NUCLEAR ENERGY INSTITUTE

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May 1, 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 section IIA1 of the Generic Aging Lessons Learned (GALL) Report. The enclosure includes three documents. One document is a mark-up of the existing GALL pages to reflect our comments. Each comment is identified by number. The second document is a table containing our comments, numbered consistent with the marked-up pages. The third document is a clean copy of the GALL pages to reflect how GALL reads with our comments incorporated.

Please note that in previous comments we suggested creating a new Chapter XI in GALL as a repository for the program evaluations. Having such a chapter allows the various GALL sections to merely reference the new chapter when a program is credited. In the enclosed comments we have followed this recommendation. Also in our previous comments we recommended removing Time Limited Aging Analyses (TLAA) from GALL and moving them to the License Renewal Standard Review Plan. As a minimum, we recommend the creation of a new chapter in GALL as a repository for TLAAs. The TLAAs in section IIA1 are identified but have not moved to a new chapter pending a decision by the NRC staff relative to our recommendation.

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

Sincerely,

Douglas J. Walters

Douglas J. Walters

Enclosures

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

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A1. Concrete Containments (Reinforced and Prestressed)

A1.1 Concrete Elements
A1.2 Steel Elements
A1.3 Prestressing System

A1. Concrete Containments (Reinforced and Prestressed)

Systems, Structures, and Components

Review Table II A addresses the elements of PWR containment structures. Reinforced and prestressed concrete containments, steel containments, and common components are discussed separately under subheadings A1, A2, and A3, respectively. This format follows the presentation format in Section 3.3 of the draft Standard Review Plan for License Renewal (SRP-LR). Concrete containments in Review Table II A1 are divided into three elements: concrete, steel, and prestressing system.

System Interfaces

Functional interfaces include the primary containment HVAC system(VII.I), containment isolation system(V.A), containment spray system(V.B), and containment heat removal system(V.C). Physical interfaces exist with any structure, system, or component which either penetrates the containment wall, such as the main steam system(VIII.A) and feedwater systems(VIII.F,VIII.G), or is supported by the containment structure, such as the polar crane(VII.K.7). The containment structure basemat typically provides support to the NSSS components and containment internal structures.

Containment HVAC (VII.F3)
Containment Isolation System (V.C)
Containment Spray (V.A)
Containment Heat Removal
Main Steam System (VIII.B1)
Feedwater System (VIII.D1)
Polar Crane (VII.B2)

1 Revise references to match Table of Contents

II. CONTAINMENT STRUCTURES

A. PWR Containments

A1. Concrete Containments (Reinforced and Prestressed)

Item	Structure/ Component	Region of Interest	Material	Environment	Aging Effect	Aging Mechanism	References
A1.1	Concrete Elements	Dome, Wall, Basemat, Ring Girder, Buttresses	Concrete	~~Inside and/or~~ Outside Containment	~~Scaling;~~ Cracking, ~~Spalling~~ Loss of Material	Freeze/ Thaw	10CFR50.55a ASME Section XI, Subsection IWL 10CFR50, Appendix J NUREG-1611 ~~Draft Regulatory Guide, DG-1076~~ ACI 201.1R-~~68~~ 92 ~~ACI 349.3R-96~~ Maintenance Rule 10CFR50.65 Reg. Guide 1.160, Rev 2 (NEI 93-01, Rev 2 & NEI 96-03

8 9 10 29 12 13

II. CONTAINMENT STRUCTURES

A. PWR Containments

A1. Concrete Containments (Reinforced and Prestressed)

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

19 MAKE CHANGES & MOVE EVALUATION TO CHAPTER XI

14 Add "or later versions" and "including authorized relief requests"

37

20

Edition 22

23 (viii)

Subsection IWL Examination Category L-A

15

24

Maintenance rule structural monitoring program (10CFR50.65) [Add here and in E&TB Column]

25

16

17 Visual examination would identify loss of material and cracking of concrete components

The frequency of inspections is specificied in IWL-2400. Concrete inspections are performed in accordance with examination category L-A

18

II. CONTAINMENT STRUCTURES

A. PWR Containments

A1. Concrete Containments (Reinforced and Prestressed)

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

II. CONTAINMENT STRUCTURES

A. PWR Containments

A1. Concrete Containments (Reinforced and Prestressed)

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
	inverted U) for each inspection period. The required minimum number of each tendon type selected for inspection varies from 2 to 4 percent. Regarding the extent, all concrete surfaces receive a visual VT-3C examination. Selected areas, such as those that indicate suspect conditions and areas surrounding tendon anchorages receive a more rigorous VT-1 or VT-1C examination. ***(5) Monitoring and Trending:*** With the exception of inaccessible areas, all concrete surfaces are monitored by virtue of the examination requirements on a regular basis as described above. Trending of prestressing force in tendons is required for prestressed containments. In addition to the random sampling used for tendon examination, one tendon of each type is selected from the first year inspection sample and designated as a common tendon. Each common tendon is then examined during each inspection. This provides monitoring and trending information over the life of the plant. 10 CFR 50.55a and IWL also require that prestressing forces in all inspection sample tendons be measured by lift-off tests and compared to acceptance standards based on the predicted force for that type of tendon over its life. ***(6) Acceptance Criteria:*** IWL-3000 provides acceptance criteria for concrete containments. For concrete surfaces, the acceptance criteria rely on the determination of the Responsible Engineer whether there is any evidence of damage or degradation sufficient to warrant further evaluation or repair. Although the acceptance criteria are qualitative, guidance is provided in IWL-2510, which references ACI 201.1R-~~68~~ for identification of concrete degradation. In addition, IWL-2320 requires the Responsible Engineer to be a registered professional engineer experienced in evaluating the inservice condition of structural concrete and knowledgeable of the design and construction codes and other criteria used in design and construction of concrete containments. Alternate acceptance criteria based on ACI 349.3R is also acceptable. The acceptance standards for the unbonded post-tensioning system is quantitative in nature. For the post-tensioning system, quantitative acceptance criteria are given for tendon force, tendon wire or strand samples, and corrosion protection medium. ***(7) Corrective Actions:*** IWL specifies that items with examination results which do not meet the acceptance standards shall be evaluated to IWL-3300 "Evaluation." Items which do not meet the acceptance standards are to be evaluated by the Owner. The Owner is responsible for preparation of an Engineering Evaluation Report. The report should include an evaluation whether the concrete containment is acceptable without repair of the item and if repair is required, the extent, method, and completion date for the repair or replacement. Also included in the report is the cause of the condition and the extent, nature, and frequency of additional examinations. IWL also provides repair procedures to follow in Article IWL-4000. This includes requirements for the concrete repair, repair of reinforcing steel, repair of the post-tensioning system, and examination of the repaired area.	92 → CMT 29

19 MAKE CHANGES & MOVE TO CHAPTER XI

II. CONTAINMENT STRUCTURES

A. PWR Containments

A1. Concrete Containments (Reinforced and Prestressed)

Item	Structure/ Component	Region of Interest	Material	Environment	Aging Effect	Aging Mechanism	References
A1.1	Concrete Elements	Dome, Wall, Basemat, Ring Girder, Buttresses	Concrete	~~Inside and/or Outside Containment~~ Concrete below grade (32)	Increase in Porosity, Permeability; Scaling, Cracking, Spalling	Leaching of Calcium Hydroxide; Aggressive Chemical Attack	*Same as A1.1, Freeze/Thaw Aging Mechanism*

II. CONTAINMENT STRUCTURES

A. PWR Containments

A1. Concrete Containments (Reinforced and Prestressed)

