



NUCLEAR ENERGY INSTITUTE

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June 9, 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 III, Sections A2-A9. 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 by providing write-ups for the Masonry Wall Inspection Program and implementation of Regulatory Guide 1.127 "Inspection of Water-Control Structures Associated with Nuclear Power Plants." These sections of Chapter III also credit the Maintenance Rule. We provided a copy of that write-up in our letter dated June 8 that transmitted comments on GALL Chapter IIIB.

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

Sincerely,

Douglas J. Walters

Enclosures

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

D042



XI. Existing Aging Management Programs And Activities

A.x

Masonry Wall Inspection Program

DESCRIPTION

Program for ensuring the structural integrity of masonry walls.

EVALUATION AND TECHNICAL BASIS

- 1) **Scope of Program:** The scope of the program includes those masonry walls within the scope of license renewal.
- 2) **Preventive Actions:** The program is a visual inspection and no preventive actions are identified. The staff has found this acceptable.
- 3) **Parameters Monitored/Inspected:** The visual inspection is performed to identify cracking of masonry walls.
- 4) **Detection:** A visual inspection performed using the guidance of IE Bulletin 80-11 and IN 87-67 provides reasonable assurance that the aging effect of cracking will be identified prior to loss of the component intended function.
- 5) **Monitoring and Trending:** There are no monitoring and trending processes associated with this program and the staff has found this acceptable.
- 6) **Acceptance Criteria:** Acceptance criteria are no unacceptable visual indication of cracking of masonry walls.
- 7) **Corrective Actions:** The program is conducted under 10 CFR 50 Appendix B (Quality Assurance); therefore, the Corrective Action requirement is satisfied.
- 8) **Confirmation Process:** The program is conducted under 10 CFR 50 Appendix B (Quality Assurance); therefore, the Confirmation Process requirement is satisfied.
- 9) **Administrative Controls:** The program is conducted under 10 CFR 50 Appendix B (Quality Assurance); therefore, the Administrative Controls requirement is satisfied.
- 10) **Operating Experience:** Incorporation of lessons learned from the implementation of IE Bulletin 80-11, USI A-46, and the MR Inspection should assure the structural integrity of all masonry walls important to safety are adequately managed. At this time, it appears that the program will be adequate for assuring the structural integrity of the masonry walls within license renewal scope for the extended period of operation.

XI. Existing Aging Management Programs And Activities

A.X

Regulatory Guide 1.1.27 ***Inspection of Water-Control Structures Associated with Nuclear Power Plants***

DESCRIPTION

The USNRC Regulatory Guide 1.127 titled "Inspection of Water-Control Structures Associated with Nuclear Power Plants" describes a basis acceptable to the NRC staff for developing an appropriate in-service inspection and surveillance program for dams, slopes, canals and other water-control structures associated with emergency cooling water systems or flood protection of nuclear power plants. The need for the in-service inspection and surveillance program is discussed in the context of historic data related to age-related deterioration and degradation due to extreme environmental conditions and the effects of natural phenomena which impacted on Water-Control Structures and the importance for periodically monitoring the performance and maintenance so that the consequences of these age-related deterioration and degradation failures could be timely prevented and mitigated.

The Guide provides detailed inspection guidance and acceptance criteria for the licensee's maintenance program for Water-Control Structures, including engineering data compilation, on-site inspection program, technical evaluation, inspection frequency and inspection report. Water-Control Structures, included in the Guide but not limited to, consist of a) concrete structures, b) embankment structures, c) spillway structures and outlet works, d) reservoirs, e) cooling water channels and canal and intake and discharge structures, f) safety and performance instrumentation. The positions and requirements delineated in this guide reflect current NRC staff practice in evaluating in-service inspection programs of Water-Control Structures.

EVALUATION AND TECHNICAL BASIS

- 1) **Scope of Program:** The Guide applies to water-control structures associated with emergency cooling water systems or flood protection of nuclear power plants. The water-control structures, included in the Guide but not limited to, consist of a) concrete structures, b) embankment structures, c) spillway structures and outlet works, d) reservoirs, e) cooling water channels and canal and intake and discharge structures, f) safety and performance instrumentation.
- 2) **Preventive Actions:** The Guide requires that the licensee's in-service inspection and surveillance program include periodic inspections of water-control structures to identify deviations in structural conditions due to age-related deterioration and degradation from the original design basis, provide inspection report including remedial and mitigating measures, where appropriate. The Guide also states that it is important that abnormalities affecting facility safety be met with quick corrective action.
- 3) **Parameters Monitored/Inspected:** Regulatory Guide 1.127 identifies the parameters to be monitored for concrete and embankments. The Regulatory Guide identifies cracking, seepage, leakage, settlement, etc., as effects that are to be monitored.
- 4) **Detection:** The Guide requires periodic inspections at intervals of no more than 5 years. The inspection interval increases from initial inspection, after the completion of construction. Special inspections immediately following the occurrence of significant natural phenomena events are required. A technical report should be prepared to present the results of each inspection, with conclusions and recommendations for additional investigations, remedial and mitigating measures, where appropriate, and abnormalities affecting facility safety be met with quick corrective action.
- 5) **Monitoring and Trending:** The Guide utilizes periodic monitoring performance and maintenance coupled with remedial and mitigating measures and quick corrective action when abnormalities affecting facility safety are identified. Inspection intervals should provide predictability of the extent of degradation and timely corrective or mitigative actions.
- 6) **Acceptance Criteria:** Provided the program is conducted under 10 CFR 50, Appendix B (Quality Assurance), the Acceptance Criteria attribute is satisfied.
- 7) **Corrective Actions:** Provided the program is conducted under 10 CFR 50, Appendix B (Quality Assurance), the Corrective Actions attribute is satisfied.

XI. Existing AGING MANAGEMENT PROGRAMS AND ACTIVITIES
Regulatory Guide 1.127

- 8) Confirmation Process:** Provided the program is conducted under 10 CFR 50, Appendix B (Quality Assurance), the Confirmation Process attribute is satisfied.
- 9) Administrative Controls:** Provided the program is conducted under 10 CFR 50, Appendix B (Quality Assurance), the Administrative Controls attribute is satisfied.
- 10) Operating Experience:** Degradation of Water Control structures has been detected at a number of nuclear power plants, and in some cases has required remedial action. No loss of intended functions has resulted from these occurrences. Therefore, it can be concluded that the inspections implemented in accordance with the guidance in Regulatory Guide 1.127 have been successful in detecting significant degradation before loss of intended function occurs.

GALL REPORT- CIVIL / STRUCTURAL DISCIPLINE COMMENTS
Section IIIA2-A9

Comment Number	GALL Section	ITEM NO.	PAGE	COMMENT
1	A.2	A2.1	III A2-4	Item should reference the Maintenance Rule as the Existing Aging Management program and the Evaluation and Technical Basis column should point to Chapter XI for an evaluation of that program. Also, the Evaluation and Technical Basis column should include the following language to clarify when the aging effects is considered significant per NUREG-1557: <i>Per NUREG-1557, freeze/thaw is non-significant if located in a geographic region of negligible weathering conditions (weathering index <100 day-inch/yr); and if located in severe weathering conditions (weathering index >500 day-inch/yr) or moderate weathering conditions (100-500 day-inch/yr), the concrete mix design meets the air content (entrained air 3-6%) and water-to-cement ratio (0.35-0.45) requirements of ACI 318-63 or ACI 349-85.</i> The Further Evaluation column should state: <i>No, if the structure/aging effect combination is within the scope of the applicant's MR structures Monitoring Program</i>
	A.3	(Freeze/Thaw)	III A3-4	
	A.5	A3.1	III A5-4	
	A.7	A5.1	III A7-4	
	A.8	A7.1	III A8-4	
	A.9	A8.1 A9.1	III A9-4	
2	A.2	A2.1	IIIA2-4	Item should reference the Maintenance Rule as the Existing Aging Management program and the Evaluation and Technical Basis column should point to
	A.3	(Leaching of	III A3-4	
	A.5	Calcium Hydroxide)	III A5-4	

GALL REPORT- CIVIL / STRUCTURAL DISCIPLINE COMMENTS
Section IIIA2-A9

Comment Number	GALL Section	ITEM NO.	PAGE	COMMENT
	A.7 A.8 A.9	A3.1 A5.1 A7.1 A8.1 A9.1	III A7-4 III A8-4 III A9-4	Chapter XI for an evaluation of that program. Also, the Evaluation and Technical Basis column should include the following language to clarify when the aging effects is considered significant per NUREG-1557: <i>Per NUREG-1557, leaching of calcium hydrides is non-significant if not exposed to flowing water or if exposed to flowing water, constructed using the guidance of ACI 201.2R-67 to ensure dense, well-cured concrete with low permeability and control cracking through proper arrangement and distribution of reinforcement.</i> The Further Evaluation column should state: <i>No, if the structure/aging effect combination is within the scope of the applicant's MR structures Monitoring Program</i>
3	A2 A3 A4 A5 A7 A8 A9	A2.1 (Reaction with Aggregates) A3.1 A4.1 A5.1 A7.1 A8.1 A9.1	IIIA2-4 III A3-4 III A4-4 III A5-5 III A7-4 III A8-4 III A9-4	Item should reference the Maintenance Rule as the Existing Aging Management program and the Evaluation and Technical Basis column should point to Chapter XI for an evaluation of that program. Also, the Evaluation and Technical Basis column should include the following language to clarify when the aging effects is considered significant per NUREG-

GALL REPORT- CIVIL / STRUCTURAL DISCIPLINE COMMENTS
Section IIIA2-A9

Comment Number	GALL Section	ITEM NO.	PAGE	COMMENT
				1557: <i>Per NUREG-1557, reaction with aggregates is non-significant if the aggregates were investigated, tested, and subjected to petrographic examinations in accordance with ASTM C295-54 or ASTM C227-50 that showed the aggregates are non-reactive; or if the aggregates were potentially reactive, the provisions of ACI 201-2R-67 were followed.</i> The Further Evaluation column should state: <i>No, if the structure/aging effect combination is within the scope of the applicant's MR structures Monitoring Program</i>
4	A2 A3 A4 A5 A7 A8 A9	A2.1 (Corrosion of Embedded Steel) A3.1 A4.1 A5.1 A7.1 A8.1 A9.1	IIIA2-4 III A3-4 III A4-4 III A5-4 III A7-4 III A8-4 III A9-4	Item should reference the Maintenance Rule as the Existing Aging Management program and the Evaluation and Technical Basis column should point to Chapter XI for an evaluation of that program. Also, the Evaluation and Technical Basis column should include the following language to clarify when the aging effects is considered significant per NUREG-1557: <i>Per NUREG-1557, corrosion of embedded steel is non-significant for exterior above grade and interior if not exposed to aggressive environment (sulfate limits</i>

GALL REPORT- CIVIL / STRUCTURAL DISCIPLINE COMMENTS
Section IIIA2-A9

Comment Number	GALL Section	ITEM NO.	PAGE	COMMENT
				<i>to <1500 ppm, pH <5.5 or chlorides >550 ppm with oxygen available) or if exposed to aggressive environment for an extended period of time, the concrete has low water-to-cement ration)0.35-0.45), adequate air entrainment (3-6%), low permeability, and designed in accordance with ACI 318-63 or ACI 349-85. EPRI TR-103842 emphasizes that oxygen and on-going exposure to an aggressive environment are required for corrosion. It states that corrosion is potentially significant for intake structures at ocean sites, due to constant exposure to seawater. For other structures, it points to the zone of fluctuating groundwater level as the only susceptible region for corrosion. Below this zone, there is insufficient oxygen. Above this zone, there is insufficient water. Per NUREG-1557, for components exposed to groundwater such as foundations and exterior concrete below grade, evaluate the aging effects of corrosion of embedded steel on concrete surfaces will be managed to maintain intended functions during the period of extended operation.</i> The Further Evaluation column should state: <i>No, if the structure/aging effect combination is within the scope of the applicant's MR structures Monitoring Program.</i>

GALL REPORT- CIVIL / STRUCTURAL DISCIPLINE COMMENTS
Section IIIA2-A9

Comment Number	GALL Section	ITEM NO.	PAGE	COMMENT	
5	A2	A2.1	IIIA2-4	Item should reference the Maintenance Rule as the Existing Aging Management program and the Evaluation and Technical Basis column should point to Chapter XI for an evaluation of that program.	
	A3	(Aggressive Chemical Attack)	III A3-4		
	A4		III A4-4		
	A5		III A5-4		
	A7		A3.1	III A7-4	
	A8	A4.1	III A8-4	Also, the Evaluation and Technical Basis column should include the following language to clarify when the aging effects is considered significant per NUREG-1557: <i>Per NUREG-1557, aggressive chemical attack in non-significant for exterior above grade and interior if not exposed to aggressive environment (pH, <5.5), or to chloride or sulfate solutions beyond defined limits (>500 ppm chloride, or >1500 ppm sulfate); or if exposed to aggressive environment that exceeds the pH, chloride, or sulfate limits the exposure is for intermittent periods only. Applicant must define "intermittent periods" if it is the technical basis for non-significance. Per NUREG 1557, exterior below grade and foundation should be evaluated to ensure that the aging effects of aggressive chemical attack on below-grade concrete surfaces will be managed to maintain the intended function(s) of Class I structure components during the period of extended operation.</i>	
	A9	A5.1	III A9-4		
		A7.1			
		A8.1			
		A9.1			
					The Further Evaluation column should state:

GALL REPORT- CIVIL / STRUCTURAL DISCIPLINE COMMENTS
Section IIIA2-A9

Comment Number	GALL Section	ITEM NO.	PAGE	COMMENT
				<i>No, if the structure/aging effect combination is within the scope of the applicant's MR structures Monitoring Program</i>
6	A2 A3 A5 A7 A8 A9	A2.1 (Settlement) A3.1 A5.1 A7.1 A8.1 A9.1	IIIA2-6 III A3-6 III A5-6 III A7-6 III A8-6 III A9-6	Item should reference the Maintenance Rule as the Existing Aging Management program and the Evaluation and Technical Basis column should point to Chapter XI for an evaluation of that program. Also, add the following language: <i>Consideration of settlement is required by ACI 318-63 or ACI 349-85. For sites with soft soil or changes in the groundwater table, a settlement monitoring program is needed. Applicant should justify non-significance or identify program credited for monitoring settlement.</i> The Further Evaluation column should state: <i>No, if the structure/aging effect combination is within the scope of the applicant's MR structures Monitoring Program</i>
7	A2 A3 A5 A6 A7 A8	A2.1 (Erosion of Porous Concrete) A3.1 A5.1 A6.1	IIIA2-6 III A3-6 III A5-6 III A6-8 III A7-6 III A8-6	Item should reference the Maintenance Rule as the Existing Aging Management program and the Evaluation and Technical Basis column should point to Chapter XI for an evaluation of that program. Also, add the following language:

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Section IIIA2-A9

Comment Number	GALL Section	ITEM NO.	PAGE	COMMENT
	A9	A7.1 A8.1 A9.1	III A9-6	<i>IN 98-26 identifies MR Structures Monitoring for managing this aging effect, if applicable</i> The Further Evaluation column should state: <i>No, if the structure/aging effect combination is within the scope of the applicant's MR structures Monitoring Program</i>
8	A2 A3 A4 A5 A7 A8	A2.2 (Corrosion) A3.2 A4.2 A5.2 A7.2 A8.2	IIIA2-6 III A3-6 III A4-4 III A5-6 III A7-6 III A8-6	Item should reference the Maintenance Rule as the Existing Aging Management program and the Evaluation and Technical Basis column should point to Chapter XI for an evaluation of that program. Also, The discussion of NUREG-1557 is incomplete and should be deleted. NUREG-1557 reads "Routine pressure retaining capability testing is effective in verifying the integrity and timely detection of corrosion for metal siding and roof decking of BWR reactor buildings." The Further Evaluation column should state: <i>No, if the structure/aging effect combination is within the scope of the applicant's MR structures Monitoring Program</i>
9	A2 A3 A5	A2.3 A3.3 A5.3	IIIA2-6 III A3-6 III A5-6	Item should reference Masonry Wall Inspection program as the Existing Aging management Program and the Evaluation and Technical Basis column should point to Chapter XI for an evaluation of that program.

