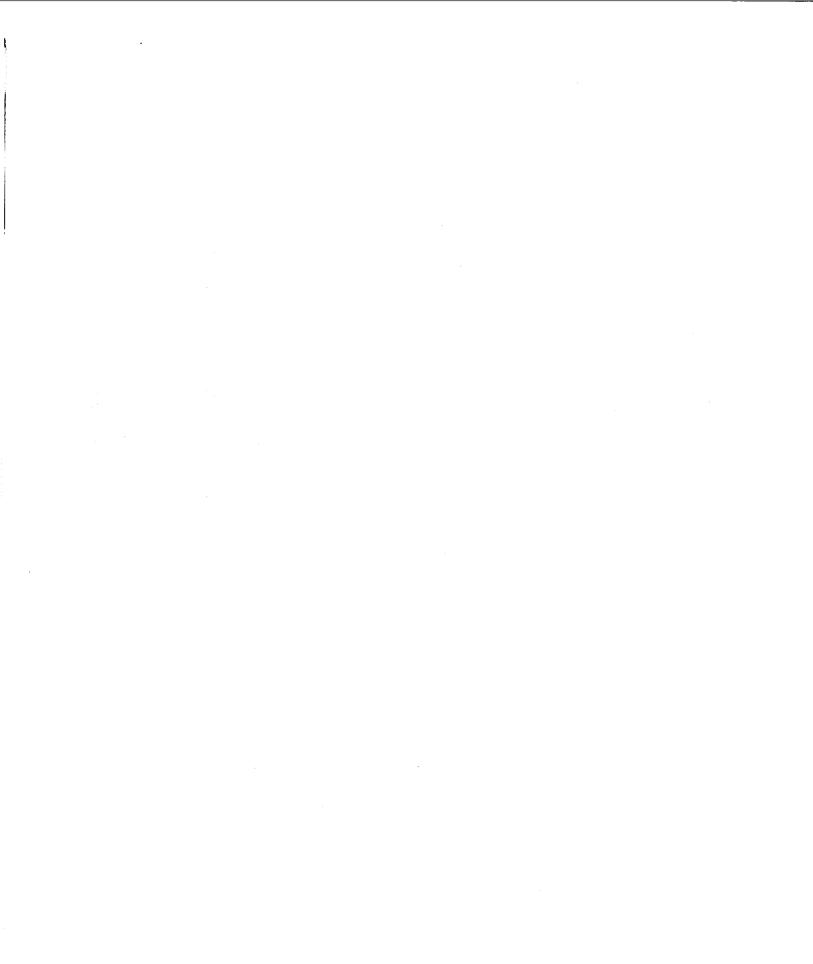
Π CONTAINMENT STRUCTURES **BWR Containments** B B4 Common Components Existing Aging Management Program Further (AMP) **Evaluation and Technical Basis** Evaluation Same as B1.1.1, Mechanical Wear Aging Same as B1.1.1, Mechanical Wear Aging Mechanism Same as See Chapter XI for an evaluation of ISCFRED. EEa/ ASME Section XI, Subsection TWE Mochanism-B1.1.1, Mechanical LOCFRO.552/ASME Wear Aging Mecinanism Section XI, Subsection INE <u>(</u>lo No specific Aging Management Program Yes. Erosion of cement from porous concrete subfoundations exists. NUREG-1611 identifies erosion of beneath containment basemats is described in IN 97-11. porous concrete subfoundation as a IN 98-26 identifies Maintenance Rule Structures r applicable, potential aging mechanism. Monitoring for managing this aging effect, if applicable. (See Chapter III.A, Class 1 Structures for evaluation of plantspecific Maintenance Rule Structures Monitoring) evaluation is required.