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
	(8) Confirmation Process: When areas of degradation are identified, an evaluation is performed to determine if repair or replacement is necessary. As part of this evaluation, IWL-3300 requires the Engineering Evaluation Report include the extent, nature, and frequency of additional examinations. ~~When significant repairs or modifications are made, additional confirmation is achieved through pressure tests required by IWL and 10 CFR 50, Appendix J.~~ ~~***(9) Administrative Controls:***~~ An approved site QA Program would be applicable to IWL. IWA-1400 provides requirements for Owner's Responsibility. This includes responsibility for preparation of plans, schedules, and inservice inspection summary reports, and submittal of these plans and reports to the enforcement and regulatory authorities having jurisdiction at the plant site. Owner is also responsible for the preparation of written examination instructions and procedures, verification of qualification level of personnel who perform the examinations, and documentation of a Quality Assurance Program. IWA-6000 specifically covers the requirements for the preparation, submittal, and retention of records and reports. ***(10) Operating Experience:*** ASME Section XI, Subsection IWL was specifically developed to identify aging degradation of containment concrete components. Since ASME Section XI, Subsection IWL was only recently adopted by 10CFR50.55a, long term experience in managing aging of containment concrete components needs to be established. The license renewal applicant should provide plant-specific operating experience related to inservice inspection of containment and occurrences of degradation.	
~~*Same as A1.1, Freeze/Thaw Aging Mechanism*~~ ~~NUREG-1611 identifies 10CFR50.55a/IWL for managing the aging effects of aggressive chemical attack and leaching of calcium hydroxide, except for inaccessible areas when there are no indications of degradation for accessible areas.~~	~~*Same as A1.1, Freeze/Thaw Aging Mechanism, except inaccessible areas must be addressed.*~~	~~Yes. NUREG-1611 specifies aging management of inaccessible areas for aggressive chemical attack of concrete surfaces exposed to ground water and for leaching of calcium hydroxide in concrete subject to flowing water. The appliant's aging management program to address this issue must be evaluated.~~

II. CONTAINMENT STRUCTURES

A. PWR Containments

A1. Concrete Containments (Reinforced and Prestressed)

Item	Structure/ Component	Region of Interest	Material	Environment	Aging Effect	Aging Mechanism	References
A1.1	Concrete Elements	Dome, Wall, Basemat, Ring Girders, Buttresses	Concrete	Inside and/or Outside Containment	Expansion & Cracking	Reaction with Aggregates	*Same as A1.1, Freeze/Thaw Aging Mechanism*
A1.1	Concrete Elements	Dome, Wall, Basemat; Ring Girders, Buttresses, and Reinforcing Steel	Concrete; Carbon Steel	Inside and/or Outside Containment	Cracking, Spalling, Loss of Bond, and Loss of Material	Corrosion of Embedded Steel	*Same as A1.1, Freeze/Thaw Aging Mechanism* EPRI TR-103842 38

II. CONTAINMENT STRUCTURES

A. PWR Containments

A1. Concrete Containments (Reinforced and Prestressed)

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
~~Same as A1.1, Freeze/Thaw Aging Mechanism~~ ~~NUREG-1611 identifies 10CFR50.55a/IWL for managing the effects of reaction with aggregates, and resolves staff's concern about delayed occurrences.~~ ASME Section XI, Subsection IWL,	~~Same as A1.1, Freeze/Thaw Aging Mechanism~~ NUREG-1611 identifies 10CFR50.55a/IWL for managing the effects of reaction with aggregates and resolves NRC staff concerns about delayed occurrences. 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.
~~Same as A1.1, Freeze/Thaw Aging Mechanism~~ ~~NUREG-1611 identifies 10CFR50.55a/IWL for managing the effects of corrosion of embedded steel, except for inaccessible areas when there are no indications of degradation for accessible areas.~~ ASME Section XI, Subsection IWL	~~Same as A1.1, Freeze/Thaw Aging Mechanism, except inaccessible areas must be addressed.~~ NUREG-1611 identifies 10CFR50.55a/IWL for managing the effects of corrosion of embeded steel. Per NUREG-1557, corrosion of embedded steel is non-significant for exterior above grade and interior if not exposed to aggressive environment (sulfates > 1500 ppm, pH < 5.5, or chlorides > 500 ppm) with oxygen available, or if exposed to aggressive environment for an extended period of time, the concrete has low water-to-cement ratio of 0.35-0.45), adequate air entrainment (3-6%), low permability, and designed in accordance with ACI 318-63 or ACI 349-85	~~Yes.~~ ~~NUREG-1611 specifies aging management of inaccessible areas for corrosion of embedded steel exposed to an aggressive environment. The applicant's aging management program to address this issue must be evaluated.~~ No

II. CONTAINMENT STRUCTURES

A. PWR Containments

A1. Concrete Containments (Reinforced and Prestressed)

Item	Structure/ Component	Region of Interest	Material	Environment	Aging Effect	Aging Mechanism	References
A1.1	Concrete Elements	~~Containment Structure and Basemat~~ Dome wall and basemat (43)	Concrete	Inside and/or Outside Containment	Cracks; Distortion; Increase in Component Stress Level	Settlement	NUREG-1611 ACI 349.3R-96
A1.1	Concrete Elements	Dome, Wall, Basemat, Ring Girder, Buttresses	Concrete	Inside and/or Outside Containment	Loss of Strength and Modulus, Change in Poisson's Ratio	Elevated Temperature (>150 °F general; >200 °F local)	NUREG-1611

II. CONTAINMENT STRUCTURES

A. PWR Containments

A1. Concrete Containments (Reinforced and Prestressed)

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
~~No mandated Aging Management Program exists. NUREG-1611 identifies the need for a settlement monitoring program, if the prerequisite conditions exist. ACI 349.3R-96 provides guidance for addressing settlement.~~ ASME Section XI, Subsection IWL (44)	~~Settlement is not addressed by 10 CFR 50.55a or IWL. NUREG-1611 specifies that a settlement monitoring program is needed for a containment structure/basemat resting on soil or piles, or if the site experiences significant changes in ground water conditions.~~ See Chapter XI for an evaluation of ASME Section XI, Subsection IWL (46)	~~Yes.~~ ~~If applicable, the applicant's aging management program to address this issue must be evaluated.~~ No
No mandated Aging Management Program exists. NUREG-1611 identifies the need for plant-specific evaluation, if the prerequisite conditions exist.	The implementation of 10 CFR 50.55a and IWL would not be able to identify the loss of strength and modulus due to elevated temperature. Thus, for any portions of concrete containment that exceed specified temperature limits, further evaluations are warranted. NUREG-1611 specifies the temperature limits, both general (150 °F) and local (200 °F), above which a plant-specific evaluation is needed. As referenced in this Section (48)	Yes. If applicable, the applicant's aging management program to address this issue must be evaluated.

II. CONTAINMENT STRUCTURES

A. PWR Containments

A1. Concrete Containments (Reinforced and Prestressed)

Item	Structure/ Component	Region of Interest	Material	Environment	Aging Effect	Aging Mechanism	References
A1.2	Steel Elements	Liner, Liner Anchors, Structural Steel as defined by IWE	Carbon Steel	Inside and/or Outside Containment	Loss of Material	Corrosion	10CFR50.55a ASME Section XI, Subsection IWE 10CFR50, Appendix J NUREG-1611 ~~NRC IN 97-10~~ → 50 ~~Draft Regulatory Guide DG-1076~~ → 51

MOVE TO CHAPTER XI EVALUATION OF IWE

MAKE CHANGES & MOVE TO CHAPTER XI.