GALL REPORT- CIVIL / STRUCTURAL DISCIPLINE COMMENTS
Section IIIA2-A9

Comment Number	GALL Section	ITEM NO.	PAGE	COMMENT
				The Further Evaluation column should state: <i>No, acceptable for managing the aging effect.</i>
380	A4	A4.2	III A4-3	Delete "stainless steel" from the Material column. BASIS: Stainless Steel does not corrode.
78	A4	A4.3	III A4-3	Delete the two items dealing with tendons. BASIS: The Maintenance Rule structural monitoring does not include inspections of prestressing systems in containment.
292	A4	A4.2 (NEW)	III A4.3	Add a new Item Number A4.2 to address the Radial Beam Seats in the BWR drywell and in the RPV support shoes in PWR's with nozzle supports.
12	A6	A6.1	IIIA6-4	The Existing Aging Management Program column should only reference the inspection program implemented using the guidance contained in Regulatory Guide 1.27. The column should also state that inspection and maintenance programs for dams that are under FERC jurisdiction are adequate aging management programs. The description in the Evaluation and Technical Basis column should also be revised as follows: Reword attribute (3) to state: Regulatory Guide 1.127 identifies the parameters to be monitored for concrete and embankments. The Regulatory Guide identifies cracking, seepage, leakage, settlement, etc., as effects

GALL REPORT- CIVIL / STRUCTURAL DISCIPLINE COMMENTS
Section IIIA2-A9

Comment Number	GALL Section	ITEM NO.	PAGE	COMMENT
				which are to be monitored. Attribute (5): Previous applicants credited this program without monitoring and trending. Why is that necessary now? Attribute (6): The items identified are not acceptance criteria. We recommend using language similar to that used in the Maintenance Rule evaluation. For attributes (6), (7), (8), and (9) recommends stating that the program is conducted under 10CFR Part 50, Appendix B and therefore the attribute is satisfied. Attribute (10) – recommend changing the last sentence to read: Therefore, it can be concluded that the inspections implemented in accordance with the guidance in Regulatory Guide 1.127 have been successful in detecting significant degradation before loss of intended function occurs.
13	A6	A6.1	IIIA6-8	Existing Aging Management Program column need only reference the Regulatory Guide and the Evaluation and Technical Basis Column should point to Chapter XI for an evaluation of that program. Also, the following language should be added:

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Section IIIA2-A9

Comment Number	GALL Section	ITEM NO.	PAGE	COMMENT
				<i>Per NUREG-1557, leaching of calcium hydrides is non-significant if not exposed to flowing water or if exposed to flowing water, constructed using the guidance of ACI 201.2R-67 to ensure dense, well-cured concrete with low permeability and control cracking through proper arrangement and distribution of reinforcement.</i>
14	A6	A6.1	III A6-8	Existing Aging Management Program column need only reference the Regulatory Guide and the Evaluation and Technical Basis Column should point to Chapter XI for an evaluation of that program. Also, the following language should be added: <i>Per NUREG-1557, reaction with aggregates is non-significant if the aggregates were investigated, tested, and subjected to petrographic examinations in accordance with ASTM C295-54 or ASTM C227-50 that showed the aggregates are non-reactive; or if the aggregates were potentially reactive, the provisions of ACI 201-2R-67 were followed.</i>
15	A6	A6.1	A6-8	Existing Aging Management Program column need only reference the Regulatory Guide and the Evaluation and Technical Basis Column should point to Chapter XI for an evaluation of that program.

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Section IIIA2-A9

Comment Number	GALL Section	ITEM NO.	PAGE	COMMENT
				Also, the following language should be added: <i>Per NUREG-1557, corrosion of embedded steel is non-significant for exterior above grade and interior if not exposed to aggressive environment (sulfate limits to <1500 ppm, pH <5.5 or chlorides >550 ppm with oxygen available) or if exposed to aggressive environment for an extended period of time, the concrete has low water-to-cement ration)0.35-0.45), adequate air entrainment (3-6%), low permeability, and designed in accordance with ACI 318-63 or ACI 349-85. EPRI TR-103842 emphasizes that oxygen and on-going exposure to an aggressive environment are required for corrosion. It states that corrosion is potentially significant for intake structures at ocean sites, due to constant exposure to seawater. For other structures, it points to the zone of fluctuating groundwater level as the only susceptible region for corrosion. Below this zone, there is insufficient oxygen. Above this zone, there is insufficient water. Per NUREG-1557, for components exposed to groundwater such as foundations and exterior concrete below grade, evaluate the aging effects of corrosion of embedded steel on concrete surfaces will be managed to maintain intended functions during the period of extended operation.</i>

GALL REPORT- CIVIL / STRUCTURAL DISCIPLINE COMMENTS
Section IIIA2-A9

Comment Number	GALL Section	ITEM NO.	PAGE	COMMENT
16	A6	A6.1	III A6-8	Existing Aging Management Program column need only reference the Regulatory Guide and the Evaluation and Technical Basis Column should point to Chapter XI for an evaluation of that program. Also, the following language should be added: <i>Per NUREG-1557, aggressive chemical attack in non-significant for exterior above grade and interior if not exposed to aggressive environment (pH, <5.5), or to chloride or sulfate solutions beyond defined limits (>500 ppm chloride, or >1500 ppm sulfate); or if exposed to aggressive environment that exceeds the pH, chloride, or sulfate limits the exposure is for intermittent periods only. Applicant must define "intermittent periods" if it is the technical basis for non-significance. Per NUREG 1557, exterior below grade and foundation should be evaluated to ensure that the aging effects of aggressive chemical attack on below-grade concrete surfaces will be managed to maintain the intended function(s) of Class I structure components during the period of extended operation.</i>
17	A6	A6.1	III A6-8	Point to Chapter XI for the evaluation of Regulatory Guide 1.127.
18	A6	A6.1	IIIA6-8	Replace text with reference to Maintenance Rule. Also, add the following "significance determination" language:

GALL REPORT- CIVIL / STRUCTURAL DISCIPLINE COMMENTS
Section IIIA2-A9

Comment Number	GALL Section	ITEM NO.	PAGE	COMMENT
				<i>IN 98-26 identifies MR Structures Monitoring for managing this aging effect, if applicable</i> Also, change the Further Evaluation column to read: <i>No, if the structure/aging effect combination is within the scope of the applicant's MR structures Monitoring Program.</i>
19	A6	A6.1 A6.2	IIIA6-10	Reference Chapter XI as the location of the Regulatory Guide 1.127 evaluation.
20	A6	A6.3	IIIA6-10	Reference the Masonry Wall Inspection Program in Chapter XI.
22	A7	A7.2	III A7-6	Existing Aging Management Program columns and Evaluation and technical Basis column should reference the Maintenance Rule. The Further Evaluation columns should say: <i>No, if the structure/aging effect combination is within the scope of the applicant's MR structures Monitoring Program</i> Also, it is not clear why the additional language is included in the Evaluation and Technical Basis column.
23	A8	A8.2	III A8-6	Existing Aging Management Program columns and Evaluation and technical Basis column should reference the Maintenance Rule. The Further Evaluation columns should say: <i>No, if the structure/aging effect combination is within the scope of the applicant's MR structures Monitoring Program</i>

A2. Group 2 Structures (BWR Reactor Bldg with Steel Superstructure)

A2.1 Concrete Elements

A2.2 Steel Elements

A2.3 Masonry Walls

A2. Group 2 Structures (BWR Reactor Bldg with Steel Superstructure)

Systems, Structures, and Components

Class 1 structures are organized into nine groups and are discussed separately under subheadings A1 through A9. This format follows the presentation format in Section 3.9 of the draft Standard Review Plan for License Renewal (SRP-LR). Review Table III A2 addresses the elements of BWR Reactor Building with Steel Superstructure. For this group, the applicable structural elements are identified: concrete, steel, and masonry walls. The aging management review is presented for each applicable structural element/aging effect combination.

System Interfaces

Physical interfaces exist with any system or component which either penetrates the structure wall or is supported by the structure wall, floor and roof. The direct interface is through the system/component supports which are anchored to the structure. A primary functional interface is protection of housed systems or components from internal/external design basis events. In the case of tanks, there is a functional interface with the associated system. Water control structures are an integral part of the systems which provide plant cooling water and residual heat removal.

III STRUCTURES AND COMPONENT SUPPORTS

A2. Group 2 Structures (BWR reactor building with steel superstructure)

Item	Structure/ Component	Region of Interest	Material	Environ- ment	Aging Effect	Aging Mechanism	References
A2.1	Concrete	Exterior Above and Below Grade; Foundation	Reinforced Concrete	Weather Exposed	Scaling, Cracking Spalling	Freeze/ Thaw	<i>Same as A1.1, Freeze/ Thaw Aging Mechanism</i>
A2.1	Concrete	Exterior Above and Below Grade; Foundation	Reinforced Concrete	Flowing Water	Increase in Porosity and Perme- ability, Loss of Strength	Leaching of Calcium Hydroxide	<i>Same as A1.1, Leaching of Calcium Hydroxide Aging Mechanism</i>
A2.1	Concrete	All	Reinforced Concrete	Any	Expansion & Cracking	Reaction with Aggregates	<i>Same as A1.1, Reaction with Aggregates Aging Mechanism</i>
A2.1	Concrete	All	Reinforced Concrete	Exposure to Aggressive Environ- ment	Cracking, Spalling, Loss of Bond, Loss of Material	Corrosion of Embedded Steel	<i>Same as A1.1, Corrosion of Embedded Steel Aging Mechanism</i>
A2.1	Concrete	All	Reinforced Concrete	Exposure to Aggressive Environ- ment	Increase in Porosity and Perme- ability, Cracking, Spalling	Aggressive Chemical Attack	<i>Same as A1.1, Aggressive Chemical Attack Aging Mechanism</i>

III STRUCTURES AND COMPONENT SUPPORTS

A2. Group 2 Structures (BWR reactor building with steel superstructure)

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
Same as A1.1, Freeze/Thaw Aging Mechanism Maintenance Rule (10CFR50.65) - Structures monitoring	Same as A1.1, Freeze/Thaw Aging Mechanism See Chapter XI for an evaluation of the Maintenance Rule - structures monitoring Add "Significance" Language from Comment	Same as A1.1, Freeze/Thaw Aging Mechanism NO, if structure/aging effect combination is within the scope of the applicability of the structures program
Same as A1.1, Leaching of Calcium Hydroxide Aging Mechanism Maintenance Rule - (10CFR50.65) - Structures monitoring	Same as A1.1, Leaching of Calcium Hydroxide Aging Mechanism See Chapter XI for an evaluation of the Maintenance Rule - Structures monitoring Add 'Significance' language from comment	Same as A1.1, Leaching of Calcium Hydroxide Aging Mechanism No, see above
Same as A1.1, Reaction with Aggregates Aging Mechanism Maintenance Rule (10CFR50.65) - Structures monitoring	Same as A1.1, Reaction with Aggregates Aging Mechanism See Chapter XI for an evaluation of the Maintenance Rule - structures monitoring Add 'Significance' language from comment.	Same as A1.1, Reaction with Aggregates Aging Mechanism No, see above
Same as A1.1, Corrosion of Embedded Steel Aging Mechanism Maintenance Rule (10CFR50.65) - Structures monitoring	Same as A1.1, Corrosion of Embedded Steel Aging Mechanism See Chapter XI for an evaluation of the Maintenance Rule - structures monitoring Add 'Significance' language from comment	Same as A1.1, Corrosion of Embedded Steel Aging Mechanism No, see above
Same as A1.1, Aggressive Chemical Attack Aging Mechanism Maintenance Rule (10CFR50.65) - Structures monitoring	Same as A1.1, Aggressive Chemical Attack Aging Mechanism See Chapter XI for an evaluation of the Maintenance Rule - structures monitoring Add 'Significance' language from comment.	Same as A1.1, Aggressive Chemical Attack Aging Mechanism No, see above

III STRUCTURES AND COMPONENT SUPPORTS

A2. Group 2 Structures (BWR reactor building with steel superstructure)

Item	Structure/ Component	Region of Interest	Material	Environ- ment	Aging Effect	Aging Mechanism	References
A2.1	Concrete	All	Reinforced Concrete	Soft Soil; Changes in Ground- water Conditions	Cracks; Distortion; Increase in Compo- nent Stress Level	Settlement	<i>Same as A1.1, Settlement Aging Mechanism</i>
A2.1	Concrete	Foundation	Reinforced Concrete	Flowing Water Under Foundation	Reduction in Founda- tion Strength	Erosion of Porous Concrete Subfounda- tion	<i>Same as A1.1, Erosion of Porous Concrete Subfoundation Aging Mechanism</i>
A2.2	Steel Compo- nents	Structural Steel	Carbon Steel	Various	Loss of Material	Corrosion	<i>Same as A1.2, Corrosion Aging Mechanism</i>
A2.3	Masonry Walls	All	Concrete Block	Ambient Environ- ment Inside Building	Cracking	Restraint; Shrinkage; Creep; Aggressive Environ- ment	<i>Same as A1.3, Cracking due to Restraint; Shrinkage; Creep; Aggressive Environment</i>

III STRUCTURES AND COMPONENT SUPPORTS

A2. Group 2 Structures (BWR reactor building with steel superstructure)

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
Same as A1.1, Settlement Aging Mechanism Maintenance Rule (10 CFR 50.65) - Structures monitoring	Same as A1.1, Settlement Aging Mechanism See Chapter XI for an evaluation of the Maintenance Rule - Structures monitoring Add language from comment	Same as A1.1, Settlement Aging Mechanism No, if...
Same as A1.1, Erosion of Porous Concrete Subfoundation Aging Mechanism Maintenance Rule (10 CFR 50.65) - Structures monitoring	Same as A1.1, Erosion of Porous Concrete Subfoundation Aging Mechanism See Chapter XI for an evaluation of the Maintenance Rule - Structures monitoring Add language from Comment	Same as A1.1, Erosion of Porous Concrete Subfoundation Aging Mechanism
Same as A1.2, Corrosion Aging Mechanism Maintenance Rule (10 CFR 50.65) - Structures monitoring	Same as A1.2, Corrosion Aging Mechanism See Chapter Note: Per NUREG-1557, aging management of the metal siding and roofing for loss of material due to corrosion is an unresolved issue. See Chapter XI for an evaluation of the Maintenance Rule - Structures monitoring	Same as A1.2, Corrosion Aging Mechanism
Same as A1.3, Cracking due to Restraint; Shrinkage; Creep; Aggressive Environment Masonry Wall Inspection Program.	Same as A1.3, Cracking due to Restraint; Shrinkage; Creep; Aggressive Environment See Chapter XI for an evaluation of the Masonry Wall inspection program	Same as A1.3, Cracking due to Restraint; Shrinkage; Creep; Aggressive Environment

A3. Group 3 Structures (Auxiliary Bldg, Diesel Generator Bldg, Radwaste Bldg, Turbine Bldg, Switchgear Rm, AFW Pumphouse, Utility/Piping Tunnels)

A3.1 Concrete Elements

A3.2 Steel Elements

A3.3 Masonry Walls

A3. Group 3 Structures (Auxiliary Bldg, Diesel Generator Bldg, Radwaste Bldg, Turbine Bldg, Switchgear Rm, AFW Pumphouse, Utility/Piping Tunnels)

Systems, Structures, and Components

Class 1 structures are organized into nine groups and are discussed separately under subheadings A1 through A9. This format follows the presentation format in Section 3.9 of the draft Standard Review Plan for License Renewal (SRP-LR). Review Table III A3 addresses the elements of Auxiliary Building, Diesel Generator Building, Radwaste Building, Turbine Building, Switchgear Room, AFW Pumphouse, and Utility/Piping Tunnels. For this group, the applicable structural elements are identified: concrete, steel, and masonry walls. The aging management review is presented for each applicable structural element/aging effect combination.

System Interfaces

Physical interfaces exist with any system or component which either penetrates the structure wall or is supported by the structure wall, floor and roof. The direct interface is through the system/component supports which are anchored to the structure. A primary functional interface is protection of housed systems or components from internal/external design basis events. In the case of tanks, there is a functional interface with the associated system. Water control structures are an integral part of the systems which provide plant cooling water and residual heat removal.