CONTAINMENT STRUCTURES B BWR Containments B4 Common Components Π

	B4	Common (Components					
	Item	Structure/ Component	Region of Interest	Material	Environ- ment	Aging Effect	Aging Mechanism	References
	B4.4		Seals & Gaskets	Various	Inside and/or Outside Contain- ment	Loss of Scaling	Deteriora- tion of Joint Scalants, Gaskets, Q-rings	10CFR50.55a ASME Section XI, Subsection IWE
								10CFR50, Appendix J
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Draft December 6, 1999

CONTAINMENT STRUCTURES Π BWR Containments Common Components R **B4** Existing Aging Management Program (AMP) Further **Evaluation and Technical Basis** Evaluation Codes and Standards (10CFR50.554), ASME Section XI, Subsection IWE Aging effect will be managed by IWE .-No. Leak tightness will be monitored by Appendix J Leak Rate Tests. De Secti Chapter ×1 for In evaluation of 10cF250.ssa/ ASME Sectim X1, Subsection IWE.



- 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	GALL			
Number	Section	ITEM NO.	Page	COMMENT
13	Various	Sys.	II B1-3	System Interfaces Section, the references to interfaces do not match the GALL Table
		Interface	II B2-3	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
226	B1	B1.1.1	II B1-5	inspection of inaccessible areas.
220	DI	D1.1.1	п Б1-5	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.
				the current neerse, 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	П В1-11	The discussion of Appendix J and Coatings Programs should be deleted.
			II B1-15	BASIS: IWE is acceptable as a stand-alone program.
267	BI	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
f				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
270	B1	B1.1.1	II B1-16	to identify TLAAs for inclusion in the Standard Review Plan.
~.~	101	D1.1.1	H DI-IO	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
			TT #1-7 (augmented VT-1 inspection as a supplement to the requirements of ASME Section XI,
				under the section as a supprement to the requirements of ASME Section AI,

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	B 3	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
1				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.

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CHAPTER II B

BOILING WATER REACTOR (BWR) CONTAINMENTS

Major BWR Containments

B1. Mark I Containments

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- 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.

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

	1 Steel Con						
Item	Structure/ Component	Region of Interest	Material	Environ- ment	Aging Effect	Aging Mechanism	References
	Structure/	Region of	Material Carbon Steel				References 10CFR50.55a ASME Section XI, Subsection IWE 10CFR50, Appendix J NUREG-1611 Draft Regulatory Guide DG-1076

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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
	See Chapter XI for an evaluation of 10CFR50.55a/ASME	No
OCFR50.55a/ASME Section XI,	Code Section XI, Subsection IWE.	
Subsection IWE		
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B BWR Containments

B1Mark I ContainmentsB1.1Steel Containments

	Structure/ Region of Environ- Aging Aging						
Item	Component	Region of Interest	Material	Environ- ment	Aging Effect	Aging Mechanism	References
Item	component	mulest	Matchai	шене	Effect	WICCHAINSIN	KCICICIICUS
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B BWR Containments

B1 Mark I Containments

B1.1 Steel Containments

B1.1 Steel Containments Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation	
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B BWR Containments

B1 Mark I Containments B1.1 Steel Containments

B1.1 Steel Containments Structure/ Region of Environ- Aging							
Item	Structure/ Component	Interest	Material	ment	Aging Effect	Aging Mechanism	References
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B BWR Containments

B1 Mark I Containments

B1.1 Steel Containments

B1.1 Steel Containments Existing Aging Management Program (AMP)	Evaluation and Technical Basis					
(AAVAA)	State and Abband Subb	Evaluation				
		-				

B BWR Containments

B1 Mark I Containments B1.1 Steel Containments

<u>D1.</u>	1 Steel Cont	анцисись					
Item	Structure/ Component	Region of Interest	Material	Environ- ment	Aging Effect	Aging Mechanism	References
100111		marat	Matorial	mont	Lincot		
							1
							10CFR50.72
							10CFR50.73
							10CFR50, Appendix J
							· ·
							Regulatory Guide 1.163
							NEI 94-01
							ANSI/ANS 56.8-
							1994
						1	
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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
(AME)	Evaluation and Icclinical Dasis	
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B BWR Containments

B1 Mark I Containments B1.1 Steel Containments

B1.1 Steel Containments Environ- Aging Aging								
ltem	Subsystem	Component	Material	ment	Aging Effect	Aging Mechanism	References	
							-	
					l • .			