II. CONTAINMENT STRUCTURES

A. PWR Containments

A1. Concrete Containments (Reinforced and Prestressed)

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
10CFR50.55a imposes the examination requirements of ASME B&PV Code Section XI on reinforced and prestressed concrete containments. Examination requirements of ASME Class MC pressure retaining components, metallic shell/liners of Class CC containments, integral attachments, seals and gaskets, pressure retaining bolting, and surface areas including welds are covered in Subsection IWE. Therefore, ASME Code Section XI, Subsection IWE (1992 Edition with 1992 Addenda), along with additional requirements specified in 10CFR50.55a(b)(2), constitute an existing mandated program which should be referenced by the applicant's containment inservice inspection program for managing aging of steel containments and liners of concrete containments for license renewal. NUREG-1611 identifies ~~10CFR50.55a/IWE for managing the effects of corrosion, except for inaccessible areas when there are no indications of degradation for accessible areas.~~ ~~GN 97-10 identifies specific locations where concrete containments are susceptible to liner plate corrosion. Applicants should consider these and review plant-specific operating experience to determine applicability.~~	Per NUREG-1611, an application for License Renewal should reference ASME Code Section XI, Subsection IWE and associated modifications/additions specified in 10 CFR50.55a for managing aging of containment steel elements. ~~In addition, an applicant should describe and justify its approach to managing the aging effect of corrosion for inaccessible areas, when there are no indications of degradation for accessible areas.~~ Evaluation of 10CFR50.55a/IWE against the ten (10) criteria for an acceptable aging management program is presented below. An applicant should ensure that its implementation of 10CFR50.55a/IWE for containment steel elements is consistent with this evaluation. ~~Any relief from the requirements of IWE(1992 Edition with 1992 Addenda) which may have been granted prior to the LR Application should be identified in the application; they will be evaluated for their significance to License Renewal.~~ ***(1) Scope of Program:*** Subsection IWE-1000 specifies the components within the scope of IWE (1992 with 1992 Addenda) for steel containments and liners of concrete containments. The components within the scope of IWE are Class MC pressure retaining components (steel containments) and their integral attachments; metallic shell and penetration liners of Class CC containments and their integral attachments; containment seals and gaskets; containment pressure retaining bolting; and surface areas, including welds and base metal. The concrete portions of containment are in accordance with IWL. IWE exempts from examination (1) components that are outside the boundaries of the containment as defined in the Design Specifications; (2) embedded or inaccessible portions of containment components that met the requirements of the original Construction Code; (3) components that become embedded or inaccessible as a result of vessel repair or replacement if IWE-1232 and IWE-5220 are met; and (4) piping, pumps, and valves that are part of the containment system, or which penetrate or are attached to the containment vessel (governed by IWB or IWC). 10 CFR 50.55a(b)(2)(x) specifies additional requirements, one of which covers inaccessible areas. It states that the licensee shall evaluate the acceptability of inaccessible areas when conditions exist in accessible areas that could indicate the presence of or result in degradation to such inaccessible areas. ~~Examination requirements for containment supports are not within the scope of IWE.~~ ***(2) Preventive Action:*** No preventive actions are specified; IWE is a monitoring program. ~~An effective method of aging management is through monitoring and maintenance of protective coatings which inhibit degradation.~~ Draft Regulatory Guide DG-1076 provides an acceptable basis for such a program. ***(3) Parameters Monitored or Inspected:*** Table IWE-2500-1 specifies six categories for examination. Cat. E-A — Parts Examined: Containment ~~Vessel~~ Surface — Examination Method: General Visual, Visual VT-3	Yes. ~~NUREG-~~1611 specifies that aging management is necessary for potential corrosion of inaccessible areas of steel liners, steel containment shells, and common steel components when conditions in accessible areas may not indicate the presence of or result in degradation to such inaccessible areas. The applicant's aging management program to address this issue must be evaluated. ~~Relief from~~ the requirements of IWE (1992 Edition with 1992 Addenda) must be evaluated to determine their significance to license ~~renewal~~.

Change to: 10CFR50.55a(b)(2)(ix)

Table 2500-1 references the applicable section in 3500 which identifies the aging effects which are evaluated.

II. CONTAINMENT STRUCTURES

A. PWR Containments

A1. Concrete Containments (Reinforced and Prestressed)

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

II. CONTAINMENT STRUCTURES

A. PWR Containments

A1. Concrete Containments (Reinforced and Prestressed)

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

Cat.	Parts Examined	Examination Method**
E-B*	~~Containment~~ ~~Penetration~~	Visual VT-1
E-C	Containment Surfaces Requiring Augmented Examination	Visual VT-1, Volumetric
E-D	Seals, Gaskets, and Moisture Barriers	Visual VT-3
E-F*	Pressure Retaining Dissimilar Metal Welds	Surface
E-G	Pressure Retaining Bolting	Visual VT-1, Bolt torque or tension test
E-P	All Pressure Retaining Components (Pressure boundary, penetration bellows, airlocks, seals and gaskets)	10 CFR 50, Appendix J (Containment Leak Rate Testing)

* ~~These~~ two categories are optional per 10 CFR 50.55a(b)(2)~~(ix)~~(C).

** The applicable examination method (where multiple methods are listed) depends on the particular subcategory within each category.

(4) Detection of Aging Effects: ~~Examination requirements specified in 10 CFR 50.55a and IWE ensure that aging effects would be detected before~~ they ~~would compromise the design basis requirements because of the frequency and extent of examination.~~ Under IWE, inservice examinations and pressure tests must be performed in accordance with one of two Inspection Programs A or B on a specified schedule. ~~Under Inspection~~ Program A there are four inspection intervals (at 3, 10, ~~27,~~ and 40 years) for which a 100% of the required examinations must be completed. Within each interval there are various inspection periods for which a certain percentage of the examinations must be performed to reach 100% at the end of that interval. In addition, a general visual examination is performed once each inpection period. After 40 years of operation, any future examinations must be performed in accordance with the Inspection Program B. Under Inspection Program B there is an initial interval of ~~10~~ years and successive intervals of 10 years each, during which 100% of the required examinations must be completed. Regarding the extent of examination, all accessible surfaces receive a visual examination. Selected areas, such as containment surfaces requiring augmented examination (E-C) require volumetric examination. ~~All pressure retaining components (E-P) require system leakage test in accordance with 10 CFR 50, Appendix J.~~

(5) Monitoring and Trending: With the exception of inaccessible areas, all surfaces are monitored by virtue of the examination requirements on a scheduled basis as described above. ~~When component examination results require evaluation of flaws, areas of degradation, or repairs and the component is found to be acceptable for continued service, the areas containing such flaws, degradation, or repairs shall be reexamined during the next inspection period, in accordance with Examination~~

II. CONTAINMENT STRUCTURES

A. PWR Containments

A1. Concrete Containments (Reinforced and Prestressed)

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

II. CONTAINMENT STRUCTURES

A. PWR Containments

A1. Concrete Containments (Reinforced and Prestressed)

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

19 MAKE CHANGES & MOVE TO CHAPTER F1

Insert two sentences from Comment # 69

68

72

73

visual examinations

corrective action

73 A

Delete and insert wording in Comment # 70

II. CONTAINMENT STRUCTURES

A. PWR Containments

A1. Concrete Containments (Reinforced and Prestressed)

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

MAKE CHANGES & MOVE TO CHAPTER XI. 19

II. CONTAINMENT STRUCTURES

A. PWR Containments

A1. Concrete Containments (Reinforced and Prestressed)