III STRUCTURES AND COMPONENT SUPPORTS

A3. Group 3 Structures (Aux., diesel generator, radwaste, turbine buildings; and switchgear room, aux. feedwater pump house, utility/piping tunnels)

Item	Structure/ Component	Region of Interest	Material	Environ- ment	Aging Effect	Aging Mechanism	References
A3.1	Concrete	Exterior Above and Below Grade; Foundation	Reinforced Concrete	Weather Exposed	Scaling, Cracking Spalling	Freeze/ Thaw	<i>Same as A1.1, Freeze/ Thaw Aging Mechanism</i>
A3.1	Concrete	Exterior Above and Below Grade; Foundation	Reinforced Concrete	Flowing Water	Increase in Porosity and Perme- ability, Loss of Strength	Leaching of Calcium Hydroxide	<i>Same as A1.1, Leaching of Calcium Hydroxide Aging Mechanism</i>
A3.1	Concrete	All	Reinforced Concrete	Any	Expansion & Cracking	Reaction with Aggregates	<i>Same as A1.1, Reaction with Aggregates Aging Mechanism</i>
A3.1	Concrete	All	Reinforced Concrete	Exposure to Aggressive Environ- ment	Cracking, Spalling, Loss of Bond, Loss of Material	Corrosion of Embedded Steel	<i>Same as A1.1, Corrosion of Embedded Steel Aging Mechanism</i>
A3.1	Concrete	All	Reinforced Concrete	Exposure to Aggressive Environ- ment	Increase in Porosity and Perme- ability, Cracking, Spalling	Aggressive Chemical Attack	<i>Same as A1.1, Aggressive Chemical Attack Aging Mechanism</i>

III STRUCTURES AND COMPONENT SUPPORTS

A3. Group 3 Structures (Aux., diesel generator, radwaste, turbine buildings; and switchgear room, aux. feedwater pump house, utility/piping tunnels)

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
1 Same as A1.1, Freeze/Thaw Aging Mechanism Maintenance Rule (10CFR 50.65) - Structures monitoring	Same as A1.1, Freeze/Thaw Aging Mechanism See Chapter XI for an evaluation of the Maintenance Rule. Add 'significance' language from comment.	Same as A1.1, Freeze/Thaw Aging Mechanism No
2 Same as A1.1, Leaching of Calcium Hydroxide Aging Mechanism Maintenance Rule (10CFR 50.65) - Structures monitoring	Same as A1.1, Leaching of Calcium Hydroxide Aging Mechanism See Chapter XI for an evaluation of the Maintenance Rule - Structures monitoring Add 'significance' language from comment.	Same as A1.1, Leaching of Calcium Hydroxide Aging Mechanism No
3 Same as A1.1, Reaction with Aggregates Aging Mechanism Maintenance Rule (10CFR 50.65) - Structures monitoring	Same as A1.1, Reaction with Aggregates Aging Mechanism See Chapter XI for an evaluation of the Maintenance Rule - Structures monitoring Add 'significance' language from comment.	Same as A1.1, Reaction with Aggregates Aging Mechanism No
4 Same as A1.1, Corrosion of Embedded Steel Aging Mechanism Maintenance Rule (10CFR 50.65) - Structures monitoring	Same as A1.1, Corrosion of Embedded Steel Aging Mechanism See Chapter XI for an evaluation of the Maintenance Rule - Structures monitoring Add 'significance' language from comment.	Same as A1.1, Corrosion of Embedded Steel Aging Mechanism No
5 Same as A1.1, Aggressive Chemical Attack Aging Mechanism Maintenance Rule (10CFR 50.65) - Structures monitoring	Same as A1.1, Aggressive Chemical Attack Aging Mechanism See Chapter XI for an evaluation of the Maintenance Rule - Structures monitoring Add 'significance' language from comment.	Same as A1.1, Aggressive Chemical Attack Aging Mechanism No

III STRUCTURES AND COMPONENT SUPPORTS

A3. Group 3 Structures (Aux., diesel generator, radwaste, turbine buildings; and switchgear room, aux. feedwater pump house, utility/piping tunnels)

Item	Structure/ Component	Region of Interest	Material	Environ- ment	Aging Effect	Aging Mechanism	References
A3.1	Concrete	All	Reinforced Concrete	Soft Soil; Changes in Ground- water Conditions	Cracks; Distortion; Increase in Compo- nent Stress Level	Settlement	<i>Same as A1.1, Settlement Aging Mechanism</i>
A3.1	Concrete	Foundation	Reinforced Concrete	Flowing Water Under Foundation	Reduction in Founda- tion Strength	Erosion of Porous Concrete Subfounda- tion	<i>Same as A1.1, Erosion of Porous Concrete Subfoundation Aging Mechanism</i>
A3.2	Steel Compo- nents	Structural Steel	Carbon Steel	Various	Loss of Material	Corrosion	<i>Same as A1.2, Corrosion Aging Mechanism</i>
A3.3	Masonry Walls	All	Concrete Block	Ambient Environ- ment Inside Building	Cracking	Restraint; Shrinkage; Creep; Aggressive Environ- ment	<i>Same as A1.3, Cracking due to Restraint; Shrinkage; Creep; Aggressive Environment</i>

III STRUCTURES AND COMPONENT SUPPORTS

A3. Group 3 Structures (Aux., diesel generator, radwaste, turbine buildings; and switchgear room, aux. feedwater pump house, utility/piping tunnels)

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
Same as A1.1, Settlement Aging Mechanism Maintenance Rule (10CFR50.65) - Structures Monitoring	Same as A1.1, Settlement Aging Mechanism See Chapter XI for an evaluation of the Maintenance Rule (10CFR50.65) - Structures Monitoring Add 'significance' language from comment.	Same as A1.1, Settlement Aging Mechanism NO
Same as A1.1, Erosion of Porous Concrete Subfoundation Aging Mechanism Maintenance Rule (10CFR50.65) - Structures monitoring	Same as A1.1, Erosion of Porous Concrete Subfoundation Aging Mechanism See Chapter XI for an evaluation of the Maintenance Rule (10CFR50.65) - Structures Monitoring Add 'significance' language from comment.	Same as A1.1, Erosion of Porous Concrete Subfoundation Aging Mechanism NO
Same as A1.2, Corrosion Aging Mechanism Maintenance Rule (10CFR50.65) - Structures Monitoring	Same as A1.2, Corrosion Aging Mechanism See Chapter XI for an evaluation of the Maintenance Rule (10CFR50.65) - Structures Monitoring	Same as A1.2, Corrosion Aging Mechanism NO
Same as A1.3, Cracking due to Restraint, Shrinkage, Creep, Aggressive Environment Masonry Wall Inspection Program	Same as A1.3, Cracking due to Restraint, Shrinkage, Creep, Aggressive Environment See Chapter XI for an evaluation of the Masonry Wall Inspection Program	Same as A1.3, Cracking due to Restraint, Shrinkage, Creep, Aggressive Environment NO

A4. Group 4 Structures (Containment Interior Structures, excluding Refueling Canal)

A4.1 Concrete Elements

A4.2 Prestressing Elements

A4.3 Steel Elements

A4. Group 4 Structures (Containment Interior Structures, excluding Refueling Canal)

Systems, Structures, and Components

Class 1 structures are organized into nine groups and are discussed separately under subheadings A1 through A9. This format follows the presentation format in Section 3.9 of the draft Standard Review Plan for License Renewal (SRP-LR). Review Table III A4 addresses the elements of Containment Interior Structures, excluding Refueling canal. For this group, the applicable structural elements are identified: concrete, steel, and prestressing system. The aging management review is presented for each applicable structural element/aging effect combination.

System Interfaces

Physical interfaces exist with any system or component which either penetrates the structure wall or is supported by the structure wall, floor and roof. The direct interface is through the system/component supports which are anchored to the structure. A primary functional interface is protection of housed systems or components from internal/external design basis events. In the case of tanks, there is a functional interface with the associated system. Water control structures are an integral part of the systems which provide plant cooling water and residual heat removal.

III STRUCTURES AND COMPONENT SUPPORTS

A4. Group 4 Structures (Containment internal structures, excluding refueling canal)

Item	Structure/Component	Region of Interest	Material	Environment	Aging Effect	Aging Mechanism	References
A4.1	Concrete	All	Reinforced Concrete	Inside Containment, Exposure to Aggressive Environment	Increase in Porosity and Permeability, Cracking, Spalling	Aggressive Chemical Attack	Same as A1.1, Aggressive Chemical Attack Aging Mechanism
A4.1	Concrete	All	Reinforced Concrete	Inside Containment	Expansion & Cracking	Reaction with Aggregates	Same as A1.1, Reaction with Aggregates Aging Mechanism
A4.1	Concrete	All	Reinforced Concrete	Inside Containment, Exposure to Aggressive Environment	Cracking, Spalling, Loss of Bond, Loss of Material	Corrosion of Embedded Steel	Same as A1.1, Corrosion of Embedded Steel Aging Mechanism
A4.2	Steel Components	All	Carbon Steel and Stainless Steel	Inside Containment	Loss of Material	Corrosion	Same as A1.2, Corrosion Aging Mechanism
A4.2	Steel Components	Radial Beam Seats	Lubrite	Inside Containment	lockup	Wear	
A4.3	Prestressing System	Tendons and Anchors	Steel	Inside Containment	Loss of Material	Corrosion	Maintenance Rule - see A1.1, Freeze/Thaw Aging Mechanism
A4.3	Prestressing System	Tendons	Steel	Inside Containment	Loss of Prestress	Tendon Relaxation; Concrete Creep and Shrinkage	Maintenance Rule - see A1.1, Freeze/Thaw Aging Mechanism

III STRUCTURES AND COMPONENT SUPPORTS

A4. Group 4 Structures (Containment internal structures, excluding refueling canal)

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
Same as A1.1, Aggressive Chemical Attack Aging Mechanism SEE COMMENT #5	Same as A1.1, Aggressive Chemical Attack Aging Mechanism	Same as A1.1, Aggressive Chemical Attack Aging Mechanism No
Same as A1.1, Reaction with Aggregates Aging Mechanism SEE COMMENT #3	Same as A1.1, Reaction with Aggregates Aging Mechanism	Same as A1.1, Reaction with Aggregates Aging Mechanism No
Same as A1.1, Corrosion of Embedded Steel Aging Mechanism SEE COMMENT #4	Same as A1.1, Corrosion of Embedded Steel Aging Mechanism	Same as A1.1, Corrosion of Embedded Steel Aging Mechanism No
Same as A1.2, Corrosion Aging Mechanism SEE COMMENT #8	Same as A1.2, Corrosion Aging Mechanism	Same as A1.2, Corrosion Aging Mechanism No
Maintenance Rule (10CFR50.65)	See Chapter XI for an evaluation of the Maintenance Rule (10CFR50.65)	No
Maintenance Rule - see A1.1, Freeze/Thaw Aging Mechanism X	Maintenance Rule - see A1.1, Freeze/Thaw Aging Mechanism Where applicable, loss of material due to corrosion must be managed to maintain the prestressing system's intended functions during the period of extended operation.	Same as A1.1, Freeze/Thaw Aging Mechanism X
Maintenance Rule - see A1.1, Freeze/Thaw Aging Mechanism X	Maintenance Rule - see A1.1, Freeze/Thaw Aging Mechanism Where applicable, loss of prestress due to tendon relaxation, concrete creep and shrinkage must be managed to maintain the prestressing system's intended functions during the period of extended operation.	Same as A1.1, Freeze/Thaw Aging Mechanism X

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A5. Group 5 Structures (Fuel Storage Facility, Refueling Canal)

A5.1 Concrete Elements

A5.2 Steel Elements

A5.3 Masonry Walls

A5. Group 5 Structures (Fuel Storage Facility, Refueling Canal)

Systems, Structures, and Components

Class 1 structures are organized into nine groups and are discussed separately under subheadings A1 through A9. This format follows the presentation format in Section 3.9 of the draft Standard Review Plan for License Renewal (SRP-LR). Review Table III A5 addresses the elements of Fuel Storage Facility and Refueling Canal. For this group, the applicable structural elements are identified: concrete, steel, and masonry walls. The aging management review is presented for each applicable structural element/aging effect combination.

System Interfaces

Physical interfaces exist with any system or component which either penetrates the structure wall or is supported by the structure wall, floor and roof. The direct interface is through the system/component supports which are anchored to the structure. A primary functional interface is protection of housed systems or components from internal/external design basis events. In the case of tanks, there is a functional interface with the associated system. Water control structures are an integral part of the systems which provide plant cooling water and residual heat removal.

III STRUCTURES AND COMPONENT SUPPORTS

A5. Group 5 Structures (Fuel storage facility, refueling canal)

Item	Structure/ Component	Region of Interest	Material	Environ- ment	Aging Effect	Aging Mechanism	References
A5.1	Concrete	Exterior Above and Below Grade; Foundation	Reinforced Concrete	Weather Exposed	Scaling, Cracking Spalling	Freeze/ Thaw	<i>Same as A1.1, Freeze/ Thaw Aging Mechanism</i>
A5.1	Concrete	Exterior Above and Below Grade; Foundation	Reinforced Concrete	Flowing Water	Increase in Porosity and Perme- ability, Loss of Strength	Leaching of Calcium Hydroxide	<i>Same as A1.1, Leaching of Calcium Hydroxide Aging Mechanism</i>
A5.1	Concrete	All	Reinforced Concrete	Any	Expansion & Cracking	Reaction with Aggregates	<i>Same as A1.1, Reaction with Aggregates Aging Mechanism</i>
A5.1	Concrete	All	Reinforced Concrete	Exposure to Aggressive Environ- ment	Cracking, Spalling, Loss of Bond, Loss of Material	Corrosion of Embedded Steel	<i>Same as A1.1, Corrosion of Embedded Steel Aging Mechanism</i>
A5.1	Concrete	All	Reinforced Concrete	Exposure to Aggressive Environ- ment	Increase in Porosity and Perme- ability, Cracking, Spalling	Aggressive Chemical Attack	<i>Same as A1.1, Aggressive Chemical Attack Aging Mechanism</i>

III STRUCTURES AND COMPONENT SUPPORTS

A5. Group 5 Structures (Fuel storage facility, refueling canal)

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
Same as A1.1, Freeze/Thaw Aging Mechanism SEE COMMENT # 1	Same as A1.1, Freeze/Thaw Aging Mechanism	Same as A1.1, Freeze/Thaw Aging Mechanism
Same as A1.1, Leaching of Calcium Hydroxide Aging Mechanism SEE COMMENT # 2	Same as A1.1, Leaching of Calcium Hydroxide Aging Mechanism	Same as A1.1, Leaching of Calcium Hydroxide Aging Mechanism
Same as A1.1, Reaction with Aggregates Aging Mechanism SEE COMMENT # 3	Same as A1.1, Reaction with Aggregates Aging Mechanism	Same as A1.1, Reaction with Aggregates Aging Mechanism
Same as A1.1, Corrosion of Embedded Steel Aging Mechanism SEE COMMENT # 4	Same as A1.1, Corrosion of Embedded Steel Aging Mechanism	Same as A1.1, Corrosion of Embedded Steel Aging Mechanism
Same as A1.1, Aggressive Chemical Attack Aging Mechanism SEE COMMENT # 5	Same as A1.1, Aggressive Chemical Attack Aging Mechanism	Same as A1.1, Aggressive Chemical Attack Aging Mechanism

III STRUCTURES AND COMPONENT SUPPORTS

A5. Group 5 Structures (Fuel storage facility, refueling canal)

Item	Structure/ Component	Region of Interest	Material	Environ- ment	Aging Effect	Aging Mechanism	References
A5.1	Concrete	All	Reinforced Concrete	Soft Soil; Changes in Ground- water Conditions	Cracks; Distortion; Increase in Compo- nent Stress Level	Settlement	<i>Same as A1.1, Settlement Aging Mechanism</i>
A5.1	Concrete	Foundation	Reinforced Concrete	Flowing Water Under Foundation	Reduction in Founda- tion Strength	Erosion of Porous Concrete Subfounda- tion	<i>Same as A1.1, Erosion of Porous Concrete Subfoundation Aging Mechanism</i>
A5.2	Steel Compo- nents	Structural Steel	Carbon Steel	Various	Loss of Material	Corrosion	<i>Same as A1.2, Corrosion Aging Mechanism</i>
A5.2	Steel Compo- nents	Liners	Stainless Steel	Exposed to Water	Crack Initiation and Growth, Loss of Material	Stress Corrosion Cracking and Crevice Corrosion	NUREG-1557
A5.3	Masonry Walls	Fuel Storage Facility	Concrete Block	Ambient Environ- ment Inside Building	Cracking	Restraint; Shrinkage; Creep; Aggressive Environ- ment	<i>Same as A1.3, Cracking due to Restraint; Shrinkage; Creep; Aggressive Environment</i>

III STRUCTURES AND COMPONENT SUPPORTS

A5. Group 5 Structures (Fuel storage facility, refueling canal)

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
Same as A1.1, Settlement Aging Mechanism SEE COMMENT # 6	Same as A1.1, Settlement Aging Mechanism	Same as A1.1, Settlement Aging Mechanism
Same as A1.1, Erosion of Porous Concrete Subfoundation Aging Mechanism	Same as A1.1, Erosion of Porous Concrete Subfoundation Aging Mechanism SEE COMMENT # 7	Same as A1.1, Erosion of Porous Concrete Subfoundation Aging Mechanism
Same as A1.2, Corrosion Aging Mechanism SEE COMMENT # 8	Same as A1.2, Corrosion Aging Mechanism	Same as A1.2, Corrosion Aging Mechanism
Periodic monitoring of the leak chase system drain lines and the leak detection sump for early detection and repair of leaks in liners.	Current leakage detection and inventory monitoring systems provide timely means to identify, monitor, and repair liner degradation.	No. Acceptable method for managing aging effect.
Same as A1.3, Cracking due to Restraint; Shrinkage; Creep; Aggressive Environment SEE COMMENT # 9	Same as A1.3, Cracking due to Restraint; Shrinkage; Creep; Aggressive Environment	Same as A1.3, Cracking due to Restraint; Shrinkage; Creep; Aggressive Environment

A6. Group 6 Structures (Water-Control Structures)

A6.1 Concrete Elements

A6.2 Steel Elements

A6.3 Masonry Walls

A6. Group 6 Structures (Water-Control Structures)

Systems, Structures, and Components

Class 1 structures are organized into nine groups and are discussed separately under subheadings A1 through A9. This format follows the presentation format in Section 3.9 of the draft Standard Review Plan for License Renewal (SRP-LR). Review Table III A6 addresses the elements of Water-Control Structures. For this group, the applicable structural elements are identified: concrete, steel, and masonry walls. The aging management review is presented for each applicable structural element/aging effect combination.

System Interfaces

Physical interfaces exist with any system or component which either penetrates the structure wall or is supported by the structure wall, floor and roof. The direct interface is through the system/component supports which are anchored to the structure. A primary functional interface is protection of housed systems or components from internal/external design basis events. In the case of tanks, there is a functional interface with the associated system. Water control structures are an integral part of the systems which provide plant cooling water and residual heat removal.