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

B1.1 Steel Containments Existing Aging Management Program (AMP)	Evaluation and Technical Basis				
······································		Evaluation			
		-			
1					

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

Item	Subsystem	tainments Component	Material	Environ- ment	Aging Effect	Aging Mechanism	References
1							

B BWR Containments B1 Mark I Containments

B1.1 Steel Containments

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

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B BWR Containments

B1Mark I ContainmentsB1.1Steel Containments

<u>~</u>	I BLEEL COIN		1	I _	1	r	1
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

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BBWR ContainmentsB1Mark I Containments

B1.1 Steel Containments

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

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**

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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.

B BWR Containments

B2 Mark II Containments B2.1 Steel Containments

<u> </u>	1 Steel Con						
Item	Structure/ Component	Region of Interest	Material	Environ- ment	Aging Effect	Aging Mechanism	References
B2.1.1	Steel Elements	Drywell; Suppres- sion 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 Contain- ment	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 Contain- ment	Fretting/ Lockup	Mechanical Wear	Same as B1.1.1, Mechanical Wear Aging Mechanism

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BBWR ContainmentsB2Mark II Containments

B2.1 Steel Containments

B2.1 Steel Containments Existing Aging Management Program		Further
(AMP) 10CFR50.55a/ASME Section XI,	Evaluation and Technical Basis See Chapter XI for an evaluation of 10CFR50.55a/ASME	Evaluation No
Subsection IWE	Section XI, Subsection IWE	110
		1. Sec. 1. Sec
		1
OCFR50.55a/ASME Section XI,	See Chapter XI for an evaluation of 10CFR50.55a/ASME	No.
ubsection IWE	Section XI, Subsection IWE	

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B BWR Containments

B2 Mark II Containments B2.2 Concrete Containment

<u> </u>	2 Concrete	Containmen	ts				
	Structure/	Region of		Environ-	Aging	Aging	
Item	Component	Interest	Material	ment	Effect	Mechanism	References
B2.2.1	Concrete Elements	Contain- ment; Basemat	Concrete	Inside and/or Outside Contain- ment	Increase in Porosity, Permea- bility; Scaling,	Leaching of Calcium Hydroxide; Aggressive Chemical	Same as B1.2.1, Aggressive Chemical Attack Aging Mechanism
					Cracking, Spalling	Attack	
B2.2.1	Concrete Elements	Contain- ment;	Concrete	Inside and/or	Expansion & Cracking	R c action with	Same as B1.2.1, Reaction with
		Basemat		Outside Contain- ment		Aggregates	Aggregates Aging Mechanism
				· .			
B2.2.1	Concrete	Contain-	Concrete;	Inside	Cracking,	Corrosion of	Same as B1.2.1,
	Elements	ment; Basemat; Reinforcing Steel	Carbon Steel	and/or Outside Contain- ment	Spalling, Loss of Bond, Loss of Material	Embedded Steel	Corrosion of Embedded Steel Aging Mechanism

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B BWR Containments B2 Mark II Containments B2 Concrete Containment

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

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B BWR Containments

B2 Mark II Containments B2.2 Concrete Containments

B2.	2 Concrete	contamment	1.35				
	Structure/	Region of		Environ-	Aging	Aging	
Item	Component	Interest	Material	ment	Effect	Mechanism	References
B2.2.1	Concrete	Basemat	Concrete	Outside	Cracks;	Settlement	NUREG-1611
	Elements			Contain-	Distortion;		
				ment	Increase in		
					Compo-		
					nent		
					Stress	:	
					Level		
			·				
		•			· ·		
	-						
B2.2.1	Concrete	Contain-	Concrete	Inside	Loss of	Elevated	Same as B1.2.1,
	Elements	ment;		and/or	Strength	Tempera-	Elevated
		Concrete		Outside	and	ture	Temperature
				Contain-	Modulus		Aging Mechanism
		Fill in					
		Fill in Annulus:			Modulus		
		Annulus;		ment	Modulus		
					MOCIUIIS		
		Annulus;			Modulus		
		Annulus;			Modulus		
		Annulus;			Molillus		
		Annulus;			Molillus		
		Annulus;			Molillus		
		Annulus;			Morinus		
		Annulus;			Morinus		
		Annulus;			Molillus		
		Annulus;			Molillus		
		Annulus;			Morinus		
		Annulus;			Molillus		
		Annulus;			Morialis		
		Annulus;			Morinius		
		Annulus;			Moliuus		
		Annulus;			Moliuus		
		Annulus;			Moliuus		
		Annulus;			Morialis		
		Annulus;			Morialis		
		Annulus;			Morialis		
		Annulus;			Morialis		
		Annulus;			Morialis		
		Annulus;			Morialis		
		Annulus;			Morinius		