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
	(Additional confirmation of leak tightness is achieved through the pressure tests required by 10 CFR 50, Appendix J.) ***(9) Administrative Controls:*** An approved site QA Program would be applicable to IWE. IWA-1400 provides requirements for Owner's Responsibility. This includes responsibility for preparation of plans, schedules, and inservice inspection summary reports, and submittal of these plans and reports to the enforcement and regulatory authorities having jurisdiction at the plant site. Owner is also responsible for the preparation of written examination instructions and procedures, verification of qualification level of personnel who perform the examinations, and documentation of a Quality Assurance Program. IWA-6000 specifically covers the requirements for the preparation, submittal, and retention of records and reports. ***(10) Operating Experience:*** ASME Section XI, Subsection IWE was specifically developed to identify aging degradation of containment steel components. Since ASME Section XI, Subsection IWE was only recently adopted by 10CFR50.55a, long term experience in managing aging of containment components needs to be established. The license renewal applicant should provide plant-specific operating experience related to inservice inspection of containment and occurrences of degradation. Insert text from Comment 74	
~~10CFR50, Appendix J (Containment Leak Rate Tests)~~ ~~A containment leak rate test (LRT)~~ program in accordance with 10 CFR 50, Appendix J is required during the extended period of operation to ensure that (1) leakage does not exceed allowable leakage rate values as specified in the technical specifications and (2) periodic surveillance of reactor containment penetrations and isolation valves is performed so that proper maintenance and repairs are made during the service life.	~~Currently there are two options, Option A and Option B,~~ either of which can be chosen to meet the requirements of a containment LRT program. Under Option A, all of the testing must be performed on a periodic interval. Option B is a performance-based approach which eliminates the prescriptive requirements that are marginal to safety. Some of the differences between these options are discussed below and more detailed information for Option B is provided in NRC Regulatory Guide 1.163 and NEI 94-01, Rev. 0. ***(1) Scope of Program:*** The scope of the containment LRT program must include all pressure retaining passive components. Two types of tests shall be implemented. Type A tests are performed to measure leakage rates through all potential leakage paths including containment welds, valves, fittings, and components which penetrate containment. Type B tests are performed to measure local leakage rates across each pressure containing or leakage limiting boundary for containment penetrations. Type A and Type B tests defined in 10 CFR 50, Appendix J are acceptable methods for performing these leak rate tests. Leakage testing for isolation valves (normally performed under Type C tests), if not included under this program, should be included under leakage rate test programs for systems containing the isolation valves. ***(2) Preventive Actions:*** Since the containment LRT program is a monitoring program, no preventive actions are needed. ***(3) Parameters Monitored:*** The parameters to be monitored are leakage rates through containment liner/welds, penetrations, fittings, and other access openings.	No

Delete reference to Appendix J

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II. CONTAINMENT STRUCTURES

A. PWR Containments

A1. Concrete Containments (Reinforced and Prestressed)

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

II. CONTAINMENT STRUCTURES

A. PWR Containments

A1. Concrete Containments (Reinforced and Prestressed)

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

II. CONTAINMENT STRUCTURES

A. PWR Containments

A1. Concrete Containments (Reinforced and Prestressed)

Item	Subsystem	Component	Material	Environment	Aging Effect	Aging Mechanism	References
							~~Draft Regulatory Guide DG-1076~~ ~~GL 98-04~~ ~~ASTM D5163-96~~ 77

II. CONTAINMENT STRUCTURES

A. PWR Containments

A1. Concrete Containments (Reinforced and Prestressed)

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

II. CONTAINMENT STRUCTURES

A. PWR Containments

A1. Concrete Containments (Reinforced and Prestressed)

Item	Structure/ Component	Region of Interest	Material	Environment	Aging Effect	Aging Mechanism	References
A1.2	Steel Elements	Liner	Carbon Steel	Inside and/or Outside Containment	Crack Initiation and Growth	Stress Corrosion Cracking	*Same as A1.2, Corrosion Aging Mechanism*
A1.3	Prestressing System	Tendons and Anchorage Components	Carbon Steel	Inside and/or Outside Containment	Loss of Material	Corrosion of Tendons/ Anchorage Components	*Same as A1.1, Freeze/Thaw Aging Mechanism* ~~NUREG-1522~~ IN 99-10

II. CONTAINMENT STRUCTURES

A. PWR Containments

A1. Concrete Containments (Reinforced and Prestressed)

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
~~*Same as A1.2, Corrosion Aging Mechanism*~~ NUREG-1611 identifies stress corrosion cracking of the steel liner as non-significant. 81 No program is required	This aging effect is not significant for the liner itself. See Item A3.1.	No.
~~*Same as A1.1, Freeze/Thaw Aging Mechanism*~~ Note: 10CFR50.55a and IWL do not apply to bonded post-tensioning systems. NUREG-1611 identifies 10CFR50.55a/IWL for managing tendon and anchor corrosion. 82 ~~NUREG-1801~~ IN 99-10 describe conditions in tendon access galleries conducive to corrosion of tendon anchorage components ASME Section XI, Subsection IWL 44	*Same as A1.1, Freeze/Thaw Aging Mechanism* ~~Managing the condition and environment in the tendon access gallery (e.g., moisture and humidity) is a prudent way to manage the degradation (i.e., corrosion) of bearing plates and other vertical tendon anchorage components~~ 83	No. ~~Yes. Plant-specific consideration of the tendon access gallery should be evaluated.~~

II. CONTAINMENT STRUCTURES

A. PWR Containments

A1. Concrete Containments (Reinforced and Prestressed)

Item	Subsystem	Component	Material	Environment	Aging Effect	Aging Mechanism	References
A1.3	Prestressing System	Tendons and Anchorage Components	Carbon Steel	Inside and/or Outside Containment	Loss of Prestress	Relaxation; Shrinkage; Creep; Elevated Temperature	10CFR50.55a ASME Section XI, Subsection IWL NUREG-1611 10CFR54 Regulatory Guide 1.35.1 ~~IN 99-10~~ → 84 ACI 318-85 → 85

II. CONTAINMENT STRUCTURES

A. PWR Containments

A1. Concrete Containments (Reinforced and Prestressed)

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
~~Codes and Standards (10CFR50.55a);~~ ASME Section XI, Subsection IWL Note: 10CFR50.55a and IWL do not apply to bonded post-tensioning systems. NUREG-1611 identifies both 10CFR50.55a/IWL and TLAA to manage loss of prestress	~~Previous evaluation of 10 CFR 50.55a;~~ IWL is augmented as follows: ***(5) Monitoring and Trending:*** 10 CFR 50.55a and IWL do not provide guidance on how to calculate expected tendon prestressing forces that are needed to compare against the measured tendon lift-off forces. This guidance is provided in NRC Regulatory Guide 1.35.1.	No, Provided Regulatory Guide 1.35.1 is followed. Otherwise plant-specific evaluation is necessary. ~~Yes.~~ ~~Methodology for TLAA must be evaluated.~~
~~Tendon Surveillance Program requires TLAA.~~ Tendon loss of Prestress Is A TLAA 86	~~To ensure that the structural and functional adequacy of the containment are maintained, a TLAA for the tendon prestressing forces is needed for the extended period of operation. A TLAA for the containment prestressing system which meets 10CFR54.21(c)(1)(ii) should have the following basic attributes:~~ 1. Calculation of the minimum required prestressing force value (MRV) for each tendon group. 87 Insert new paragraph 2. Calculated predicted lower limit (PLL) prestressing force for each group of tendons (See NRC R.G. 1.35.1). During each inspection, the measured prestressing forces in the sampled tendons are compared against the PLL. ~~As discussed in IN 99-10, the trend lines shall be developed using a regression analysis considering individual tendon lift-off forces rather than the average lift-off forces for each group of tendons.~~ 88 3. The PLL developed for the 40 year period of operation shall be extended to 60 years. The applicant has to demonstrate that the trend of the measured prestressing forces during the extended period remain above the PLL for each tendon group. If this can not be achieved, then a systematic plan of retensioning selected tendons should be developed which would result in the trend lines remaining above the PLL or a reanalysis of the containment demonstrating design adequacy is needed. If the approach described above is not feasible due to the lack of available tendon lift-off force data needed to develop trend lines, then a TLAA for containment prestressing forces performed in accordance with 10 CFR 54.21(c)(1)(iii) is acceptable. In this case, the TLAA must satisfy the ten (10) criteria for an acceptable aging management program and must specifically include the following: ***(3)Parameters Monitored:*** The parameters to be monitored are the prestressing forces in accordance with requirements specified in Subsection IWL of Section XI of the ASME Code as incorporated by reference in 10 CFR 50.55a. ***(5) Monitoring and Trending:*** The prestressing forces shall be plotted against time and trending lines developed for the period of extended operation. ***(6) Acceptance Criteria:*** The prestressing force trend lines must be shown to be above the ~~prescribed~~ lower limit (PLL) lines. 90 predicted	