III STRUCTURES AND COMPONENT SUPPORTS

A6. Group 6 Structures (Water-control structures)

Item	Structure/ Component	Region of Interest	Material	Environ- ment	Aging Effect	Aging Mechanism	References
A6.1	Concrete	Exterior Above and Below Grade; Foundation; Interior Slab	Reinforced Concrete	Weather Exposed	Scaling, Cracking, Spalling	Freeze/ Thaw	Regulatory Guide 1.127 NUREG-1557

III STRUCTURES AND COMPONENT SUPPORTS

A6. Group 6 Structures (Water-control structures)

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MOVE TO CHAPTER XI

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
REGULATORY GUIDE 1.127 The USNRC Regulatory Guide 1.127 titled "Inspection of Water-Control Structures Associated with Nuclear Power Plants" describes a basis acceptable to the NRC staff for developing an appropriate in-service inspection and surveillance program for dams, slopes, canals and other water-control structures associated with emergency cooling water systems or flood protection of nuclear power plants. The need for the in-service inspection and surveillance program is discussed in the context of historic data related to age-related deterioration and degradation due to extreme environmental conditions and the effects of natural phenomena which impacted on Water-Control Structures and the importance for periodically monitoring the performance and maintenance so that the consequences of these age-related deterioration and degradation failures could be timely prevented and mitigated. The Guide provides detailed inspection guidance and acceptance criteria for the licensee's maintenance program for Water-Control Structures, including engineering data compilation, on-site inspection program, technical evaluation, inspection frequency and inspection report. Water-Control Structures, included in the Guide but not limited to, consist of a) concrete structures, b) embankment structures, c) spillway structures and outlet works, d) reservoirs, e) cooling water channels and canal and intake and discharge structures, f) safety and performance instrumentation. The positions and requirements delineated in this guide reflect current NRC staff practice in evaluating in-service inspection programs of Water-Control Structures. Per NUREG-1557, this program is acceptable for license renewal. <u>Note:</u> Freeze/Thaw may be non-significant. See A1.1 for technical basis	(1) Scope of Program: The Guide applies to water-control structures associated with emergency cooling water systems or flood protection of nuclear power plants. The water-control structures, included in the Guide but not limited to, consist of a) concrete structures, b) embankment structures, c) spillway structures and outlet works, d) reservoirs, e) cooling water channels and canal and intake and discharge structures, f) safety and performance instrumentation. (2) Preventive Actions: The Guide requires that the licensee's in-service inspection and surveillance program include periodic inspections of water-control structures to identify deviations in structural conditions due to age-related deterioration and degradation from the original design basis, provide inspection report including remedial and mitigating measures, where appropriate. The Guide also states that it is important that abnormalities affecting facility safety be met with quick corrective action. (3) Parameters Monitored/Inspected: The Guide identifies age-related deterioration and degradation mechanisms for water-control structures as listed in Scope, and discusses the extent to which the age-related deterioration and degradation mechanisms impact the intended functions of the water-control structures, if they were left undetected, uncorrected and unmanaged. (4) Detection: The Guide requires periodic inspections at intervals of no more than 5 years. The inspection interval increases from initial inspection, after the completion of construction. Special inspections immediately following the occurrence of significant natural phenomena events are required. A technical report should be prepared to present the results of each inspection, with conclusions and recommendations for additional investigations, remedial and mitigating measures, where appropriate, and abnormalities affecting facility safety be met with quick corrective action. (5) Monitoring and Trending: The Guide utilizes periodic monitoring performance and maintenance coupled with remedial and mitigating measures and quick corrective action when abnormalities affecting facility safety are identified. Inspection intervals should provide predictability of the extent of degradation and timely corrective or mitigative actions. (6) Acceptance Criteria: The Guide requires that the inspection report should include the following major elements: Initial report: - Results of the visual inspection of each project feature, - Results of the instrumentation observations, - Evaluation of operational adequacy of the reservoir regulation plan, maintenance of the dam, and maintenance of operating facilities, including the warning system, Technical assessment of the causes of distress or abnormal conditions and evaluation of the behavior, movement, deformation, or loading of the structure,	No. Acceptable method for managing aging effect.

Make changes noted in comment #12

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Inspection Program implemented using the guidance of Reg. Guide 1.127

FERC dam maintenance & inspection

III STRUCTURES AND COMPONENT SUPPORTS

A6. Group 6 Structures (Water-control structures)

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

III STRUCTURES AND COMPONENT SUPPORTS

A6. Group 6 Structures (Water-control structures)

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
	5. Conclusion and recommendations for additional investigations, remedial measures, or future inspections, where appropriate; b. Subsequent reports: These reports should include information described in a. In addition, any extreme events that have occurred since the last inspection should also be included. The Guide relies on the experience and judgement of the inspector to determine the extent to which need for corrective action should be warranted. (7) Corrective Actions: As described in Acceptance Criteria, the inspection report includes provisions for technical assessment of the causes of distress or abnormal conditions and recommendations for remedial or mitigating measures. Therefore, issues related to corrective actions, including root cause determination and prevention of recurrence are adequately addressed by the Guide. (8) Confirmation Process: The Guide states that any abnormal hazardous conditions observed during the inspection should be immediately reported to the NRC staff in accordance with the commission's regulations, as summarized in Regulatory Guide 1.16, "Reporting of Operating Information - Appendix A Technical Specifications". (9) Administrative Controls: The on-site inspections are documented in the form of technical report and are retained on-site for reference purposes and NRC audits. (10) Operating Experience: Degradation of Water Control structures has been detected at a number of nuclear power plants, and in some cases has required remedial action. No loss of intended functions has resulted from these occurrences. Therefore, it can be concluded that the Reg. Guide 1.127 inspection programs have been successful in detecting significant degradation before loss of intended function occurs.	MAKE CHANGES NOTED IN COMMENT #12

III STRUCTURES AND COMPONENT SUPPORTS

A6. Group 6 Structures (Water-control structures)

Item	Structure/ Component	Region of Interest	Material	Environ- ment	Aging Effect	Aging Mechanism	References
A6.1	Concrete	Exterior Above and Below Grade; Foundation; Interior Slab	Reinforced Concrete	Flowing Water	Increase in Porosity and Perme- ability, Loss of Strength	Leaching of Calcium Hydroxide	Regulatory Guide 1.127
A6.1	Concrete	All	Reinforced Concrete	Any	Expansion & Cracking	Reaction with Aggregates	Regulatory Guide 1.127
A6.1	Concrete	All	Reinforced Concrete	Exposure to Aggressive Environ- ment	Cracking, Spalling, Loss of Bond, Loss of Material	Corrosion of Embedded Steel	Regulatory Guide 1.127
A6.1	Concrete	All	Reinforced Concrete	Exposure to Aggressive Environ- ment	Increase in Porosity and Perme- ability, Cracking, Spalling	Aggressive Chemical Attack	Regulatory Guide 1.127
A6.1	Concrete	All	Reinforced Concrete	Soft Soil; Changes in Ground- water Conditions	Cracks; Distortion; Increase in Compo- nent Stress Level	Settlement	Regulatory Guide 1.127
A6.1	Concrete	Foundation	Reinforced Concrete	Flowing Water Under Foundation	Reduction in Founda- tion Strength	Erosion of Porous Concrete Subfounda- tion	<i>Same as A1.1, Erosion of Porous Concrete Subfoundation Aging Mechanism</i>

III STRUCTURES AND COMPONENT SUPPORTS

A6. Group 6 Structures (Water control structures)

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
Regulatory Guide 1.127 <u>Note:</u> Leaching of calcium hydroxide may be non-significant. See A1.1 for technical basis	See program description and evaluation above. Chapter XI for an evaluation of Regulatory Guide 1.127 Add significance language	No. Acceptable method for managing aging effect.
Regulatory Guide 1.127 <u>Note:</u> Reaction with aggregates may be non-significant. See A1.1 for technical basis	See program description and evaluation above.	No. Acceptable method for managing aging effect.
Regulatory Guide 1.127 <u>Note:</u> Corrosion of embedded steel may be non-significant. See A1.1 for technical basis	See program description and evaluation above.	No. Acceptable method for managing aging effect.
Regulatory Guide 1.127 <u>Note:</u> Aggressive chemical attack may be non-significant. See A1.1 for technical basis	See program description and evaluation above.	No. Acceptable method for managing aging effect.
Regulatory Guide 1.127	See program description and evaluation above. See Chapter XI for an evaluation of Regulatory Guide 1.127	No. Acceptable method for managing aging effect.
Same as A1.1, Erosion of Porous Concrete Subfoundation Aging Mechanism Maintenance Rule (10CFR50.65 - Structures Monitoring)	Same as A1.1, Erosion of Porous Concrete Subfoundation Aging Mechanism See Chapter XI for an evaluation of the Maintenance Rule. Add 'significance' language from comment.	Same as A1.1, Erosion of Porous Concrete Subfoundation Aging Mechanism

III STRUCTURES AND COMPONENT SUPPORTS

A6. Group 6 Structures (Water-control structures)

Item	Structure/ Component	Region of Interest	Material	Environ- ment	Aging Effect	Aging Mechanism	References
A6.1	Concrete	Exterior Above and Below Grade; Foundation; Interior Slab	Reinforced Concrete	Flowing Water	Loss of material	Abrasion; Cavitation	Regulatory Guide 1.127
A6.2	Steel Compo- nents	Structural Steel	Carbon Steel	Various	Loss of Material	Corrosion	Regulatory Guide 1.127
A6.3	Masonry Walls	Intake Structure; Cooling Tower	Concrete Block	Various	Cracking	Restraint; Shrinkage; Creep; Aggressive Environ- ment	<i>Same as A1.3, Cracking due to Restraint; Shrinkage; Creep; Aggressive Environment</i>

III STRUCTURES AND COMPONENT SUPPORTS

A6. Group 6 Structures (Water-control structures)

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
Regulatory Guide 1.127	See program description and evaluation above. <i>See Chapter XI for an evaluation of Regulatory Guide 1.127</i>	No. Acceptable method for managing aging effect.
Regulatory Guide 1.127	See program description and evaluation above. <i>See Chapter XI for an evaluation of Regulatory Guide 1.127</i>	No. Acceptable method for managing aging effect.
Same as A1.3, Cracking due to Restraint; Shrinkage; Creep; Aggressive Environment <i>Masonry Wall Inspection Program</i>	Same as A1.3, Cracking due to Restraint; Shrinkage; Creep; Aggressive Environment <i>Masonry Wall Inspection Program</i>	Same as A1.3, Cracking due to Restraint; Shrinkage; Creep; Aggressive Environment <i>See Chapter XI for</i>

A7. Group 7 Structures (Concrete Tanks)

A7.1 Concrete Elements

A7.2 Steel Elements

A7. Group 7 Structures (Concrete Tanks)

Systems, Structures, and Components

Class 1 structures are organized into nine groups and are discussed separately under subheadings A1 through A9. This format follows the presentation format in Section 3.9 of the draft Standard Review Plan for License Renewal (SRP-LR). Review Table III A7 addresses the elements of Concrete Tanks. For this group, the applicable structural elements are identified: concrete and steel. The aging management review is presented for each applicable structural element/aging effect combination.

System Interfaces

Physical interfaces exist with any system or component which either penetrates the structure wall or is supported by the structure wall, floor and roof. The direct interface is through the system/component supports which are anchored to the structure. A primary functional interface is protection of housed systems or components from internal/external design basis events. In the case of tanks, there is a functional interface with the associated system. Water control structures are an integral part of the systems which provide plant cooling water and residual heat removal.

III STRUCTURES AND COMPONENT SUPPORTS

A7. Group 7 Structures (Concrete Tanks)

Item	Structure/ Component	Region of Interest	Material	Environ- ment	Aging Effect	Aging Mechanism	References
A7.1	Concrete	Exterior Above and Below Grade; Foundation	Reinforced Concrete	Weather Exposed	Scaling, Cracking, Spalling	Freeze/ Thaw	<i>Same as A1.1, Freeze/ Thaw Aging Mechanism</i>
A7.1	Concrete	Exterior Above and Below Grade; Foundation	Reinforced Concrete	Flowing Water	Increase in Porosity and Perme- ability, Loss of Strength	Leaching of Calcium Hydroxide	<i>Same as A1.1, Leaching of Calcium Hydroxide Aging Mechanism</i>
A7.1	Concrete	All	Reinforced Concrete	Any	Expansion & Cracking	Reaction with Aggregates	<i>Same as A1.1, Reaction with Aggregates Aging Mechanism</i>
A7.1	Concrete	All	Reinforced Concrete	Exposure to Aggressive Environ- ment	Cracking, Spalling, Loss of Bond, Loss of Material	Corrosion of Embedded Steel	<i>Same as A1.1, Corrosion of Embedded Steel Aging Mechanism</i>
A7.1	Concrete	All	Reinforced Concrete	Exposure to Aggressive Environ- ment	Increase in Porosity and Perme- ability, Cracking, Spalling	Aggressive Chemical Attack	<i>Same as A1.1, Aggressive Chemical Attack Aging Mechanism</i>

A7. Group 7 Structures (Concrete Tanks)

SEE COMMENT #1

SEE COMMENT #2

SEE COMMENT #3

SEE COMMENT #4

SEE COMMENT # 5

III STRUCTURES AND COMPONENT SUPPORTS

A7. Group 7 Structures (Concrete Tanks)

Item	Structure/ Component	Region of Interest	Material	Environ- ment	Aging Effect	Aging Mechanism	References
A7.1	Concrete	All	Reinforced Concrete	Soft Soil; Changes in Ground- water Conditions	Cracks; Distortion; Increase in Compo- nent Stress Level	Settlement	<i>Same as A1.1, Settlement Aging Mechanism</i>
A7.1	Concrete	Foundation	Reinforced Concrete	Flowing Water Under Foundation	Reduction in Founda- tion Strength	Erosion of Porous Concrete Subfounda- tion	<i>Same as A1.1, Erosion of Porous Concrete Subfoundation Aging Mechanism</i>
A7.2	Steel Compo- nents	Structural Steel	Carbon Steel	Various	Loss of Material	Corrosion	<i>Same as A1.2, Corrosion Aging Mechanism</i>
A7.2	Steel Compo- nents	Liner	Stainless Steel	Exposed to Fluid Environ- ment (water, fuel)	Crack Initiation and Growth, Loss of Material	Stress Corrosion Cracking, Crevice Corrosion	<i>Maintenance Rule - see A1.1, Freeze/Thaw Aging Mechanism</i>

III STRUCTURES AND COMPONENT SUPPORTS

A7. Group 7 Structures (Concrete Tanks)

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
Same as A1.1, Settlement Aging Mechanism SEE COMMENT # 6	Same as A1.1, Settlement Aging Mechanism	Same as A1.1, Settlement Aging Mechanism
Same as A1.1, Erosion of Porous Concrete Subfoundation Aging Mechanism SEE COMMENT # 7	Same as A1.1, Erosion of Porous Concrete Subfoundation Aging Mechanism	Same as A1.1, Erosion of Porous Concrete Subfoundation Aging Mechanism
Same as A1.2, Corrosion Aging Mechanism SEE COMMENT # 8	Same as A1.2, Corrosion Aging Mechanism	Same as A1.2, Corrosion Aging Mechanism
Maintenance Rule - see A1.1, Freeze/Thaw Aging Mechanism (10CFR50.65) - Structures Monitoring	Maintenance Rule - see A1.1, Freeze/Thaw Aging Mechanism Plant-specific evaluation to ensure the aging effects of degradation due to stress corrosion cracking and crevice corrosion on liners will be managed to maintain their intended functions during the period of extended operation. See Chapter XI for an evaluation of the Maintenance Rule - (10CFR50.65) - Structures Monitoring	Same as A1.1, Freeze/Thaw Aging Mechanism NO

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A8. Group 8 Structures (Steel Tanks)

A8.1 Concrete Elements

A8.2 Steel Elements

A8. Group 8 Structures (Steel Tanks)

Systems, Structures, and Components

Class 1 structures are organized into nine groups and are discussed separately under subheadings A1 through A9. This format follows the presentation format in Section 3.9 of the draft Standard Review Plan for License Renewal (SRP-LR). Review Table III A8 addresses the elements of Steel Tanks. For this group, the applicable structural elements are identified: concrete and steel. The aging management review is presented for each applicable structural element/aging effect combination.

System Interfaces

Physical interfaces exist with any system or component which either penetrates the structure wall or is supported by the structure wall, floor and roof. The direct interface is through the system/component supports which are anchored to the structure. A primary functional interface is protection of housed systems or components from internal/external design basis events. In the case of tanks, there is a functional interface with the associated system. Water control structures are an integral part of the systems which provide plant cooling water and residual heat removal.