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B BWR Containments

B2 Mark II Containments B2.2 Concrete Containments

B2.2 Concrete Containments		
Existing Aging Management Program		Further
(AMP)	Evaluation and Technical Basis	Evaluation
No mandated Aging Management Program	Settlement is not addressed by 10 CFR 50.55a or IWL.	Yes.
exists. NUREG-1611 identifies the need	NUREG-1611 specifies that a settlement monitoring	
for a settlement monitoring program, if	program is needed for a containment structure/basemat	If
the prerequisite conditions exist. ACI	resting on soil or piles, or if the site experiences	applicable,
349.3R-96 provides guidance for	significant changes in ground water conditions.	the
addressing settlement.	organicant oranigeo in ground where conductions.	applicant's
addressing setuement.		
Note: Oncoles distortions and increase in		aging
Note: Cracks, distortions, and increses in component stress levels may not require		manage- ment
management because settlement is not		program to
plausible for the particular site.		address this
		issue must
		be
		evaluated.
		1
No mandated aging management program	The implementation of 10CFr50.55a and IWL would not	Same as
exits. NUREG-1611 identifies the need	be able to identify the loss of strength and mosulus due	B1.2.1.
for plant-specific evaluation; if the	to elevated temperature. Thus, for any portions of	Elevated
prerequisite conditions exist.	concrete containment that exceed specified temperature	Tempera-
pracquista conditions exist.	limits, further evaluations are warranted. NUREG-1611	ture Aging
	specifies the temperature limits, both general (150°F)	Mechanism
	and local (200°F) above which a plant specific evaluation	
	is needed.	
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B BWR Containments

B2 Mark II Containments B2.2 Concrete Containments

<u>B2.</u>		Containment	ts				
Item	Structure/ Component	Region of Interest	Material	Environ- ment	Aging Effect	Aging Mechanism	References
B2.2.2	Steel Elements	Drywell, Suppres- sion Chamber and Basemat Liners; Liner Anchors; Drywell Head; Downcomer Pipes & Bracing	Carbon Steel	Inside and/or Outside Contain- ment	Loss of Material	Corrosion	Same as B1.2.2, Corrosion Aging Mechanism
B2.2.2	Steel Elements	Suppres- sion Chamber Liner (Interior Surface)	Steel Steel	Inside and/or Outside Contain- ment	Crack Initiation and Growth	Stress Corrosion Cracking	Same as B1.1.1, Stress Corrosion Cracking Aging Mechanism

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
OCFR50.55a/ASME Section XI, ubsection IWE	See Chapter XI for an evaluation of 10CFR50.55a/ASME Section XI, Subsection IWE and an evaluation of	No.
	10CFR50, Appendix J.	

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B BWR Containments

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

B BWR Containments B2 Mark II Containments B2 Concrete Containment

B2.2 Concrete Containments Existing Aging Management Program		Further
(AMP)	Evaluation and Technical Basis	Evaluation
OCFR50.55a/ASME Section XI, Subsection IWE	See Chapter XI for an evaluation of 10CFR50.55a/ASME Section XI, Subsection IWE	No

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B BWR Containments

Item	Subsystem	Component	Material	Environ- ment	Aging Effect	Aging Mechanism	References

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B BWR Containments

B2 Mark II Containments

B2.2 Concrete Containments Existing Aging Management Program Further (AMP) **Evaluation and Technical Basis** Evaluation

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B BWR Containments

B2 Mark II Containments B2.2 Concrete Containments

		Containment	1.3				
	Structure/	Region of		Environ-	Aging	Aging	
Item	Component	Interest	Material	ment	Effect	Mechanism	References
					1		
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B BWR Containments

B2 Mark II Containments

B2.2 Concrete Containments

uation and Technical Basis	Evaluation

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B3. Mark III Containments

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- 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.