The Chapter XI evaluation of ASME Section XI, Subsecti

or MRV as appropriate

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MOVE ALL TO NEW TLAA CHAPTER

II. CONTAINMENT STRUCTURES

A. PWR Containments

A1. Concrete Containments (Reinforced and Prestressed)

Item	Subsystem	Component	Material	Environment	Aging Effect	Aging Mechanism	References

II. CONTAINMENT STRUCTURES

A. PWR Containments

A1. Concrete Containments (Reinforced and Prestressed)

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

91 reword as noted in comment.

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GALL REPORT-CIVIL/STRUCTURAL COMMENTS
Section IIA1

Comment Number	GALL Section	ITEM NO.	Page	COMMENT
1	IIA1	IIA1	I1A1-3	The references to interfaces should be revised as noted to match the GALL Table of Contents
8	IIA1	A1.1	IIA1-4	The environment should only include "Outside Containment" for freeze-thaw. BASIS: Freeze-thaw is only applicable for those components exposed to the external environment.
9	IIA1	A1.1	IIA1-4	Aging Effects should be loss of material and cracking
10	IIA1	A1.1	IIA1-4	In the Reference column delete the reference to Draft Reg. Guide DG-1076. BASIS: Draft Reg Guide DG-1076 is not directly applicable for concrete freeze-thaw considerations
12	IIA1	A1.1	IIA1-4	Delete ACI 349.3 in the References column. BASIS: ACI 349.3 has not been credited with managing aging of concrete and may be more restrictive than IWL requirements. It is not necessary for it to be included in the references since it is discussed under element #6.
13	IIA1	A1.1	IIA1-4	In addition to ASME XI, IWL, licensees should be able to credit the Maintenance Rule 10CFR50.65, Regulatory Guide 1.160 Rev.2., and NUMARC 93-01. BASIS: These programs are particularly effective for structures and supports, which are not currently under the scope of ASME XI-IWL. The structural monitoring programs developed under MR have been mandated since 1996 and therefore provide operating experience and effectiveness demonstration. NEI submitted a paper regarding structural monitoring programs to NRC, with a request to declare the structural monitoring program an effective aging management program for structures on a generic basis. The effectiveness criteria review is part of the NEI submittal to NRC
14	IIA1	A1.1	IIA1-5	Revise sentence to allow credit for later editions of the code. BASIS: Latest Rule now allows use of IWL 1995 Edition with 1996 Addenda. Additionally, several utilities have submitted and received Relief Requests for use of the 1998 Edition with 1998 Addenda.
15	IIA1	A1.1	IIA1-5	Existing Aging Management Program column , the second paragraph should say "NUREG-1611 identifies Subsection IWL Examination Category L-A" Also, this should be moved to the Evaluation and Technical Basis column. BASIS: Provides clarification
16	IIA1	A1.1	IIA1-5	Include reference to structural monitoring program under the maintenance rule. BASIS: The structural monitoring program under the maintenance rule is an aging management program for concrete containments
17	IIA1	A1.1	IIA1-5	Add sentence: Visual examination would identify loss of material and cracking of concrete components BASIS: Parameters monitored or inspected should be directly linked to the aging effect such as loss of material and cracking.
18	IIA1	A1.1	IIA1-5	Add the following sentence: The frequency of inspection is specified in IWL-2400.

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Section IIA1

Comment Number	GALL Section	ITEM NO.	Page	COMMENT
				Concrete inspections are performed in accordance with Examination Category L-A, Concrete. BASIS: Ties directly to code.
19	GENERIC			Move discussions and evaluations of the Aging Management Programs to New Gall Chapter XI.
20	IIA1	A1.1	IIA1-5	Editorial. For consistency "attributes" should be used when discussing elements of an aging management program.
22	IIA1	A1.1	IIA1-5	Editorial change – add the word "edition"
23	IIA1	A1.1	IIA1-5	Editorial change – reference should be 50.55a(b)(2)(viii).
24	IIA1	A1.1	IIA1-5	Delete the sentence: "Examination requirements for containment supports are not within the scope of IWL."
25	IIA1	A1.1	IIA1-5	Delete sentence referencing draft Regulatory Guide DG-1076 BASIS: Draft Regulatory Guide DG-1076 (Service Level I, II and III Protective Coatings, proposed revision 1 to R.G 1.54) is not applicable to US power plants and not within the CLB of any plant. Some plants may have implemented portions of R.G. 1.54, however, this applies only to the containment interior, while the evaluated mechanism of freeze/thaw only acts on the exterior. Criteria 2 of the effectiveness evaluation refers to DG-1076 as an effective aging management program for coating maintenance, though no experience or demonstration exists to support this (especially on the exterior containment surfaces subjected to freeze/thaw).
29	IIA1	A1.1	IIA1-7	Recommend changing the ACI reference to ACI 201.1R-92 which is more readily available. BASIS: IWL-2310 (b) does not mandate the use of ACI 201.1R-68, rather suggests its use. The later code is more comprehensive
32	IIA1	A1.1	IIA1-8	Delete the wording in the "environment" column and replace with "Concrete below grade." BASIS: Only concrete exterior surfaces exposed to flowing groundwater are subject to leaching of calcium hydroxide and subsequent attack by aggressive groundwater
33	IIA1	A1.1	IIA1-9	Incorporate the following paragraph: The IWL inspections are comparable to the concrete inspections performed in accordance with 10 CFR 50 Appendix J. NUREG-1540 states that inspections mandated by Appendix J to 10 CFR Part 50, though basically visual, have been reasonably effective in identifying containment problems to date. Therefore, previous Appendix J inspections provide additional verification that a visual inspection of containment concrete is effective. BASIS: The comparable visual examination provides operating experience that can be used for IWL
34	IIA1	A1.1	IIA1-9	Delete the last sentence that deals with Appendix J.