III STRUCTURES AND COMPONENT SUPPORTS

A8. Group 8 Structures (Steel Tanks)

Item	Structure/ Component	Region of Interest	Material	Environ- ment	Aging Effect	Aging Mechanism	References
A8.1	Concrete	Foundation	Reinforced Concrete	Weather Exposed	Scaling, Cracking, Spalling	Freeze/ Thaw	<i>Same as A1.1, Freeze/ Thaw Aging Mechanism</i>
A8.1	Concrete	Foundation	Reinforced Concrete	Flowing Water	Increase in Porosity and Perme- ability, Loss of Strength	Leaching of Calcium Hydroxide	<i>Same as A1.1, Leaching of Calcium Hydroxide Aging Mechanism</i>
A8.1	Concrete	Foundation	Reinforced Concrete	Any	Expansion & Cracking	Reaction with Aggregates	<i>Same as A1.1, Reaction with Aggregates Aging Mechanism</i>
A8.1	Concrete	Foundation	Reinforced Concrete	Exposure to Aggressive Environ- ment	Cracking, Spalling, Loss of Bond, Loss of Material	Corrosion of Embedded Steel	<i>Same as A1.1, Corrosion of Embedded Steel Aging Mechanism</i>
A8.1	Concrete	Foundation	Reinforced Concrete	Exposure to Aggressive Environ- ment	Increase in Porosity and Perme- ability, Cracking, Spalling	Aggressive Chemical Attack	<i>Same as A1.1, Aggressive Chemical Attack Aging Mechanism</i>

III STRUCTURES AND COMPONENT SUPPORTS

A8. Group 8 Structures (Steel Tanks)

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
Same as A1.1, Freeze/Thaw Aging Mechanism SEE COMMENT #1	Same as A1.1, Freeze/Thaw Aging Mechanism	Same as A1.1, Freeze/Thaw Aging Mechanism
Same as A1.1, Leaching of Calcium Hydroxide Aging Mechanism SEE COMMENT #2	Same as A1.1, Leaching of Calcium Hydroxide Aging Mechanism	Same as A1.1, Leaching of Calcium Hydroxide Aging Mechanism
Same as A1.1, Reaction with Aggregates Aging Mechanism SEE COMMENT #3	Same as A1.1, Reaction with Aggregates Aging Mechanism	Same as A1.1, Reaction with Aggregates Aging Mechanism
Same as A1.1, Corrosion of Embedded Steel Aging Mechanism SEE COMMENT #4	Same as A1.1, Corrosion of Embedded Steel Aging Mechanism	Same as A1.1, Corrosion of Embedded Steel Aging Mechanism
Same as A1.1, Aggressive Chemical Attack Aging Mechanism SEE COMMENT #5	Same as A1.1, Aggressive Chemical Attack Aging Mechanism	Same as A1.1, Aggressive Chemical Attack Aging Mechanism

III STRUCTURES AND COMPONENT SUPPORTS

A8. Group 8 Structures (Steel Tanks)

Item	Structure/ Component	Region of Interest	Material	Environ- ment	Aging Effect	Aging Mechanism	References
A8.1	Concrete	Foundation	Reinforced Concrete	Soft Soil; Changes in Ground- water Conditions	Cracks; Distortion; Increase in Compo- nent Stress Level	Settlement	<i>Same as A1.1, Settlement Aging Mechanism</i>
A8.1	Concrete	Foundation	Reinforced Concrete	Flowing Water Under Foundation	Reduction in Founda- tion Strength	Erosion of Porous Concrete Subfounda- tion	<i>Same as A1.1, Erosion of Porous Concrete Subfoundation Aging Mechanism</i>
A8.2	Steel Compo- nents	Structural Steel	Carbon Steel	Various	Loss of Material	Corrosion	<i>Same as A1.2, Corrosion Aging Mechanism</i>
A8.2	Steel Compo- nents	Liner	Stainless Steel	Exposed to Fluid Environ- ment	Crack Initiation and Growth, Loss of Material	Stress Corrosion Cracking, Crevice Corrosion	<i>Same as A7.2, Stress Corrosion Cracking, Crevice Corrosion Aging Mechanism</i>

III STRUCTURES AND COMPONENT SUPPORTS

A8. Group 8 Structures (Steel Tanks)

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
Same as A1.1, Settlement Aging Mechanism SEE COMMENT #6	Same as A1.1, Settlement Aging Mechanism	Same as A1.1, Settlement Aging Mechanism
Same as A1.1, Erosion of Porous Concrete Subfoundation Aging Mechanism SEE COMMENT #7	Same as A1.1, Erosion of Porous Concrete Subfoundation Aging Mechanism	Same as A1.1, Erosion of Porous Concrete Subfoundation Aging Mechanism
Same as A1.2, Corrosion Aging Mechanism SEE COMMENT #8	Same as A1.2, Corrosion Aging Mechanism	Same as A1.2, Corrosion Aging Mechanism
Same as A7.2, Stress Corrosion Cracking, Crevice Corrosion Aging Mechanism Maintenance Rule (10 CFR 50.65) - Structures Monitoring 23	Same as A7.2, Stress Corrosion Cracking, Crevice Corrosion Aging Mechanism See Chapter K1 for an evaluation of the Maintenance Rule (10 CFR 50.65) - Structures Monitoring	Same as A7.2, Stress Corrosion Cracking, Crevice Corrosion Aging Mechanism

A9. Group 9 Structures (BWR Unit Vent Stack)

A9.1 Concrete Elements

A9. Group 9 Structures (BWR Unit Vent Stack)

Systems, Structures, and Components

Class 1 structures are organized into nine groups and are discussed separately under subheadings A1 through A9. This format follows the presentation format in Section 3.9 of the draft Standard Review Plan for License Renewal (SRP-LR). Review Table III A9 addresses the elements of BWR Unit Vent Stack. For this group, the applicable structural elements are identified: concrete. The aging management review is presented for each applicable structural element/aging effect combination.

System Interfaces

Physical interfaces exist with any system or component which either penetrates the structure wall or is supported by the structure wall, floor and roof. The direct interface is through the system/component supports which are anchored to the structure. A primary functional interface is protection of housed systems or components from internal/external design basis events. In the case of tanks, there is a functional interface with the associated system. Water control structures are an integral part of the systems which provide plant cooling water and residual heat removal.

III STRUCTURES AND COMPONENT SUPPORTS

A9. Group 9 Structures (BWR unit vent stacks)

Item	Structure/ Component	Region of Interest	Material	Environ- ment	Aging Effect	Aging Mechanism	References
A9.1	Concrete	Exterior Above and Below Grade; Foundation	Reinforced Concrete	Weather Exposed	Scaling, Cracking, Spalling	Freeze/ Thaw	<i>Same as A1.1, Freeze/ Thaw Aging Mechanism</i>
A9.1	Concrete	Exterior Above and Below Grade; Foundation	Reinforced Concrete	Flowing Water	Increase in Porosity and Perme- ability, Loss of Strength	Leaching of Calcium Hydroxide	<i>Same as A1.1, Leaching of Calcium Hydroxide Aging Mechanism</i>
A9.1	Concrete	All	Reinforced Concrete	Any	Expansion & Cracking	Reaction with Aggregates	<i>Same as A1.1, Reaction with Aggregates Aging Mechanism</i>
A9.1	Concrete	All	Reinforced Concrete	Exposure to Aggressive Environ- ment	Cracking, Spalling, Loss of Bond, Loss of Material	Corrosion of Embedded Steel	<i>Same as A1.1, Corrosion of Embedded Steel Aging Mechanism</i>
A9.1	Concrete	All	Reinforced Concrete	Exposure to Aggressive Environ- ment	Increase in Porosity and Perme- ability, Cracking, Spalling	Aggressive Chemical Attack	<i>Same as A1.1, Aggressive Chemical Attack Aging Mechanism</i>

III STRUCTURES AND COMPONENT SUPPORTS
A9. Group 9 Structures (BWR unit vent stacks)

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
Same as A1.1, Freeze/Thaw Aging Mechanism <i>SEE COMMENT #1</i>	Same as A1.1, Freeze/Thaw Aging Mechanism	Same as A1.1, Freeze/Thaw Aging Mechanism
Same as A1.1, Leaching of Calcium Hydroxide Aging Mechanism <i>SEE COMMENT #2</i>	Same as A1.1, Leaching of Calcium Hydroxide Aging Mechanism	Same as A1.1, Leaching of Calcium Hydroxide Aging Mechanism
Same as A1.1, Reaction with Aggregates Aging Mechanism <i>SEE COMMENT #3</i>	Same as A1.1, Reaction with Aggregates Aging Mechanism	Same as A1.1, Reaction with Aggregates Aging Mechanism
Same as A1.1, Corrosion of Embedded Steel Aging Mechanism <i>SEE COMMENT #4</i>	Same as A1.1, Corrosion of Embedded Steel Aging Mechanism	Same as A1.1, Corrosion of Embedded Steel Aging Mechanism
Same as A1.1, Aggressive Chemical Attack Aging Mechanism <i>SEE COMMENT #5</i>	Same as A1.1, Aggressive Chemical Attack Aging Mechanism	Same as A1.1, Aggressive Chemical Attack Aging Mechanism

III STRUCTURES AND COMPONENT SUPPORTS

A9. Group 9 Structures (BWR unit vent stacks)

Item	Structure/ Component	Region of Interest	Material	Environ- ment	Aging Effect	Aging Mechanism	References
A9.1	Concrete	All	Reinforced Concrete	Soft Soil; Changes in Ground- water Conditions	Cracks; Distortion; Increase in Compo- nent Stress Level	Settlement	<i>Same as A1.1, Settlement Aging Mechanism</i>
A9.1	Concrete	Foundation	Reinforced Concrete	Flowing Water Under Foundation	Reduction in Founda- tion Strength	Erosion of Porous Concrete Subfounda- tion	<i>Same as A1.1, Erosion of Porous Concrete Subfoundation Aging Mechanism</i>

III STRUCTURES AND COMPONENT SUPPORTS
A9. Group 9 Structures (BWR unit vent stacks)

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
Same as A1.1, Settlement Aging Mechanism SEE COMMENT #6	Same as A1.1, Settlement Aging Mechanism	Same as A1.1, Settlement Aging Mechanism
Same as A1.1, Erosion of Porous Concrete Subfoundation Aging Mechanism SEE COMMENT #7	Same as A1.1, Erosion of Porous Concrete Subfoundation Aging Mechanism	Same as A1.1, Erosion of Porous Concrete Subfoundation Aging Mechanism

A2. Group 2 Structures (BWR Reactor Bldg with Steel Superstructure)

A2.1 Concrete Elements

A2.2 Steel Elements

A2.3 Masonry Walls

A2. Group 2 Structures (BWR Reactor Bldg with Steel Superstructure)

Systems, Structures, and Components

Class 1 structures are organized into nine groups and are discussed separately under subheadings A1 through A9. This format follows the presentation format in Section 3.9 of the draft Standard Review Plan for License Renewal (SRP-LR). Review Table III A2 addresses the elements of BWR Reactor Building with Steel Superstructure. For this group, the applicable structural elements are identified: concrete, steel, and masonry walls. The aging management review is presented for each applicable structural element/aging effect combination.

System Interfaces

Physical interfaces exist with any system or component which either penetrates the structure wall or is supported by the structure wall, floor and roof. The direct interface is through the system/component supports which are anchored to the structure. A primary functional interface is protection of housed systems or components from internal/external design basis events. In the case of tanks, there is a functional interface with the associated system. Water control structures are an integral part of the systems which provide plant cooling water and residual heat removal.

III STRUCTURES AND COMPONENT SUPPORTS

A2. Group 2 Structures (BWR reactor building with steel superstructure)

Item	Structure/ Component	Region of Interest	Material	Environ- ment	Aging Effect	Aging Mechanism	References
A2.1	Concrete	Exterior Above and Below Grade; Foundation	Reinforced Concrete	Weather Exposed	Scaling, Cracking Spalling	Freeze/ Thaw	<i>Same as A1.1, Freeze/ Thaw Aging Mechanism</i>
A2.1	Concrete	Exterior Above and Below Grade; Foundation	Reinforced Concrete	Flowing Water	Increase in Porosity and Perme- ability, Loss of Strength	Leaching of Calcium Hydroxide	<i>Same as A1.1, Leaching of Calcium Hydroxide Aging Mechanism</i>
A2.1	Concrete	All	Reinforced Concrete	Any	Expansion & Cracking	Reaction with Aggregates	<i>Same as A1.1, Reaction with Aggregates Aging Mechanism</i>
A2.1	Concrete	All	Reinforced Concrete	Exposure to Aggressive Environ- ment	Cracking, Spalling, Loss of Bond, Loss of Material	Corrosion of Embedded Steel	<i>Same as A1.1, Corrosion of Embedded Steel Aging Mechanism</i>
A2.1	Concrete	All	Reinforced Concrete	Exposure to Aggressive Environ- ment	Increase in Porosity and Perme- ability, Cracking, Spalling	Aggressive Chemical Attack	<i>Same as A1.1, Aggressive Chemical Attack Aging Mechanism</i>

III STRUCTURES AND COMPONENT SUPPORTS

A2. Group 2 Structures (BWR reactor building with steel superstructure)

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
Maintenance Rule (10CFR50.65) – Structures monitoring	See Chapter XI for an evaluation of Maintenance Rule (10CFR50.65) – Structures monitoring Per NUREG-1557, freeze/thaw is non-significant if located in a geographic region of negligible weathering conditions (weathering index <100 day-inch/yr); and if located in severe weathering conditions (weathering index >500 day-inch/yr) or moderate weathering conditions (100-500 day-inch/yr), the concrete mix design meets the air content (entrained air 3-6%) and water-to-cement ratio (0.35-0.45) requirements of ACI 318-63 or ACI 349-85.	No, if the structure/aging effect combination is within the scope of the applicant's MR structures Monitoring Program
Maintenance Rule (10CFR50.65) – Structures monitoring	See Chapter XI for an evaluation of Maintenance Rule (10CFR50.65) – Structures monitoring. Per NUREG-1557, leaching of calcium hydroxides is non-significant if not exposed to flowing water or if exposed to flowing water, constructed using the guidance of ACI 201.2R-67 to ensure dense, well-cured concrete with low permeability and control cracking through proper arrangement and distribution of reinforcement.	No, if the structure/aging effect combination is within the scope of the applicant's MR structures Monitoring Program
Maintenance Rule (10CFR50.65) – Structures monitoring	See Chapter XI for an evaluation of Maintenance Rule (10CFR50.65) – Structures monitoring. Per NUREG-1557, reaction with aggregates is non-significant if the aggregates were investigated, tested, and subjected to petrographic examinations in accordance with ASTM C295-54 or ASTM C227-50 that showed the aggregates are non-reactive; or if the aggregates were potentially reactive, the provisions of ACI 201-2R-67 were followed.	No, if the structure/aging effect combination is within the scope of the applicant's MR structures Monitoring Program
Maintenance Rule (10CFR50.65) – Structures monitoring	See Chapter XI for an evaluation of Maintenance Rule (10CFR50.65) – Structures monitoring [NOTE: Because of space limitations the discussion of significance determination for Corrosion of Embedded Steel is not presented. See Comment # 4 for specific language]	No, if the structure/aging effect combination is within the scope of the applicant's MR structures Monitoring Program
Maintenance Rule (10CFR50.65) – Structures monitoring	See Chapter XI for an evaluation of Maintenance Rule (10CFR50.65) – Structures monitoring Per NUREG-1557, aggressive chemical attack is non-significant for exterior above grade and interior if not exposed to aggressive environment (pH,<5.5), or to chloride or sulfate solutions beyond defined limits (>500 ppm chloride, or >1500 ppm sulfate); or if exposed to aggressive environment that exceeds the pH, chloride, or sulfate limits the exposure is for intermittent periods only. Applicant must define "intermittent periods" if it is the technical basis for non-significance. Per NUREG 1557, exterior below grade and foundation should be evaluated to ensure that the aging effects of aggressive chemical attack on below-grade concrete surfaces will be managed to maintain the intended function(s) of Class I structure components during the period of extended operation.	No, if the structure/aging effect combination is within the scope of the applicant's MR structures Monitoring Program

III STRUCTURES AND COMPONENT SUPPORTS

A2. Group 2 Structures (BWR reactor building with steel superstructure)

Item	Structure/ Component	Region of Interest	Material	Environ- ment	Aging Effect	Aging Mechanism	References
A2.1	Concrete	All	Reinforced Concrete	Soft Soil; Changes in Ground- water Conditions	Cracks; Distortion; Increase in Compo- nent Stress Level	Settlement	<i>Same as A1.1, Settlement Aging Mechanism</i>
A2.1	Concrete	Foundation	Reinforced Concrete	Flowing Water Under Foundation	Reduction in Founda- tion Strength	Erosion of Porous Concrete Subfounda- tion	<i>Same as A1.1, Erosion of Porous Concrete Subfoundation Aging Mechanism</i>
A2.2	Steel Compo- nents	Structural Steel	Carbon Steel	Various	Loss of Material	Corrosion	<i>Same as A1.2, Corrosion Aging Mechanism</i>
A2.3	Masonry Walls	All	Concrete Block	Ambient Environ- ment Inside Building	Cracking	Restraint; Shrinkage; Creep; Aggressive Environ- ment	<i>Same as A1.3, Cracking due to Restraint; Shrinkage; Creep; Aggressive Environment</i>

III STRUCTURES AND COMPONENT SUPPORTS

A2. Group 2 Structures (BWR reactor building with steel superstructure)

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
Maintenance Rule (10CFR50.65) – Structures monitoring	See Chapter XI for an evaluation of Maintenance Rule (10CFR50.65) – Structures monitoring Consideration of settlement is required by ACI 318-63 or ACI 349-85. For sites with soft soil or changes in the groundwater table, a settlement monitoring program is needed. Applicant should justify non-significance or identify program credited for monitoring settlement.	No, if the structure/aging effect combination is within the scope of the applicant's MR structures Monitoring Program
Maintenance Rule (10CFR50.65) – Structures monitoring	See Chapter XI for an evaluation of Maintenance Rule (10CFR50.65) – Structures monitoring IN 98-26 identifies MR Structures Monitoring for managing this aging effect, if applicable	No, if the structure/aging effect combination is within the scope of the applicant's MR structures Monitoring Program
Maintenance Rule (10CFR50.65) – Structures monitoring	See Chapter XI for an evaluation of Maintenance Rule (10CFR50.65) – Structures monitoring	No, if the structure/aging effect combination is within the scope of the applicant's MR structures Monitoring Program
Masonry Wall Inspection Program	See Chapter XI for an evaluation of the Masonry Wall Inspection Program	No, acceptable for managing aging effect.