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B BWR Containments

B3 Mark III Containments B3.1 Steel Containments

<u></u>	1 Steel Con						
Item	Structure/ Component	Region of Interest	Material	Environ- ment	Aging Effect	Aging Mechanism	References
B3.1.1	Steel Elements	Contain- ment Shell; Suppres- sion Chamber Shell; Basemat Liner; Liner Anchors	Carbon Steel	Inside and/or Outside Contain- ment	Loss of Material	Corrosion	Same as B1.1.1, Corrosion Aging Mechanism
B3.1.1	Steel Elements	Suppres- sion Chamber Shell (Interior Surface)	Steel Steel	Inside and/or Outside Contain- ment	Crack Initiation and Growth	Stress Corrosion Cracking	Same as B1.1.1, Stress Corrosion Cracking Aging Mechanism

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B BWR Containments B3 Mark III Containments B3.1 Steel Containments

B3.1 Steel Containments		
Existing Aging Management Program		Further
(AMP)	Evaluation and Technical Basis	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.	No.
	Aging effect will be managed by Examination Category E-P (10 CFR 50, Appendix J, Integrated Leak Rate Test).	

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B BWR Containments

B3 Mark III Containments B3.1 Steel Containments

B3.		tainments					
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

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B BWR Containments

B3 Mark III Containments

B3.1 Steel Containments

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
0CFR50.55a/ASME Section XI,	See Chapter XI for an evaluation of 10CFR50.55a/ASME	No
ubsection IWL	Section XI, Subsection IWL	
OCFR50.55a/ASME Section XI, subsection IWL	See Chapter XI for an evaluation of 10CFR50.55a/ASME Section XI, Subsection IWL	No

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B BWR Containments

B3 Mark III Containments B3.1 Steel Containments

<u> </u>	1 Steel Con	tainments					
Item	Structure/ Component	Region of Interest	Material	Environ- ment	Aging Effect	Aging Mechanism	References
B3.1.2	Concrete Elements	Basemat	Concrete	Inside and/or Outside Contain- ment	Cracks; Distortion; Increase in Compo- nent 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 Contain- ment	Loss of Strength and Modulus	Elevated Tempera- ture 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

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B BWR Containments B3 Mark III Containments B3.1 Steel Containments

B3.1 Steel Containments		
Existing Aging Management Program		Further
(AMP)	Evaluation and Technical Basis	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. NUREQ-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

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B BWR Containments

2 Concrete	Containment	ts				
Structure/ Component	Region of Interest	Material	Environ- ment	Aging Effect	Aging Mechanism	References
Concrete Elements	Dome, Wall, Basemat	Concrete	Inside and/or Outside Contain- ment	Scaling, Cracking, Spalling	Freeze/ Thaw	Same as B1.2.1, Aggressive Chemical Attack Aging Mechanism
Concrete	Dome Wall	Concepta	Incide	Inomose in	Leaghing of	Same as B1.2.1,
Concrete Elements	Dome, Wall, Basemat	Concrete	Inside and/or Outside Contain- ment	Increase in Porosity, Permea- bility; Scaling, Cracking, Spalling	Leaching of Calcium Hydroxide; Aggressive Chemical Attack	Same as B1.2.1, Aggressive Chemical Attack Aging Mechanism
	Structure/ Component Concrete Elements	Structure/ ComponentRegion of InterestConcreteDome, Wall, BasematElementsBasemat	ComponentInterestMaterialConcreteDome, Wall, BasematConcreteElementsBasematImage: State	Structure/ ComponentRegion of InterestMaterialEnviron- mentConcreteDome, Wall, BasematConcreteInside and/or Outside Contain- mentElementsBasematConcreteInside and/or Outside Contain- ment	Structure/ Component Region of Interest Material Environ- ment Aging Effect Concrete Dome, Wall, Basemat Concrete Inside and/or Scaling, Cracking, Spalling Elements Basemat Concrete Inside and/or Spalling Outside Contain- ment Basemat Spalling Concrete Dome, Wall, Name Concrete Increase in Porosity, Outside Concrete Dome, Wall, Basemat Concrete Inside and/or Increase in Porosity, Permea- Contain- ment	Structure/ Component Region of Interest Material Material Environ- ment Aging Effect Aging Mechanism Concrete Dome, Wall, Basemat Concrete Inside and/or Outside Contain- ment Scaling, Spalling Freeze/ Thaw Image: Solution of the second Solution of the second Spalling Spalling Thaw Image: Solution of the second Spalling Spalling Spalling Image: Solution of the second Spalling Spalling Image: Spalling Image: Spalling Image: Spalling Image: Spalling Image: Spalling Ima