GALL REPORT-CIVIL/STRUCTURAL COMMENTS
Section IIA1

Comment Number	GALL Section	ITEM NO.	Page	COMMENT
				BASIS: The Appendix J test is not needed to confirm the adequacy of the concrete
35	IIA1	A1.1	IIA1-9	Only program titles need to be identified in the Existing Aging Management Program (AMP) column. Move the detailed information to the Evaluation and Technical Basis column
36	IIA1	A1.1	IIA1-9	Include ASME Section XI, Subsection IWL in the Existing Aging Management Program column
37	IIA1	A1.1	IIA1-5 IIA1-9	The "Aging Management Program," "Evaluation," and "Further Evaluation" columns imply that there are additional requirements for inservice inspection of inaccessible areas when there are no indications of degradation for (adjacent, nearby) accessible areas. These implications should be removed. BASIS: Implying such requirements is tantamount to additional rulemaking over and above 10 CFR 50.55a without adhering to the rulemaking process This same comment applies to other portions of the report related to inservice inspection of inaccessible areas.
38	IIA1	A1.1	IIA1-10	Add a reference to EPRI TR-103842. BASIS: 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.
39	IIA1	A1.1	IIA1-11	Only program titles need to be identified in the Existing Aging Management Program (AMP) column. Move the detailed information to the Evaluation and Technical Basis column.
40	IIA1	A1.1	IIA1-11	Include ASME Section XI, Subsection IWL in the Evaluation and Technical Basis column. Add paragraph from III A1-8 on reaction with aggregates. BASIS: Provides more complete information.
41	IIA1	A1.1	IIA1-11	Only program titles need to be identified in the Existing Aging Management Program (AMP) column. Move the detailed information to the Evaluation and Technical Basis column
42	IIA1	A1.1	IIA1-11	Include ASME Section XI, Subsection IWL in the Existing Aging Management Program column. BASIS: To be consistent with other sections
43	IIA1	A1.1	IIA1-12	Change the Region of Interest to Dome, Wall, and Basemat. BASIS: To be consistent with other sections
44	IIA1	A1.1	IIA1-13	IWL should be identified as the Existing Aging Management Program. BASIS: IWL is implemented to address cracking. Cracking is the effect of settlement. Therefore, IWL would address cracking due to settlement.
46	IIA1	A1.1	IIA1-13	Evaluation and Technical Basis: ASME Section XI, Subsection IWL would manage cracking, which is the applicable aging effect of settlement on concrete structures. In

GALL REPORT-CIVIL/STRUCTURAL COMMENTS
Section IIA1

Comment Number	GALL Section	ITEM NO.	Page	COMMENT
				addition, for plants with concrete containment structures/basemats founded on soft soil or piles, any plant settlement monitoring program that is an element of the existing licensing basis for the plant should be continued through the license renewal term. ACI 349.3R-96 provides guidance for addressing settlement. Therefore, the Evaluation and Technical Basis column should reference ASME Section XI, Subsection IWL.
47	IIA1	A1.1	IIA1-13	Change further evaluation to NO. BASIS: For settlement, IWL is adequate to manage cracking which is the effect of settlement on structures
48	IIA1	A1.1	IIA1-13	Incorporate the phrase "as referenced in this section" in the Evaluation and Technical Basis column. BASIS: This wording clarifies that it is only the items mentioned in the Region of Interest column that are evaluated
49	IIA1	A1.1	IIA1-14	Clarified the region of interest specific to scope of IWE
50	IIA1	A1.1	IIA1-14	Delete reference to IN 97-10. BASIS: See Comment # 53 below
51	IIA1	A1.1	IIA1-14	See Comment # 10 above
52	IIA1	A1.1	IIA1-15	Move information on NUREG-1611 to the Evaluation and Technical Basis column. BASIS: This column should only identify the program name.
53	IIA1	A1.1	IIA1-15	Delete IN 97-10. BASIS: GALL report states that IN 97-10 identifies specific locations where concrete containments are susceptible to liner plate corrosion. These are areas identified in IWE, Section 1241, as suspect areas requiring augmented examination and are inspected under IWE inspection program, hence no additional inspection required for these areas. In addition IN 97-10 states that concrete containment liner plate inspection in accordance with the 10 CFR 50.55a requirements involves consideration of the potential corrosion areas
54	IIA1	A1.1	IIA1-15	For attribute (3) Parameters Monitored or Inspected, there should be a tie directly to the aging effect (loss of material). The area is to be inspected for evidence of corrosion as specified in IWE-3510. Add the following text to intro: "Table IWE-2500-1 specifies six categories for examination. Table 2500-1 references the applicable section in 3500 which identifies the aging effects which are evaluated."
56	IIA1	A1.1	IIA1-15	Evaluation and Technical Basis column, second paragraph. Delete the information on relief requests. BASIS: Evaluation of relief requests are not required per the rule
57	IIA1	A1.1	IIA1-15	50.55a is the incorrect reference for inaccessible areas. BASIS: Additional requirements for inaccessible areas are identified in 50.55a(b)(2)(ix).

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Section IIA1

Comment Number	GALL Section	ITEM NO.	Page	COMMENT
58	IIA1	A1.1	IIA1-15	For attribute (1) Scope, delete the last sentence that states that containment supports are not in the scope of IWE. BASIS: Containment supports are not within the list of components identified at the beginning of the section
59	IIA1	A1.1	IIA1-15	Delete the information in attribute (2) Preventive Action that deals with the protective coatings. BASIS: IWE is an acceptable aging management program for loss of material due to corrosion without the coatings program
60	IIA1	A1.1	IIA1-15	Under attribute (3) Parameters Monitored or Inspected, the parts examined for Category E-A should be changed to : E-A Containment surface
61	IIA1	A1.1	IIA1-15	In the Further Evaluation column, delete the information on relief requests. Basis: Evaluation of relief requests are not required per the rule.
62	IIA1	A1.1	IIA1-17	Under attribute (3) Parameters Monitored or Inspected, the parts examined for Category E-B should be changed to E-B Pressure Retaining Welds
63	IIA1	A1.1	IIA1-17	Under attribute (4) Detection of Aging Effects, change the lead in sentence to the following, "The frequency and the scope of examination are sufficient to ensure that aging effects would be detected before they would compromise the design basis requirements. " BASIS: Matches lead in for IWL on page II A1-5.
64	IIA1	A1.1	IIA1-17	The reference to 50.55a in attribute (3) Parameters Monitored and Inspected, should be changed to 50.55a(b)(2)(ix)(C).
65	IIA1	A1.1	IIA1-17	The four inspection intervals listed in attribute (4) Detection of Aging, should be changed to (at 3, 10, 23, and 40 years) BASIS: Code
66	IIA1	A1.1	IIA1-17	The evaluation and technical basis (Detection of Aging Effects) notes the first inservice inspection interval under Program B to be 10 years for IWE. The industry has taken the position that the first interval is 12 years long for IWE. BASIS: This came about due to the extended first period of five years. The first interval would be divided as follows. First period - five years, second period - 4 years, and third period - 3 years. The last two periods of the interval resume the normal Code duration. The NRC by rulemaking extended the first period of the first interval to five years vice the normal three. Subsequent intervals revert back to ten years. It should be also noted that the Code interval and interval dates for IWE are different than the IWB, IWC, and IWD interval and interval dates for most plants, if not all. The requirement to perform IWE inspections did not exist until September 9, 1996. This was the start of the first IWE period
67	IIA1	A1.1	IIA1-17	Attribute (4) Detection of Aging Effects, delete the information on pressure tests. If left, then need to provide reference to 10 CFR Appendix J for the frequency of the pressure tests. Most licensees are not performing pressure tests to the frequency stated