A3. Group 3 Structures (Auxiliary Bldg, Diesel Generator Bldg, Radwaste Bldg, Turbine Bldg, Switchgear Rm, AFW Pumphouse, Utility/Piping Tunnels)

A3.1 Concrete Elements

A3.2 Steel Elements

A3.3 Masonry Walls

A3. Group 3 Structures (Auxiliary Bldg, Diesel Generator Bldg, Radwaste Bldg, Turbine Bldg, Switchgear Rm, AFW Pumphouse, Utility/Piping Tunnels)

Systems, Structures, and Components

Class 1 structures are organized into nine groups and are discussed separately under subheadings A1 through A9. This format follows the presentation format in Section 3.9 of the draft Standard Review Plan for License Renewal (SRP-LR). Review Table III A3 addresses the elements of Auxiliary Building, Diesel Generator Building, Radwaste Building, Turbine Building, Switchgear Room, AFW Pumphouse, and Utility/Piping Tunnels. For this group, the applicable structural elements are identified: concrete, steel, and masonry walls. The aging management review is presented for each applicable structural element/aging effect combination.

System Interfaces

Physical interfaces exist with any system or component which either penetrates the structure wall or is supported by the structure wall, floor and roof. The direct interface is through the system/component supports which are anchored to the structure. A primary functional interface is protection of housed systems or components from internal/external design basis events. In the case of tanks, there is a functional interface with the associated system. Water control structures are an integral part of the systems which provide plant cooling water and residual heat removal.

III STRUCTURES AND COMPONENT SUPPORTS

A3. Group 3 Structures (Aux., diesel generator, radwaste, turbine buildings; and switchgear room, aux. feedwater pump house, utility/piping tunnels)

Item	Structure/ Component	Region of Interest	Material	Environ- ment	Aging Effect	Aging Mechanism	References
A3.1	Concrete	Exterior Above and Below Grade; Foundation	Reinforced Concrete	Weather Exposed	Scaling, Cracking Spalling	Freeze/ Thaw	<i>Same as A1.1, Freeze/ Thaw Aging Mechanism</i>
A3.1	Concrete	Exterior Above and Below Grade; Foundation	Reinforced Concrete	Flowing Water	Increase in Porosity and Perme- ability, Loss of Strength	Leaching of Calcium Hydroxide	<i>Same as A1.1, Leaching of Calcium Hydroxide Aging Mechanism</i>
A3.1	Concrete	All	Reinforced Concrete	Any	Expansion & Cracking	Reaction with Aggregates	<i>Same as A1.1, Reaction with Aggregates Aging Mechanism</i>
A3.1	Concrete	All	Reinforced Concrete	Exposure to Aggressive Environ- ment	Cracking, Spalling, Loss of Bond, Loss of Material	Corrosion of Embedded Steel	<i>Same as A1.1, Corrosion of Embedded Steel Aging Mechanism</i>
A3.1	Concrete	All	Reinforced Concrete	Exposure to Aggressive Environ- ment	Increase in Porosity and Perme- ability, Cracking, Spalling	Aggressive Chemical Attack	<i>Same as A1.1, Aggressive Chemical Attack Aging Mechanism</i>

III STRUCTURES AND COMPONENT SUPPORTS

A3. Group 3 Structures (Aux., diesel generator, radwaste, turbine buildings; and switchgear room, aux. feedwater pump house, utility/piping tunnels)

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
Maintenance Rule (10CFR50.65) – Structures monitoring	See Chapter XI for an evaluation of Maintenance Rule (10CFR50.65) – Structures monitoring. Per NUREG-1557, freeze/thaw is non-significant if located in a geographic region of negligible weathering conditions (weathering index <100 day-inch/yr); and if located in severe weathering conditions (weathering index >500 day-inch/yr) or moderate weathering conditions (100-500 day-inch/yr), the concrete mix design meets the air content (entrained air 3-6%) and water-to-cement ratio (0.35-0.45) requirements of ACI 318-63 or ACI 349-85.	No, if the structure/aging effect combination is within the scope of the applicant's MR structures Monitoring Program
Maintenance Rule (10CFR50.65) – Structures monitoring	See Chapter XI for an evaluation of Maintenance Rule (10CFR50.65) – Structures monitoring. Per NUREG-1557, leaching of calcium hydroxides is non-significant if not exposed to flowing water or if exposed to flowing water, constructed using the guidance of ACI 201.2R-67 to ensure dense, well-cured concrete with low permeability and control cracking through proper arrangement and distribution of reinforcement.	No, if the structure/aging effect combination is within the scope of the applicant's MR structures Monitoring Program
Maintenance Rule (10CFR50.65) – Structures monitoring	See Chapter XI for an evaluation of Maintenance Rule (10CFR50.65) – Structures monitoring. Per NUREG-1557, reaction with aggregates is non-significant if the aggregates were investigated, tested, and subjected to petrographic examinations in accordance with ASTM C295-54 or ASTM C227-50 that showed the aggregates are non-reactive; or if the aggregates were potentially reactive, the provisions of ACI 201-2R-67 were followed.	No, if the structure/aging effect combination is within the scope of the applicant's MR structures Monitoring Program
Maintenance Rule (10CFR50.65) – Structures monitoring	See Chapter XI for an evaluation of Maintenance Rule (10CFR50.65) – Structures monitoring NOTE: Because of space limitations the discussion of significance determination for Corrosion of Embedded Steel is not presented. See Comment # 4 for specific language]	No, if the structure/aging effect combination is within the scope of the applicant's MR structures Monitoring Program
Maintenance Rule (10CFR50.65) – Structures monitoring	See Chapter XI for an evaluation of Maintenance Rule (10CFR50.65) – Structures monitoring Per NUREG-1557, aggressive chemical attack is non-significant for exterior above grade and interior if not exposed to aggressive environment (pH,<5.5), or to chloride or sulfate solutions beyond defined limits (>500 ppm chloride, or >1500 ppm sulfate); or if exposed to aggressive environment that exceeds the pH, chloride, or sulfate limits the exposure is for intermittent periods only. Applicant must define "intermittent periods" if it is the technical basis for non-significance. Per NUREG 1557, exterior below grade and foundation should be evaluated to ensure that the aging effects of aggressive chemical attack on below-grade concrete surfaces will be managed to maintain the intended function(s) of Class I structure components during the period of extended operation.	No, if the structure/aging effect combination is within the scope of the applicant's MR structures Monitoring Program

III STRUCTURES AND COMPONENT SUPPORTS

A3. Group 3 Structures (Aux., diesel generator, radwaste, turbine buildings; and switchgear room, aux. feedwater pump house, utility/piping tunnels)

Item	Structure/ Component	Region of Interest	Material	Environ- ment	Aging Effect	Aging Mechanism	References
A3.1	Concrete	All	Reinforced Concrete	Soft Soil; Changes in Ground- water Conditions	Cracks; Distortion; Increase in Compo- nent Stress Level	Settlement	<i>Same as A1.1, Settlement Aging Mechanism</i>
A3.1	Concrete	Foundation	Reinforced Concrete	Flowing Water Under Foundation	Reduction in Founda- tion Strength	Erosion of Porous Concrete Subfounda- tion	<i>Same as A1.1, Erosion of Porous Concrete Subfoundation Aging Mechanism</i>
A3.2	Steel Compo- nents	Structural Steel	Carbon Steel	Various	Loss of Material	Corrosion	<i>Same as A1.2, Corrosion Aging Mechanism</i>
A3.3	Masonry Walls	All	Concrete Block	Ambient Environ- ment Inside Building	Cracking	Restraint; Shrinkage; Creep; Aggressive Environ- ment	<i>Same as A1.3, Cracking due to Restraint; Shrinkage; Creep; Aggressive Environment</i>

III STRUCTURES AND COMPONENT SUPPORTS

A3. Group 3 Structures (Aux., diesel generator, radwaste, turbine buildings; and switchgear room, aux. feedwater pump house, utility/piping tunnels)

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
Maintenance Rule (10CFR50.65) – Structures monitoring.	See Chapter XI for an evaluation of Maintenance Rule (10CFR50.65) – Structures monitoring. Consideration of settlement is required by ACI 318-63 or ACI 349-85. For sites with soft soil or changes in the groundwater table, a settlement monitoring program is needed. Applicant should justify non-significance or identify program credited for monitoring settlement.	No, if the structure/aging effect combination is within the scope of the applicant's MR structures Monitoring Program
Maintenance Rule (10CFR50.65) – Structures monitoring.	See Chapter XI for an evaluation of Maintenance Rule (10CFR50.65) – Structures monitoring. IN 98-26 identifies MR Structures Monitoring for managing this aging effect, if applicable	No, if the structure/aging effect combination is within the scope of the applicant's MR structures Monitoring Program
Maintenance Rule (10CFR50.65) – Structures monitoring.	See Chapter XI for an evaluation of Maintenance Rule (10CFR50.65) – Structures monitoring.	No, if the structure/aging effect combination is within the scope of the applicant's MR structures Monitoring Program
Masonry Wall Inspection Program	See Chapter XI for an evaluation of the Masonry Wall Inspection Program	No. acceptable for managing aging effect

A4. Group 4 Structures (Containment Interior Structures, excluding Refueling Canal)

A4.1 Concrete Elements

A4.2 Prestressing Elements

A4.3 Steel Elements

A4. Group 4 Structures (Containment Interior Structures, excluding Refueling Canal)

Systems, Structures, and Components

Class 1 structures are organized into nine groups and are discussed separately under subheadings A1 through A9. This format follows the presentation format in Section 3.9 of the draft Standard Review Plan for License Renewal (SRP-LR). Review Table III A4 addresses the elements of Containment Interior Structures, excluding Refueling canal. For this group, the applicable structural elements are identified: concrete, steel, and prestressing system. The aging management review is presented for each applicable structural element/aging effect combination.

System Interfaces

Physical interfaces exist with any system or component which either penetrates the structure wall or is supported by the structure wall, floor and roof. The direct interface is through the system/component supports which are anchored to the structure. A primary functional interface is protection of housed systems or components from internal/external design basis events. In the case of tanks, there is a functional interface with the associated system. Water control structures are an integral part of the systems which provide plant cooling water and residual heat removal.

III STRUCTURES AND COMPONENT SUPPORTS

A4. Group 4 Structures (Containment internal structures, excluding refueling canal)

Item	Structure/ Component	Region of Interest	Material	Environ- ment	Aging Effect	Aging Mechanism	References
A4.1	Concrete	All	Reinforced Concrete	Inside Contain- ment, Exposure to Aggressive Environ- ment	Increase in Porosity and Permea- bility, Cracking, Spalling	Aggressive Chemical Attack	<i>Same as A1.1, Aggressive Chemical Attack Aging Mechanism</i>
A4.1	Concrete	All	Reinforced Concrete	Inside Contain- ment	Expansion & Cracking	Reaction with Aggregates	<i>Same as A1.1, Reaction with Aggregates Aging Mechanism</i>
A4.1	Concrete	All	Reinforced Concrete	Inside Contain- ment, Exposure to Aggressive Environ- ment	Cracking, Spalling, Loss of Bond, Loss of Material	Corrosion of Embedded Steel	<i>Same as A1.1, Corrosion of Embedded Steel Aging Mechanism</i>
A4.2	Steel Compo- nents	All	Carbon Steel	Inside Contain- ment	Loss of Material	Corrosion	<i>Same as A1.2, Corrosion Aging Mechanism</i>
4.2	Steel Components	Radial Beam Seats	Lubrite	Inside Contain- ment	Lock-up	Wear	

III STRUCTURES AND COMPONENT SUPPORTS

A4. Group 4 Structures (Containment internal structures, excluding refueling canal)

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
Maintenance Rule (10CFR50.65) – Structures monitoring.	See Chapter XI for an evaluation of Maintenance Rule (10CFR50.65) – Structures monitoring. NOTE: Because of space limitations the discussion of significance determination for Aggressive Chemical Attack is not presented. See Comment # 5 for specific language]	No, if the structure/aging effect combination is within the scope of the applicant's MR structures Monitoring Program
Maintenance Rule (10CFR50.65) – Structures monitoring.	See Chapter XI for an evaluation of Maintenance Rule (10CFR50.65) – Structures monitoring. NOTE: Because of space limitations the discussion of significance determination for Reaction with Aggregates is not presented. See Comment # 3 for specific language]	No, if the structure/aging effect combination is within the scope of the applicant's MR structures Monitoring Program
Maintenance Rule (10CFR50.65) – Structures monitoring.	See Chapter XI for an evaluation of Maintenance Rule (10CFR50.65) – Structures monitoring. NOTE: Because of space limitations the discussion of significance determination for Corrosion of Embedded Steel is not presented. See Comment # 4 for specific language]	No, if the structure/aging effect combination is within the scope of the applicant's MR structures Monitoring Program
Maintenance Rule (10CFR50.65) – Structures monitoring.	See Chapter XI for an evaluation of Maintenance Rule (10CFR50.65) – Structures monitoring.	No, if the structure/aging effect combination is within the scope of the applicant's MR structures Monitoring Program
Maintenance Rule (10CFR50.65) – Structures monitoring.	See Chapter XI for an evaluation of Maintenance Rule (10CFR50.65) – Structures monitoring.	No, if the structure/aging effect combination is within the scope of the applicant's MR structures Monitoring Program

A5. Group 5 Structures (Fuel Storage Facility, Refueling Canal)

A5.1 Concrete Elements

A5.2 Steel Elements

A5.3 Masonry Walls

A5. Group 5 Structures (Fuel Storage Facility, Refueling Canal)

Systems, Structures, and Components

Class 1 structures are organized into nine groups and are discussed separately under subheadings A1 through A9. This format follows the presentation format in Section 3.9 of the draft Standard Review Plan for License Renewal (SRP-LR). Review Table III A5 addresses the elements of Fuel Storage Facility and Refueling Canal. For this group, the applicable structural elements are identified: concrete, steel, and masonry walls. The aging management review is presented for each applicable structural element/aging effect combination.

System Interfaces

Physical interfaces exist with any system or component which either penetrates the structure wall or is supported by the structure wall, floor and roof. The direct interface is through the system/component supports which are anchored to the structure. A primary functional interface is protection of housed systems or components from internal/external design basis events. In the case of tanks, there is a functional interface with the associated system. Water control structures are an integral part of the systems which provide plant cooling water and residual heat removal.

III STRUCTURES AND COMPONENT SUPPORTS

A5. Group 5 Structures (Fuel storage facility, refueling canal)

Item	Structure/ Component	Region of Interest	Material	Environ- ment	Aging Effect	Aging Mechanism	References
A5.1	Concrete	Exterior Above and Below Grade; Foundation	Reinforced Concrete	Weather Exposed	Scaling, Cracking Spalling	Freeze/ Thaw	<i>Same as A1.1, Freeze/ Thaw Aging Mechanism</i>
A5.1	Concrete	Exterior Above and Below Grade; Foundation	Reinforced Concrete	Flowing Water	Increase in Porosity and Perme- ability, Loss of Strength	Leaching of Calcium Hydroxide	<i>Same as A1.1, Leaching of Calcium Hydroxide Aging Mechanism</i>
A5.1	Concrete	All	Reinforced Concrete	Any	Expansion & Cracking	Reaction with Aggregates	<i>Same as A1.1, Reaction with Aggregates Aging Mechanism</i>
A5.1	Concrete	All	Reinforced Concrete	Exposure to Aggressive Environ- ment	Cracking, Spalling, Loss of Bond, Loss of Material	Corrosion of Embedded Steel	<i>Same as A1.1, Corrosion of Embedded Steel Aging Mechanism</i>
A5.1	Concrete	All	Reinforced Concrete	Exposure to Aggressive Environ- ment	Increase in Porosity and Perme- ability, Cracking, Spalling	Aggressive Chemical Attack	<i>Same as A1.1, Aggressive Chemical Attack Aging Mechanism</i>

III STRUCTURES AND COMPONENT SUPPORTS

A5. Group 5 Structures (Fuel storage facility, refueling canal)

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
Maintenance Rule (10CFR50.65) – Structures monitoring.	See Chapter XI for an evaluation of Maintenance Rule (10CFR50.65) – Structures monitoring. Per NUREG-1557, freeze/thaw is non-significant if located in a geographic region of negligible weathering conditions (weathering index <100 day-inch/yr); and if located in severe weathering conditions (weathering index >500 day-inch/yr) or moderate weathering conditions (100-500 day-inch/yr), the concrete mix design meets the air content (entrained air 3-6%) and water-to-cement ratio (0.35-0.45) requirements of ACI 318-63 or ACI 349-85.	No, if the structure/aging effect combination is within the scope of the applicant's MR structures Monitoring Program
Maintenance Rule (10CFR50.65) – Structures monitoring.	See Chapter XI for an evaluation of Maintenance Rule (10CFR50.65) – Structures monitoring. Per NUREG-1557, leaching of calcium hydroxides is non-significant if not exposed to flowing water or if exposed to flowing water, constructed using the guidance of ACI 201.2R-67 to ensure dense, well-cured concrete with low permeability and control cracking through proper arrangement and distribution of reinforcement.	No, if the structure/aging effect combination is within the scope of the applicant's MR structures Monitoring Program
Maintenance Rule (10CFR50.65) – Structures monitoring.	See Chapter XI for an evaluation of Maintenance Rule (10CFR50.65) – Structures monitoring. Per NUREG-1557, reaction with aggregates is non-significant if the aggregates were investigated, tested, and subjected to petrographic examinations in accordance with ASTM C295-54 or ASTM C227-50 that showed the aggregates are non-reactive; or if the aggregates were potentially reactive, the provisions of ACI 201-2R-67 were followed	No, if the structure/aging effect combination is within the scope of the applicant's MR structures Monitoring Program
Maintenance Rule (10CFR50.65) – Structures monitoring.	See Chapter XI for an evaluation of Maintenance Rule (10CFR50.65) – Structures monitoring. NOTE: Because of space limitations the discussion of significance determination for Corrosion of Embedded Steel is not presented. See Comment # 4 for specific language]	No, if the structure/aging effect combination is within the scope of the applicant's MR structures Monitoring Program
Maintenance Rule (10CFR50.65) – Structures monitoring.	See Chapter XI for an evaluation of Maintenance Rule (10CFR50.65) – Structures monitoring. Per NUREG-1557, aggressive chemical attack is non-significant for exterior above grade and interior if not exposed to aggressive environment (pH,<5.5), or to chloride or sulfate solutions beyond defined limits (>500 ppm chloride, or >1500 ppm sulfate); or if exposed to aggressive environment that exceeds the pH, chloride, or sulfate limits the exposure is for intermittent periods only. Applicant must define "intermittent periods" if it is the technical basis for non-significance. Per NUREG 1557, exterior below grade and foundation should be evaluated to ensure that the aging effects of aggressive chemical attack on below-grade concrete surfaces will be managed to maintain the intended function(s) of Class I structure components during the period of extended operation.	No, if the structure/aging effect combination is within the scope of the applicant's MR structures Monitoring Program