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B BWR Containments

B3.2 Concrete Containments		
Existing Aging Management Program		Further
(AMP)	Evaluation and Technical Basis	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

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B BWR Containments

ВЗ.		Containment	<u>.</u>				
Item	Structure/ Component	Region of Interest	Material	Environ- ment	Aging Effect	Aging Mechanism	References
B3.2.1	Concrete Elements	Dome, Wall, Basemat	Concrete	Inside and/or Outside Contain- ment	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 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

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B BWR Containments

B3.2 Concrete Containments Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
0CFR50.55a/ASME Section XI,	See Chapter XI for an evaluation of 10CFR50.55a/ASME	No
ubsection IWL	Section XI, Subsection IWL	
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]
OCFR50.55a/ASME Section XI,	See Chapter XI for an evaluation of 10CFR50.55a/ASME	No
ubsection IWL	Section XI, Subsection IWL	

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B BWR Containments

B3 Mark III Containments B3.2 Concrete Containments

B3.		Containment					
Item	Structure/ Component	Region of Interest	Material	Environ- ment	Aging Effect	Aging Mechanism	References
B3.2.1	Concrete Elements	Basemat and piles	Concrete	Inside and/or Outside Contain- ment	Cracks; Distortion; Increase in Compo- nent Stress Level	Settlement	Same as B2.2.1, Settlement Aging Mechanism
B3.2.1	Concrete Elements	Dome, Wall, Basemat	Concrete	Inside and/or Outside Contain- ment	Loss of Strength and Modulus	Elevated Tempera- ture 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

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B BWR Containments B3 Mark III Containments B3.2 Concrete Containments

B3.2 Concrete Containments		
Existing Aging Management Program		Further
(AMP)	Evaluation and Technical Basis	Evaluation
No mandated Aging Management Program	Settlement is not addressed by 10 CFR 50.55a or IWL.	Yes.
exists. NUREG-1611 identifies the need	NUREG-1611 specifies that a settlement monitoring	
for a settlement monitoring program, if	program is needed for a containment structure/basemat	If
the prerequisite conditions exist. ACI	resting on soil or piles, or if the site experiences	applicable,
349.3R-96 provides guidance for	significant changes in ground water conditions.	the
addressing settlement.	Significant changes in ground where conditions	applicant's
autrobalig botachione.		aging
Note: Cracks, distortions, and increses in		manage-
component stress levels may not require		ment
management because settlement is not		program to
plausible for the particular site.		address this
		issue must
		be
		evaluated.
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No mandated aging management program	The implementation of 10CFr50.55a and IWL would not	Yes.
exits. NUREG-1611 identifies the need	be able to identify the loss of strength and mosulus due	
for plant-specific evaluation; if the	to elevated temperature. Thus, for any portions of	If
prerequisite conditions exist.	concrete containment that exceed specified temperature	applicable,
	limits, further evaluations are warranted. NUREG-1611	the
	specifies the temperature limits, both general (150°F)	applicant's
	and local (200°F) above which a plant specific evaluation	aging
	is needed.	manage-
		ment
		program to
		address this
		issue must
		be
		evaluated.
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B BWR Containments

	z concrete	Containment	is				
	Structure/	Region of		Environ-	Aging	Aging	
Item	Component	Interest	Material	ment	Effect	Mechanism	References
B3.2.2	Steel Elements	Contain- ment Liner, Suppres- sion Chamber Liner, Basemat Liner, Liner Anchors	Carbon Steel	Inside and/or Outside Contain- ment	Loss of Material	Corrosion	Same as B1.1.1, Corrosion Aging Mechanism
B3.2.2	Steel Elements	Suppres- sion Chamber Liner (Interior Surface)	Stainless Steel	Inside and/or Outside Contain- ment	Crack Initiation and Growth	Stress Corrosion Cracking	Same as B2.2.2, Stress Corrosion Cracking Aging Mechanism

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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
OCFR50.55a/ASME Code Section XI, Subsection IWE. OCFR50, 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
ocraso, Appendix o		
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B4. Common Components

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- 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

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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.