GALL REPORT-CIVIL/STRUCTURAL COMMENTS
Section IIA1

Comment Number	GALL Section	ITEM NO.	Page	COMMENT
				in IWE. BASIS: Discussing IWE not 10 CFR Appendix J.
68	IIA1	A1.1	IIA1-17	Attribute (5) Monitoring and Trending, delete the last sentence. BASIS: There is no requirement in the code to do what the sentence states.
69	IIA1	A1.1	IIA1-19	Under attribute (5) Monitoring and Trending insert the following sentences: Except as permitted by 10 CFR 50.55a(b)(2)(ix)(D), IWE requires that examinations performed during any one inspection that reveal flaws or areas of degradation exceeding the acceptance standards shall be extended to include an additional number of examinations within the same category approximately equal to the initial number of examinations. Also, except as permitted by 10 CFR 50.55a(b)(2)(ix)(D), when additional flaws or areas of degradation that exceed the acceptance standards are revealed, all of the remaining examinations within the same category must be performed for the inspection interval. BASIS: Wording reflects the exception permitted by 50.55a(b)(2)(ix)(D).
70	IIA1	A1.1	IIA1-19	Revise wording under attribute (6) to state: For containment steel shell or liner, material loss exceeding 10% of the nominal containment wall thickness, or material loss that is projected to exceed 10% of the nominal containment wall thickness prior to the next examination, shall be documented. Such areas shall be accepted by engineering evaluation or corrected by repair or replacement in accordance with IWE-3122. BASIS: IWE 3512.3 states: "...Containment vessel examinations that reveal material loss exceeding 10% of the nominal containment wall thickness, or material loss that is projected to exceed 10% of the nominal containment wall thickness prior to the next examination, shall be documented. Such areas shall be accepted by engineering evaluation or corrected by repair or replacement in accordance with IWE-3122." Interpretation of IWE-3512.3 is inconsistent with its requirement
71	IIA1	A1.1	IIA1-19	See Comment # 69
72	IIA1	A1.1	IIA1-19	Attribute (6) Acceptance criteria, delete the first sentence. Start the sentence at "Table IWE-3410-1 presents..." BASIS: The existing sentence does not identify everything covered by IWE
73	IIA1	A1.1	IIA1-19	Attribute (6) acceptance Criteria, revise the fourth sentence as follows: "Most of the acceptance standards rely upon visual examinations, an engineering evaluation or require corrective action." BASIS: Most of the acceptance standards rely on visual examinations
74	IIA1	A1.1	IIA1-21	Incorporate the following paragraph: Examinations performed in accordance with Appendix J to 10 CFR Part 50 (which is similar to the visual inspections of IWE) have provided operating experience which supports the reasonableness and effectiveness of IWE. BASIS: Comparable visual program provides operating experience.
75	IIA1	A1.1	IIA1-21	The discussion of Appendix J and Coatings Programs should be deleted.

GALL REPORT-CIVIL/STRUCTURAL COMMENTS
Section IIA1

Comment Number	GALL Section	ITEM NO.	Page	COMMENT
				BASIS: IWE is acceptable as a stand-alone program.
77	IIA1	A1.1	IIA1-24	The references to DG-1076, GL98-04 and ASTM D5163-96 should be deleted, as well as the discussion of the aging management program for protective coatings. The pertinent functions have been adequately addressed by ASME XI-IWE and the Structures Monitoring Program. The referenced program would be a new design basis requirement.
78	IIA1	A1.1	IIA1-25	Delete the information on the coatings program. BASIS: IWE is an acceptable aging management program for containment steel components
80	IIA1	A1.3	IIA1-26	NUREG-1522 is not a mandated program and should be deleted from the Reference column
81	IIA1	A1.2	IIA1-27	Reference only the program. Move the information regarding NUREG-1611 to the Evaluation and Technical Basis column. Delete reference to A1.2 and add "No Program is Required." Also, add "No Program is Required" to the Evaluation and Technical Basis column.
82	IIA1	A1.3	IIA1-27	Reference only the program. Move the information regarding NUREG-1611, NUREG 1522 and IN 99-10 to the Evaluation and Technical Basis column
83	IIA1	A1.3	IIA1-27	Delete the discussion in the Evaluation and Technical Basis column regarding the tendon gallery. BASIS: The environment of the tendon gallery is similar to the external dome environment. Both environments subject the tendon anchorage to moisture, humidity, etc. Therefore, the tendon gallery environment is not unique and should not be singled out. In addition, the tendon anchorage are protected from the moist, humid environment by the tendon caps and grease which is within the cap. The tendon anchorage are evaluated by IWE regardless of where they are located. Tendon anchorage within the tendon gallery would be evaluated by IWE.
84	IIA1	A1.3	IIA1-28	Delete the reference to IN 99-10. Basis: See Comment # 88
85	IIA1	A1.3	IIA1-28	The TLAA evaluation in the Evaluation and Technical Basis column is very prescriptive. Other methods such as ACI-318-95, may be more accurate, appropriate or current.
86	IIA1	A1.3	IIA1-29	Editorial change to reflect that Loss of Prestress is a TLAA.
87	IIA1	A1.3	IIA1-29	Insert the following paragraph: The guidance in reg. Guide 1.35 represents an acceptable method for demonstrating that the loss of prestress in tendons is adequately managed. There are other equivalent methods (such as ACI 318-95) which are acceptale. The guidance in Reg. Guide 1.35 has the following attributes which satisfy the TLAA requirements of 10 CFR 54.21©(1)(ii). The basic attributes are:
88	IIA1	A1.3	IIA1-29	In the discussion for attribute (5) Monitoring and Trending, delete the IN 99-10 information in item 2.

GALL REPORT-CIVIL/STRUCTURAL COMMENTS
Section IIA1

Comment Number	GALL Section	ITEM NO.	Page	COMMENT
				BASIS: Information notices are not requirements. The discussion in item 2 has the tone of the IN being a requirement. Note the word "shall" in the sentence
89	IIA1	A1.3	IIA1-29	Item (3) in the evaluation column discusses demonstrating that the trend (regression analysis) of measured prestressing forces remain above the PLL for the extended period, otherwise develop a retensioning plan. The discussion should recognize the alternative of demonstrating that the trend of measured prestressing forces remain above the minimum required prestressing force value (MRV), since there can be a large range of acceptable force values between the PLL and the MRV. For example, consider the realistic case where at year 60, PUL=625k, PLL=575k, Trend =570k, and MRV=525k. Suggested reword: change "...PLL..." to "...PLL or MRV as appropriate..." The same comment applies to Items (6) & (7) in the same column.
90	IIA1	A1.3	IIA1-29	Editorial. Two different words have been supplied for the "P" in "PLL" – predicted and prescribed. Whichever is used it should be consistent throughout the document.
91	IIA1	A1.3	IIA1-30	Attribute (7) should be rewritten as follows: "Where tendon forces fall below the acceptance standards, corrective actions may include retensioning, replacement of selected tendons with new tendons, or reanalysis." BASIS: Reg Guide 1.35 and IWL allow the prestressing force of a selected tendon to go below the PLL. If the measured force lies between 95% and 90% of the PLL, additional testing is required.
92	IIA1	A1.3	IIA1-30	Delete reference to IN 99-10 BASIS: Information Notices are not requirements

CHAPTER II

CONTAINMENT STRUCTURES

Major Containment Structures

A. Pressurized Water Reactor (PWR) Containments

B. Boiling Water Reactor (BWR) Containments

CHAPTER II A

PRESSURIZED WATER REACTOR (PWR) CONTAINMENTS

Major PWR Containments

A1. Concrete Containments (Reinforced and Prestressed)

A2. Steel Containments

A3. Common Components

A1. Concrete Containments (Reinforced and Prestressed)

A1.1 Concrete Elements
A1.2 Steel Elements
A1.3 Prestressing System

A1. Concrete Containments (Reinforced and Prestressed)

Systems, Structures, and Components

Review Table II A addresses the elements of PWR containment structures. Reinforced and prestressed concrete containments, steel containments, and common components are discussed separately under subheadings A1, A2, and A3, respectively. This format follows the presentation format in Section 3.3 of the draft Standard Review Plan for License Renewal (SRP-LR). Concrete containments in Review Table II A1 are divided into three elements: concrete, steel, and prestressing system.

System Interfaces

Functional interfaces include the primary containment HVAC system (VII.F3), containment isolation system(V.C), containment spray system(V.A), and containment heat removal system(?). Physical interfaces exist with any structure, system, or component which either penetrates the containment wall, such as the main steam system (VIII.B1) and feedwater systems(VIII.B2), or is supported by the containment structure, such as the polar crane(VII.B2). The containment structure basemat typically provides support to the NSSS components and containment internal structures.