III STRUCTURES AND COMPONENT SUPPORTS

A5. Group 5 Structures (Fuel storage facility, refueling canal)

Item	Structure/ Component	Region of Interest	Material	Environ- ment	Aging Effect	Aging Mechanism	References
A5.1	Concrete	All	Reinforced Concrete	Soft Soil; Changes in Ground- water Conditions	Cracks; Distortion; Increase in Compo- nent Stress Level	Settlement	<i>Same as A1.1, Settlement Aging Mechanism</i>
A5.1	Concrete	Foundation	Reinforced Concrete	Flowing Water Under Foundation	Reduction in Founda- tion Strength	Erosion of Porous Concrete Subfounda- tion	<i>Same as A1.1, Erosion of Porous Concrete Subfoundation Aging Mechanism</i>
A5.2	Steel Compo- nents	Structural Steel	Carbon Steel	Various	Loss of Material	Corrosion	<i>Same as A1.2, Corrosion Aging Mechanism</i>
A5.2	Steel Compo- nents	Liners	Stainless Steel	Exposed to Water	Crack Initiation and Growth, Loss of Material	Stress Corrosion Cracking and Crevice Corrosion	NUREG-1557
A5.3	Masonry Walls	Fuel Storage Facility	Concrete Block	Ambient Environ- ment Inside Building	Cracking	Restraint; Shrinkage; Creep; Aggressive Environ- ment	<i>Same as A1.3, Cracking due to Restraint; Shrinkage; Creep; Aggressive Environment</i>

III STRUCTURES AND COMPONENT SUPPORTS

A5. Group 5 Structures (Fuel storage facility, refueling canal)

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
Maintenance Rule (10CFR50.65) – Structures monitoring.	See Chapter XI for an evaluation of Maintenance Rule (10CFR50.65) – Structures monitoring. Consideration of settlement is required by ACI 318-63 or ACI 349-85. For sites with soft soil or changes in the groundwater table, a settlement monitoring program is needed. Applicant should justify non-significance or identify program credited for monitoring settlement.	No, if the structure/aging effect combination is within the scope of the applicant's MR structures Monitoring Program
Maintenance Rule (10CFR50.65) – Structures monitoring.	See Chapter XI for an evaluation of Maintenance Rule (10CFR50.65) – Structures monitoring. IN 98-26 identifies MR Structures Monitoring for managing this aging effect, if applicable	No, if the structure/aging effect combination is within the scope of the applicant's MR structures Monitoring Program
Maintenance Rule (10CFR50.65) – Structures monitoring.	See Chapter XI for an evaluation of Maintenance Rule (10CFR50.65) – Structures monitoring.	No, if the structure/aging effect combination is within the scope of the applicant's MR structures Monitoring Program
Periodic monitoring of the leak chase system drain lines and the leak detection sump for early detection and repair of leaks in liners.	Current leakage detection and inventory monitoring systems provide timely means to identify, monitor, and repair liner degradation.	No. Acceptable method for managing aging effect.
Masonry Wall Inspection Program	See Chapter XI for an evaluation of the Masonry Wall Inspection Program	No. Acceptable method for managing aging effect.

A6. Group 6 Structures (Water-Control Structures)

A6.1 Concrete Elements

A6.2 Steel Elements

A6.3 Masonry Walls

A6. Group 6 Structures (Water-Control Structures)

Systems, Structures, and Components

Class 1 structures are organized into nine groups and are discussed separately under subheadings A1 through A9. This format follows the presentation format in Section 3.9 of the draft Standard Review Plan for License Renewal (SRP-LR). Review Table III A6 addresses the elements of Water-Control Structures. For this group, the applicable structural elements are identified: concrete, steel, and masonry walls. The aging management review is presented for each applicable structural element/aging effect combination.

System Interfaces

Physical interfaces exist with any system or component which either penetrates the structure wall or is supported by the structure wall, floor and roof. The direct interface is through the system/component supports which are anchored to the structure. A primary functional interface is protection of housed systems or components from internal/external design basis events. In the case of tanks, there is a functional interface with the associated system. Water control structures are an integral part of the systems which provide plant cooling water and residual heat removal.

III STRUCTURES AND COMPONENT SUPPORTS

A6. Group 6 Structures (Water-control structures)

Item	Structure/ Component	Region of Interest	Material	Environ- ment	Aging Effect	Aging Mechanism	References
A6.1	Concrete	Exterior Above and Below Grade; Foundation; Interior Slab	Reinforced Concrete	Weather Exposed	Scaling, Cracking, Spalling	Freeze/ Thaw	Regulatory Guide 1.127 NUREG-1557

III STRUCTURES AND COMPONENT SUPPORTS
A6. Group 6 Structures (Water-control structures)

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
Inspection program implemented using the guidance in Regulatory Guide 1.127 "Inspection of Water-Control Structures Associated with Nuclear Power Plants" FERC dam and maintenance and inspection.	See Chapter XI for an evaluation of Regulatory Guide 1.1.27 and the FERC dam inspections and maintenance.	No. Acceptable method for managing aging effect.

III STRUCTURES AND COMPONENT SUPPORTS

A6. Group 6 Structures (Water-control structures)

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

III STRUCTURES AND COMPONENT SUPPORTS
A6. Group 6 Structures (Water-control structures)

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

III STRUCTURES AND COMPONENT SUPPORTS

A6. Group 6 Structures (Water-control structures)

Item	Structure/ Component	Region of Interest	Material	Environ- ment	Aging Effect	Aging Mechanism	References
A6.1	Concrete	Exterior Above and Below Grade; Foundation; Interior Slab	Reinforced Concrete	Flowing Water	Increase in Porosity and Perme- ability, Loss of Strength	Leaching of Calcium Hydroxide	Regulatory Guide 1.127
A6.1	Concrete	All	Reinforced Concrete	Any	Expansion & Cracking	Reaction with Aggregates	Regulatory Guide 1.127
A6.1	Concrete	All	Reinforced Concrete	Exposure to Aggressive Environ- ment	Cracking, Spalling, Loss of Bond, Loss of Material	Corrosion of Embedded Steel	Regulatory Guide 1.127
A6.1	Concrete	All	Reinforced Concrete	Exposure to Aggressive Environ- ment	Increase in Porosity and Perme- ability, Cracking, Spalling	Aggressive Chemical Attack	Regulatory Guide 1.127
A6.1	Concrete	All	Reinforced Concrete	Soft Soil; Changes in Ground- water Conditions	Cracks; Distortion; Increase in Compo- nent Stress Level	Settlement	Regulatory Guide 1.127
A6.1	Concrete	Foundation	Reinforced Concrete	Flowing Water Under Foundation	Reduction in Founda- tion Strength	Erosion of Porous Concrete Subfounda- tion	<i>Same as A1.1, Erosion of Porous Concrete Subfoundation Aging Mechanism</i>

III STRUCTURES AND COMPONENT SUPPORTS
A6. Group 6 Structures (Water-control structures)

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
Regulatory Guide 1.127	See Chapter XI for an evaluation of Regulatory Guide 1.1.27 and the FERC dam inspections and maintenance. NOTE: Because of space limitations the discussion of significance determination for Leaching of Calcium Hydroxide is not presented. See Comment # 13 for specific language]	No. Acceptable method for managing aging effect.
Regulatory Guide 1.127	See Chapter XI for an evaluation of Regulatory Guide 1.1.27 and the FERC dam inspections and maintenance. NOTE: Because of space limitations the discussion of significance determination for Reaction with Aggregates is not presented. See Comment # 14 for specific language]	No. Acceptable method for managing aging effect.
Regulatory Guide 1.127	See Chapter XI for an evaluation of Regulatory Guide 1.1.27 and the FERC dam inspections and maintenance. NOTE: Because of space limitations the discussion of significance determination for Corrosion of Embedded Steel is not presented. See Comment # 15 for specific language]	No. Acceptable method for managing aging effect.
Regulatory Guide 1.127	See Chapter XI for an evaluation of Regulatory Guide 1.1.27 and the FERC dam inspections and maintenance. NOTE: Because of space limitations the discussion of significance determination for Aggressive Chemical Attack is not presented. See Comment # 16 for specific language]	No. Acceptable method for managing aging effect.
Regulatory Guide 1.127	See Chapter XI for an evaluation of Regulatory Guide 1.1.27 and the FERC dam inspections and maintenance. NOTE: Because of space limitations the discussion of significance determination for Corrosion of Embedded Steel is not presented. See Comment # 4 for specific language]	No. Acceptable method for managing aging effect.
Maintenance Rule (10CFR50.65) – Structures monitoring.	See Chapter XI for an evaluation of Maintenance Rule (10CFR50.65) – Structures monitoring. IN 98-26 identifies MR Structures Monitoring for managing this aging effect, if applicable.	No, if the structure/aging effect combination is within the scope of the applicant's MR structures Monitoring Program

III STRUCTURES AND COMPONENT SUPPORTS

A6. Group 6 Structures (Water-control structures)

Item	Structure/ Component	Region of Interest	Material	Environ- ment	Aging Effect	Aging Mechanism	References
A6.1	Concrete	Exterior Above and Below Grade; Foundation; Interior Slab	Reinforced Concrete	Flowing Water	Loss of material	Abrasion; Cavitation	Regulatory Guide 1.127
A6.2	Steel Compo- nents	Structural Steel	Carbon Steel	Various	Loss of Material	Corrosion	Regulatory Guide 1.127
A6.3	Masonry Walls	Intake Structure; Cooling Tower	Concrete Block	Various	Cracking	Restraint; Shrinkage; Creep; Aggressive Environ- ment	<i>Same as A1.3, Cracking due to Restraint; Shrinkage; Creep; Aggressive Environment</i>

III STRUCTURES AND COMPONENT SUPPORTS

A6. Group 6 Structures (Water-control structures)

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
Regulatory Guide 1.127	See Chapter XI for an evaluation of Regulatory Guide 1.1.27 and the FERC dam inspections and maintenance	No. Acceptable method for managing aging effect.
Regulatory Guide 1.127	See Chapter XI for an evaluation of Regulatory Guide 1.1.27 and the FERC dam inspections and maintenance	No. Acceptable method for managing aging effect.
Masonry Wall Inspection Program	See Chapter XI for an evaluation of the Masonry Wall Inspection Program	No. Acceptable method for managing aging effect.

A7. Group 7 Structures (Concrete Tanks)

A7.1 Concrete Elements

A7.2 Steel Elements

A7. Group 7 Structures (Concrete Tanks)

Systems, Structures, and Components

Class 1 structures are organized into nine groups and are discussed separately under subheadings A1 through A9. This format follows the presentation format in Section 3.9 of the draft Standard Review Plan for License Renewal (SRP-LR). Review Table III A7 addresses the elements of Concrete Tanks. For this group, the applicable structural elements are identified: concrete and steel. The aging management review is presented for each applicable structural element/aging effect combination.

System Interfaces

Physical interfaces exist with any system or component which either penetrates the structure wall or is supported by the structure wall, floor and roof. The direct interface is through the system/component supports which are anchored to the structure. A primary functional interface is protection of housed systems or components from internal/external design basis events. In the case of tanks, there is a functional interface with the associated system. Water control structures are an integral part of the systems which provide plant cooling water and residual heat removal.

III STRUCTURES AND COMPONENT SUPPORTS

A7. Group 7 Structures (Concrete Tanks)

Item	Structure/ Component	Region of Interest	Material	Environ- ment	Aging Effect	Aging Mechanism	References
A7.1	Concrete	Exterior Above and Below Grade; Foundation	Reinforced Concrete	Weather Exposed	Scaling, Cracking, Spalling	Freeze/ Thaw	<i>Same as A1.1, Freeze/ Thaw Aging Mechanism</i>
A7.1	Concrete	Exterior Above and Below Grade; Foundation	Reinforced Concrete	Flowing Water	Increase in Porosity and Perme- ability, Loss of Strength	Leaching of Calcium Hydroxide	<i>Same as A1.1, Leaching of Calcium Hydroxide Aging Mechanism</i>
A7.1	Concrete	All	Reinforced Concrete	Any	Expansion & Cracking	Reaction with Aggregates	<i>Same as A1.1, Reaction with Aggregates Aging Mechanism</i>
A7.1	Concrete	All	Reinforced Concrete	Exposure to Aggressive Environ- ment	Cracking, Spalling, Loss of Bond, Loss of Material	Corrosion of Embedded Steel	<i>Same as A1.1, Corrosion of Embedded Steel Aging Mechanism</i>
A7.1	Concrete	All	Reinforced Concrete	Exposure to Aggressive Environ- ment	Increase in Porosity and Perme- ability, Cracking, Spalling	Aggressive Chemical Attack	<i>Same as A1.1, Aggressive Chemical Attack Aging Mechanism</i>

III STRUCTURES AND COMPONENT SUPPORTS

A7. Group 7 Structures (Concrete Tanks)

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
Maintenance Rule (10CFR50.65) – Structures monitoring.	See Chapter XI for an evaluation of Maintenance Rule (10CFR50.65) – Structures monitoring Per NUREG-1557, freeze/thaw is non-significant if located in a geographic region of negligible weathering conditions (weathering index <100 day-inch/yr); and if located in severe weathering conditions (weathering index >500 day-inch/yr) or moderate weathering conditions (100-500 day-inch/yr), the concrete mix design meets the air content (entrained air 3-6%) and water-to-cement ratio (0.35-0.45) requirements of ACI 318-63 or ACI 349-85.	No, if the structure/aging effect combination is within the scope of the applicant's MR structures Monitoring Program
Maintenance Rule (10CFR50.65) – Structures monitoring.	See Chapter XI for an evaluation of Maintenance Rule (10CFR50.65) – Structures monitoring. Per NUREG-1557, leaching of calcium hydroxides is non-significant if not exposed to flowing water or if exposed to flowing water, constructed using the guidance of ACI 201.2R-67 to ensure dense, well-cured concrete with low permeability and control cracking through proper arrangement and distribution of reinforcement.	No, if the structure/aging effect combination is within the scope of the applicant's MR structures Monitoring Program
Maintenance Rule (10CFR50.65) – Structures monitoring.	See Chapter XI for an evaluation of Maintenance Rule (10CFR50.65) – Structures monitoring. Per NUREG-1557, reaction with aggregates is non-significant if the aggregates were investigated, tested, and subjected to petrographic examinations in accordance with ASTM C295-54 or ASTM C227-50 that showed the aggregates are non-reactive; or if the aggregates were potentially reactive, the provisions of ACI 201-2R-67 were followed.	No, if the structure/aging effect combination is within the scope of the applicant's MR structures Monitoring Program
Maintenance Rule (10CFR50.65) – Structures monitoring.	See Chapter XI for an evaluation of Maintenance Rule (10CFR50.65) – Structures monitoring NOTE: Because of space limitations the discussion of significance determination for Corrosion of Embedded Steel is not presented. See Comment # 4 for specific language]	No, if the structure/aging effect combination is within the scope of the applicant's MR structures Monitoring Program
Maintenance Rule (10CFR50.65) – Structures monitoring.	See Chapter XI for an evaluation of Maintenance Rule (10CFR50.65) – Structures monitoring Per NUREG-1557, aggressive chemical attack is non-significant for exterior above grade and interior if not exposed to aggressive environment (pH,<5.5), or to chloride or sulfate solutions beyond defined limits (>500 ppm chloride, or >1500 ppm sulfate); or if exposed to aggressive environment that exceeds the pH, chloride, or sulfate limits the exposure is for intermittent periods only. Applicant must define "intermittent periods" if it is the technical basis for non-significance. Per NUREG 1557, exterior below grade and foundation should be evaluated to ensure that the aging effects of aggressive chemical attack on below-grade concrete surfaces will be managed to maintain the intended function(s) of Class I structure components during the period of extended operation.	No, if the structure/aging effect combination is within the scope of the applicant's MR structures Monitoring Program

III STRUCTURES AND COMPONENT SUPPORTS

A7. Group 7 Structures (Concrete Tanks)

Item	Structure/ Component	Region of Interest	Material	Environ- ment	Aging Effect	Aging Mechanism	References
A7.1	Concrete	All	Reinforced Concrete	Soft Soil; Changes in Ground- water Conditions	Cracks; Distortion; Increase in Compo- nent Stress Level	Settlement	<i>Same as A1.1, Settlement Aging Mechanism</i>
A7.1	Concrete	Foundation	Reinforced Concrete	Flowing Water Under Foundation	Reduction in Founda- tion Strength	Erosion of Porous Concrete Subfounda- tion	<i>Same as A1.1, Erosion of Porous Concrete Subfoundation Aging Mechanism</i>
A7.2	Steel Compo- nents	Structural Steel	Carbon Steel	Various	Loss of Material	Corrosion	<i>Same as A1.2, Corrosion Aging Mechanism</i>
A7.2	Steel Compo- nents	Liner	Stainless Steel	Exposed to Fluid Environ- ment (water, fuel)	Crack Initiation and Growth, Loss of Material	Stress Corrosion Cracking, Crevice Corrosion	<i>Maintenance Rule – see A1.1, Freeze/Thaw Aging Mechanism</i>

III STRUCTURES AND COMPONENT SUPPORTS

A7. Group 7 Structures (Concrete Tanks)

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
Maintenance Rule (10CFR50.65) – Structures monitoring	See Chapter XI for an evaluation of Maintenance Rule (10CFR50.65) – Structures monitoring Consideration of settlement is required by ACI 318-63 or ACI 349-85. For sites with soft soil or changes in the groundwater table, a settlement monitoring program is needed. Applicant should justify non-significance or identify program credited for monitoring settlement.	No, if the structure/aging effect combination is within the scope of the applicant's MR structures Monitoring Program
Maintenance Rule (10CFR50.65) – Structures monitoring	See Chapter XI for an evaluation of Maintenance Rule (10CFR50.65) – Structures monitoring IN 98-26 identifies MR Structures Monitoring for managing this aging effect, if applicable	No, if the structure/aging effect combination is within the scope of the applicant's MR structures Monitoring Program
Maintenance Rule (10CFR50.65) – Structures monitoring	See Chapter XI for an evaluation of Maintenance Rule (10CFR50.65) – Structures monitoring	No, if the structure/aging effect combination is within the scope of the applicant's MR structures Monitoring Program
Maintenance Rule (10CFR50.65) – Structures monitoring	See Chapter XI for an evaluation of Maintenance Rule (10CFR50.65) – Structures monitoring	No, if the structure/aging effect combination is within the scope of the applicant's MR structures Monitoring Program

A8. Group 8 Structures (Steel Tanks)

A8.1 Concrete Elements

A8.2 Steel Elements

A8. Group 8 Structures (Steel Tanks)

Systems, Structures, and Components

Class 1 structures are organized into nine groups and are discussed separately under subheadings A1 through A9. This format follows the presentation format in Section 3.9 of the draft Standard Review Plan for License Renewal (SRP-LR). Review Table III A8 addresses the elements of Steel Tanks. For this group, the applicable structural elements are identified: concrete and steel. The aging management review is presented for each applicable structural element/aging effect combination.