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B BWR Containments B4 Common Components

B4		Components					
Item	Structure/ Component	Region of Interest	Material	Environ- ment	Aging Effect	Aging Mechanism	References
B4.1		Penetration Sleeves; Penetration Bellows	Carbon Steel	Inside and/or Outside Contain- ment	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 Contain- ment	Cumula- tive Fatigue Damage	Cyclic Loading	Same as B1.1.1, Cycling Loading Aging Mechanism

B BWR Containments

B4 Common Components

B4 Common Components		
Existing Aging Management Program		Further
(AMP)	Evaluation and Technical Basis	Evaluation
10CFR50.55a/ASME Code Section XI,	See Chapter XI for an evaluation of 10CFR50.55a/ASME	No
Subsection IWE.	Code Section XI, Subsection IWE.	
		1. Sec. 1. Sec
Same as B1.1.1, Cycling Loading Aging	Same as B1.1.1, Cycling Loading Aging Mechanism	Same as
Mechanism		B1.1.1,
		Cycling
		Loading
		Aging
		Mechanism

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B BWR Containments B4 Common Components

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

B BWR Containments

B4 Common Components

B4 Common Components		-
Existing Aging Management Program		Further
(AMP)	Evaluation and Technical Basis	Evaluation
100PDE0 EEe (AS)/D Orde Order 37	See Obester VI for an avaluation of 100EDE0 EEC (403/E	No
10CFR50.55a/ASME Code Section XI,	See Chapter XI for an evaluation of 10CFR50.55a/ASME	110
Subsection IWE.	Code Section XI, Subsection IWE.	
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10000050 FE- (AQME Orde Section VI	See Chapter XI for an evaluation of 10CFR50.55a/ASME	No
10CFR50.55a/ASME Code Section XI,		NO
Subsection IWE.	Code Section XI, Subsection IWE.	
		1

B BWR Containments B4 Common Components

B4	Common Components						
	Structure/	Region of		Environ-	Aging	Aging	
Item	Component	Interest	Material	ment	Effect	Mechanism	References Same as B1.1.1,
B4.2		Personnel	Carbon	Inside	Fretting/	Mechanical Wear of	Mechanical Wear
		Airlock; Equipment	Steel	and/or Outside	Lockup	Locks/	Aging
		Hatch; CRD		Contain-		Hinges and	Mechanism
		Hatch		ment		Closure	
						Mechanisms	
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		Subfounda-	Porous	Under-	Reduction	Erosion of	NUREG-1611
B4.3		tion Layer	Concrete	ground	in Founda-	Porous	NOKEG-1011
			001101012	Broann	tion	Concrete	NRC IN 97-11
					Strength	Subfounda-	
						tion	NRC IN 98-26
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B BWR Containments

B4 Common Components

B4 Common Components		
Existing Aging Management Program	Evaluation and Technical Basis	Further Evaluation
(AMP) 10CFR50.55a/ASME Section XI, Subsection IWE	Evaluation and Technical Basis 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.

B BWR Containments B4 Common Components

B4	Common	Components					
	Structure/	Region of		Environ-	Aging	Aging	
Item	Component	Interest	Material	ment	Effect	Mechanism	References
B4.4		Scals &	Various	Inside	Loss of	Deteriora-	10CFR50.55a
		Gaskets		and/or	Scaling	tion of Joint	
				Outside		Scalants,	ASME Section
				Contain-		Gaskets,	XI, Subsection
				ment		O-rings	IWE
							10CFR50,
							Appendix J
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B BWR Containments

B4 Common Components

	Further
	Evaluation
See Chapter XI for an evaluation of 10CFR50.55a/ASME Section XI, Subsection IWE.	No.
Leak tightness will be monitored by Appendix J Leak Rate Tests.	
	Leak tightness will be monitored by Appendix J Leak

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- 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.
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- 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.