System Interfaces

Physical interfaces exist with any system or component which either penetrates the structure wall or is supported by the structure wall, floor and roof. The direct interface is through the system/component supports which are anchored to the structure. A primary functional interface is protection of housed systems or components from internal/external design basis events. In the case of tanks, there is a functional interface with the associated system. Water control structures are an integral part of the systems which provide plant cooling water and residual heat removal.

III STRUCTURES AND COMPONENT SUPPORTS

A8. Group 8 Structures (Steel Tanks)

Item	Structure/ Component	Region of Interest	Material	Environ- ment	Aging Effect	Aging Mechanism	References
A8.1	Concrete	Foundation	Reinforced Concrete	Weather Exposed	Scaling, Cracking, Spalling	Freeze/ Thaw	<i>Same as A1.1, Freeze/ Thaw Aging Mechanism</i>
A8.1	Concrete	Foundation	Reinforced Concrete	Flowing Water	Increase in Porosity and Perme- ability, Loss of Strength	Leaching of Calcium Hydroxide	<i>Same as A1.1, Leaching of Calcium Hydroxide Aging Mechanism</i>
A8.1	Concrete	Foundation	Reinforced Concrete	Any	Expansion & Cracking	Reaction with Aggregates	<i>Same as A1.1, Reaction with Aggregates Aging Mechanism</i>
A8.1	Concrete	Foundation	Reinforced Concrete	Exposure to Aggressive Environ- ment	Cracking, Spalling, Loss of Bond, Loss of Material	Corrosion of Embedded Steel	<i>Same as A1.1, Corrosion of Embedded Steel Aging Mechanism</i>
A8.1	Concrete	Foundation	Reinforced Concrete	Exposure to Aggressive Environ- ment	Increase in Porosity and Perme- ability, Cracking, Spalling	Aggressive Chemical Attack	<i>Same as A1.1, Aggressive Chemical Attack Aging Mechanism</i>

III STRUCTURES AND COMPONENT SUPPORTS

A8. Group 8 Structures (Steel Tanks)

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
Maintenance Rule (10CFR50.65) – Structures monitoring	See Chapter XI for an evaluation of Maintenance Rule (10CFR50.65) – Structures monitoring Per NUREG-1557, freeze/thaw is non-significant if located in a geographic region of negligible weathering conditions (weathering index <100 day-inch/yr); and if located in severe weathering conditions (weathering index >500 day-inch/yr) or moderate weathering conditions (100-500 day-inch/yr), the concrete mix design meets the air content (entrained air 3-6%) and water-to-cement ratio (0.35-0.45) requirements of ACI 318-63 or ACI 349-85.	No, if the structure/aging effect combination is within the scope of the applicant's MR structures Monitoring Program
Maintenance Rule (10CFR50.65) – Structures monitoring	See Chapter XI for an evaluation of Maintenance Rule (10CFR50.65) – Structures monitoring. Per NUREG-1557, leaching of calcium hydroxides is non-significant if not exposed to flowing water or if exposed to flowing water, constructed using the guidance of ACI 201.2R-67 to ensure dense, well-cured concrete with low permeability and control cracking through proper arrangement and distribution of reinforcement.	No, if the structure/aging effect combination is within the scope of the applicant's MR structures Monitoring Program
Maintenance Rule (10CFR50.65) – Structures monitoring	See Chapter XI for an evaluation of Maintenance Rule (10CFR50.65) – Structures monitoring. Per NUREG-1557, reaction with aggregates is non-significant if the aggregates were investigated, tested, and subjected to petrographic examinations in accordance with ASTM C295-54 or ASTM C227-50 that showed the aggregates are non-reactive; or if the aggregates were potentially reactive, the provisions of ACI 201-2R-67 were followed.	No, if the structure/aging effect combination is within the scope of the applicant's MR structures Monitoring Program
Maintenance Rule (10CFR50.65) – Structures monitoring	See Chapter XI for an evaluation of Maintenance Rule (10CFR50.65) – Structures monitoring NOTE: Because of space limitations the discussion of significance determination for Corrosion of Embedded Steel is not presented. See Comment # 4 for specific language]	No, if the structure/aging effect combination is within the scope of the applicant's MR structures Monitoring Program
Maintenance Rule (10CFR50.65) – Structures monitoring	See Chapter XI for an evaluation of Maintenance Rule (10CFR50.65) – Structures monitoring Per NUREG-1557, aggressive chemical attack is non-significant for exterior above grade and interior if not exposed to aggressive environment (pH,<5.5), or to chloride or sulfate solutions beyond defined limits (>500 ppm chloride, or >1500 ppm sulfate); or if exposed to aggressive environment that exceeds the pH, chloride, or sulfate limits the exposure is for intermittent periods only. Applicant must define "intermittent periods" if it is the technical basis for non-significance. Per NUREG 1557, exterior below grade and foundation should be evaluated to ensure that the aging effects of aggressive chemical attack on below-grade concrete surfaces will be managed to maintain the intended function(s) of Class I structure components during the period of extended operation.	No, if the structure/aging effect combination is within the scope of the applicant's MR structures Monitoring Program

III STRUCTURES AND COMPONENT SUPPORTS

A8. Group 8 Structures (Steel Tanks)

Item	Structure/ Component	Region of Interest	Material	Environ- ment	Aging Effect	Aging Mechanism	References
A8.1	Concrete	Foundation	Reinforced Concrete	Soft Soil; Changes in Ground- water Conditions	Cracks; Distortion; Increase in Compo- nent Stress Level	Settlement	<i>Same as A1.1, Settlement Aging Mechanism</i>
A8.1	Concrete	Foundation	Reinforced Concrete	Flowing Water Under Foundation	Reduction in Founda- tion Strength	Erosion of Porous Concrete Subfounda- tion	<i>Same as A1.1, Erosion of Porous Concrete Subfoundation Aging Mechanism</i>
A8.2	Steel Compo- nents	Structural Steel	Carbon Steel	Various	Loss of Material	Corrosion	<i>Same as A1.2, Corrosion Aging Mechanism</i>
A8.2	Steel Compo- nents	Liner	Stainless Steel	Exposed to Fluid Environ- ment	Crack Initiation and Growth, Loss of Material	Stress Corrosion Cracking, Crevice Corrosion	<i>Same as A7.2, Stress Corrosion Cracking, Crevice Corrosion Aging Mechanism</i>

III STRUCTURES AND COMPONENT SUPPORTS

A8. Group 8 Structures (Steel Tanks)

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
Maintenance Rule (10CFR50.65) – Structures monitoring	See Chapter XI for an evaluation of Maintenance Rule (10CFR50.65) – Structures monitoring Consideration of settlement is required by ACI 318-63 or ACI 349-85. For sites with soft soil or changes in the groundwater table, a settlement monitoring program is needed. Applicant should justify non-significance or identify program credited for monitoring settlement.	No, if the structure/aging effect combination is within the scope of the applicant's MR structures Monitoring Program
Maintenance Rule (10CFR50.65) – Structures monitoring	See Chapter XI for an evaluation of Maintenance Rule (10CFR50.65) – Structures monitoring IN 98-26 identifies MR Structures Monitoring for managing this aging effect, if applicable	No, if the structure/aging effect combination is within the scope of the applicant's MR structures Monitoring Program
Maintenance Rule (10CFR50.65) – Structures monitoring	See Chapter XI for an evaluation of Maintenance Rule (10CFR50.65) – Structures monitoring	No, if the structure/aging effect combination is within the scope of the applicant's MR structures Monitoring Program
Maintenance Rule (10CFR50.65) – Structures monitoring.	See Chapter XI for an evaluation of Maintenance Rule (10CFR50.65) – Structures monitoring.	No, if the structure/aging effect combination is within the scope of the applicant's MR structures Monitoring Program

A9. Group 9 Structures (BWR Unit Vent Stack)

A9.1 Concrete Elements

A9. Group 9 Structures (BWR Unit Vent Stack)

Systems, Structures, and Components

Class 1 structures are organized into nine groups and are discussed separately under subheadings A1 through A9. This format follows the presentation format in Section 3.9 of the draft Standard Review Plan for License Renewal (SRP-LR). Review Table III A9 addresses the elements of BWR Unit Vent Stack. For this group, the applicable structural elements are identified: concrete. The aging management review is presented for each applicable structural element/aging effect combination.

System Interfaces

Physical interfaces exist with any system or component which either penetrates the structure wall or is supported by the structure wall, floor and roof. The direct interface is through the system/component supports which are anchored to the structure. A primary functional interface is protection of housed systems or components from internal/external design basis events. In the case of tanks, there is a functional interface with the associated system. Water control structures are an integral part of the systems which provide plant cooling water and residual heat removal.

III STRUCTURES AND COMPONENT SUPPORTS
A9. Group 9 Structures (BWR unit vent stacks)

Item	Structure/ Component	Region of Interest	Material	Environ- ment	Aging Effect	Aging Mechanism	References
A9.1	Concrete	Exterior Above and Below Grade; Foundation	Reinforced Concrete	Weather Exposed	Scaling, Cracking, Spalling	Freeze/ Thaw	<i>Same as A1.1, Freeze/ Thaw Aging Mechanism</i>
A9.1	Concrete	Exterior Above and Below Grade; Foundation	Reinforced Concrete	Flowing Water	Increase in Porosity and Perme- ability, Loss of Strength	Leaching of Calcium Hydroxide	<i>Same as A1.1, Leaching of Calcium Hydroxide Aging Mechanism</i>
A9.1	Concrete	All	Reinforced Concrete	Any	Expansion & Cracking	Reaction with Aggregates	<i>Same as A1.1, Reaction with Aggregates Aging Mechanism</i>
A9.1	Concrete	All	Reinforced Concrete	Exposure to Aggressive Environ- ment	Cracking, Spalling, Loss of Bond, Loss of Material	Corrosion of Embedded Steel	<i>Same as A1.1, Corrosion of Embedded Steel Aging Mechanism</i>
A9.1	Concrete	All	Reinforced Concrete	Exposure to Aggressive Environ- ment	Increase in Porosity and Perme- ability, Cracking, Spalling	Aggressive Chemical Attack	<i>Same as A1.1, Aggressive Chemical Attack Aging Mechanism</i>

III STRUCTURES AND COMPONENT SUPPORTS
A9. Group 9 Structures (BWR unit vent stacks)

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
Maintenance Rule (10CFR50.65) – Structures monitoring	See Chapter XI for an evaluation of Maintenance Rule (10CFR50.65) – Structures monitoring Per NUREG-1557, freeze/thaw is non-significant if located in a geographic region of negligible weathering conditions (weathering index <100 day-inch/yr); and if located in severe weathering conditions (weathering index >500 day-inch/yr) or moderate weathering conditions (100-500 day-inch/yr), the concrete mix design meets the air content (entrained air 3-6%) and water-to-cement ratio (0.35-0.45) requirements of ACI 318-63 or ACI 349-85.	No, if the structure/aging effect combination is within the scope of the applicant's MR structures Monitoring Program
Maintenance Rule (10CFR50.65) – Structures monitoring	See Chapter XI for an evaluation of Maintenance Rule (10CFR50.65) – Structures monitoring. Per NUREG-1557, leaching of calcium hydrides is non-significant if not exposed to flowing water or if exposed to flowing water, constructed using the guidance of ACI 201.2R-67 to ensure dense, well-cured concrete with low permeability and control cracking through proper arrangement and distribution of reinforcement.	No, if the structure/aging effect combination is within the scope of the applicant's MR structures Monitoring Program
Maintenance Rule (10CFR50.65) – Structures monitoring	See Chapter XI for an evaluation of Maintenance Rule (10CFR50.65) – Structures monitoring. Per NUREG-1557, reaction with aggregates is non-significant if the aggregates were investigated, tested, and subjected to petrographic examinations in accordance with ASTM C295-54 or ASTM C227-50 that showed the aggregates are non-reactive; or if the aggregates were potentially reactive, the provisions of ACI 201-2R-67 were followed.	No, if the structure/aging effect combination is within the scope of the applicant's MR structures Monitoring Program
Maintenance Rule (10CFR50.65) – Structures monitoring	See Chapter XI for an evaluation of Maintenance Rule (10CFR50.65) – Structures monitoring NOTE: Because of space limitations the discussion of significance determination for Corrosion of Embedded Steel is not presented. See Comment # 4 for specific language]	No, if the structure/aging effect combination is within the scope of the applicant's MR structures Monitoring Program
Maintenance Rule (10CFR50.65) – Structures monitoring	See Chapter XI for an evaluation of Maintenance Rule (10CFR50.65) – Structures monitoring Per NUREG-1557, aggressive chemical attack is non-significant for exterior above grade and interior if not exposed to aggressive environment (pH _i <5.5), or to chloride or sulfate solutions beyond defined limits (>500 ppm chloride, or >1500 ppm sulfate); or if exposed to aggressive environment that exceeds the pH, chloride, or sulfate limits the exposure is for intermittent periods only. Applicant must define "intermittent periods" if it is the technical basis for non-significance. Per NUREG 1557, exterior below grade and foundation should be evaluated to ensure that the aging effects of aggressive chemical attack on below-grade concrete surfaces will be managed to maintain the intended function(s) of Class I structure components during the period of extended operation.	No, if the structure/aging effect combination is within the scope of the applicant's MR structures Monitoring Program

III STRUCTURES AND COMPONENT SUPPORTS
A9. Group 9 Structures (BWR unit vent stacks)

Item	Structure/ Component	Region of Interest	Material	Environ- ment	Aging Effect	Aging Mechanism	References
A9.1	Concrete	All	Reinforced Concrete	Soft Soil; Changes in Ground- water Conditions	Cracks; Distortion; Increase in Compo- nent Stress Level	Settlement	<i>Same as A1.1, Settlement Aging Mechanism</i>
A9.1	Concrete	Foundation	Reinforced Concrete	Flowing Water Under Foundation	Reduction in Founda- tion Strength	Erosion of Porous Concrete Subfounda- tion	<i>Same as A1.1, Erosion of Porous Concrete Subfoundation Aging Mechanism</i>

III STRUCTURES AND COMPONENT SUPPORTS
A9. Group 9 Structures (BWR unit vent stacks)

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
Maintenance Rule (10CFR50.65) – Structures monitoring	See Chapter XI for an evaluation of Maintenance Rule (10CFR50.65) – Structures monitoring Consideration of settlement is required by ACI 318-63 or ACI 349-85. For sites with soft soil or changes in the groundwater table, a settlement monitoring program is needed. Applicant should justify non-significance or identify program credited for monitoring settlement.	No, if the structure/aging effect combination is within the scope of the applicant's MR structures Monitoring Program
Maintenance Rule (10CFR50.65) – Structures monitoring	See Chapter XI for an evaluation of Maintenance Rule (10CFR50.65) – Structures monitoring IN 98-26 identifies MR Structures Monitoring for managing this aging effect, if applicable	No, if the structure/aging effect combination is within the scope of the applicant's MR structures Monitoring Program