II. CONTAINMENT STRUCTURES

A. PWR Containments

A1. Concrete Containments (Reinforced and Prestressed)

Item	Structure/ Component	Region of Interest	Material	Environment	Aging Effect	Aging Mechanism	References
A1.1	Concrete Elements	Dome, Wall, Basemat, Ring Girder, Buttresses	Concrete	Outside Containment	Cracking, Loss of Material	Freeze/ Thaw	10CFR50.55a ASME Section XI, Subsection IWL 10CFR50, Appendix J NUREG-1611 ACI 201.1R-92 10CFR50.65, Maintenance Rule Reg Guide 1.160, Rev. 2 NUMARC 93-01, Rev 2 NEI 96-03 NUREG-1705 NUREG-1723

II. CONTAINMENT STRUCTURES

A. PWR Containments

A1. Concrete Containments (Reinforced and Prestressed)

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
10CFR50.55a/ASME Section XI, Subsection IWL	See Chapter XI for evaluation of 10CFR50.55a/ASME Section XI, Subsection IWL NUREG-1611 identifies Subsection IWL Examination Category L-A for managing the effects of freeze/thaw.	No

II. CONTAINMENT STRUCTURES

A. PWR Containments

A1. Concrete Containments (Reinforced and Prestressed)

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

II. CONTAINMENT STRUCTURES

A. PWR Containments

A1. Concrete Containments (Reinforced and Prestressed)

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

II. CONTAINMENT STRUCTURES

A. PWR Containments

A1. Concrete Containments (Reinforced and Prestressed)

Item	Structure/ Component	Region of Interest	Material	Environ-ment	Aging Effect	Aging Mechanism	References
A1.1	Concrete Elements	Dome, Wall, Basemat, Ring Girder, Buttresses	Concrete	Concrete below grade	Increase in Porosity, Permea-bility; Cracking, Loss of Material	Leaching of Calcium Hydroxide; Aggressive Chemical Attack	*Same as A1.1, Freeze/Thaw Aging Mechanism*

II. CONTAINMENT STRUCTURES

A. PWR Containments

A1. Concrete Containments (Reinforced and Prestressed)

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
10CFR50.55a/ASME Section XI, Subsection IWL	See Chapter XI for an evaluation of 10CFR50.55a/ASME Section XI, Subsection IWL NUREG-1611 identifies 10CFR50.55a/IWL for managing the aging effects of aggressive chemical attack and leaching of calcium hydroxide. Per NUREG-1557, leaching of calcium hydroxide 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

II. CONTAINMENT STRUCTURES

A. PWR Containments

A1. Concrete Containments (Reinforced and Prestressed)

Item	Structure/ Component	Region of Interest	Material	Environ-ment	Aging Effect	Aging Mechanism	References
A1.1	Concrete Elements	Dome, Wall, Basemat, Ring Girders, Buttresses	Concrete	Inside and/or Outside Contain-ment	Cracking	Reaction with Aggregates	*Same as A1.1, Freeze/Thaw Aging Mechanism*
A1.1	Concrete Elements	Dome, Wall, Basemat; Ring Girders, Buttresses, and Reinforcing Steel	Concrete; Carbon Steel	Inside and/or Outside Contain-ment	Cracking, Loss of Bond, and Loss of Material	Corrosion of Embedded Steel	*Same as A1.1, Freeze/Thaw Aging Mechanism* EPRI TR-103842

II. CONTAINMENT STRUCTURES
A. PWR Containments
A1. Concrete Containments (Reinforced and Prestressed)

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
10CFR50.55a/ASME Section XI, Subsection IWL	See Chapter XI for an evaluation of 10CFR50.55a/ASME Section XI, Subsection IWL NUREG-1611 identifies 10CFR50.55a/IWL for managing the effects of reaction with aggregates, and resolves staff's concern about delayed occurrences. 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.
10CFR50.55a/ASME Section XI, Subsection IWL	See Chapter XI for an evaluation of 10CFR50.55a/ASME Section XI, Subsection IWL NUREG-1611 identifies 10CFR50.55a/IWL for managing the effects of corrosion of embedded steel. Per NUREG-1557, corrosion of embedded steel is non-significant for exterior above grade and interior if not exposed to aggressive environment (sulfates > 1500 ppm, pH < 5.5, or chlorides > 500 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.	No

II. CONTAINMENT STRUCTURES

A. PWR Containments

A1. Concrete Containments (Reinforced and Prestressed)

Item	Structure/ Component	Region of Interest	Material	Environ-ment	Aging Effect	Aging Mechanism	References
A1.1	Concrete Elements	Dome, Wall and Basemat	Concrete	Inside and/or Outside Contain-ment	Cracks; Distortion; Increase in Compo-nent Stress Level	Settlement	NUREG-1611 ACI 349.3R-96
A1.1	Concrete Elements	Dome, Wall, Basemat, Ring Girder, Buttresses	Concrete	Inside and/or outside Containment	Loss of Strength and Modulus, Change in Poisson's Ratio	Elevated Tempera-ture (>150°F general; >200°local)	NUREG-1611 ASME Section III, Division 2, CC-3440

II. CONTAINMENT STRUCTURES

A. PWR Containments

A1. Concrete Containments (Reinforced and Prestressed)

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
10CFR50.55a/ASME Section XI, Subsection IWL	See Chapter XI for an evaluation of 10CFR50.55a/ASME Section XI, Subsection IWL	No
No mandated Aging Management Program exists. NUREG-1611 identifies the need for plant-specific evaluation, if the prerequisite conditions exist.	The implementation of 10 CFR 50.55a and IWL would not be able to identify the loss of strength and modulus due to elevated temperature. Thus, for any portions of concrete containment that exceed specified temperature limits, as referenced in this section, further evaluations are warranted. NUREG-1611 specifies the temperature limits, both general (150 °F) and local (200 °F), above which a plant-specific evaluation is needed.	Yes. If applicable, the applicant's aging management program to address this issue must be evaluated.

II. CONTAINMENT STRUCTURES

A. PWR Containments

A1. Concrete Containments (Reinforced and Prestressed)

Item	Structure/ Component	Region of Interest	Material	Environ-ment	Aging Effect	Aging Mechanism	References
A1.2	Steel Elements	Liner, Liner Anchors, Structural Steel as defined by IWE	Carbon Steel	Inside and/or Outside Contain-ment	Loss of Material	Corrosion	10CFR50.55a ASME Section XI, Subsection IWE 10CFR50, Appendix J NUREG-1611

II. CONTAINMENT STRUCTURES

A. PWR Containments

A1. Concrete Containments (Reinforced and Prestressed)

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

II. CONTAINMENT STRUCTURES

A. PWR Containments

A1. Concrete Containments (Reinforced and Prestressed)

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

II. CONTAINMENT STRUCTURES

A. PWR Containments

A1. Concrete Containments (Reinforced and Prestressed)

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

II. CONTAINMENT STRUCTURES

A. PWR Containments

A1. Concrete Containments (Reinforced and Prestressed)

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

II. CONTAINMENT STRUCTURES

A. PWR Containments

A1. Concrete Containments (Reinforced and Prestressed)

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

II. CONTAINMENT STRUCTURES

A. PWR Containments

A1. Concrete Containments (Reinforced and Prestressed)

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

II. CONTAINMENT STRUCTURES

A. PWR Containments

A1. Concrete Containments (Reinforced and Prestressed)

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

II. CONTAINMENT STRUCTURES

A. PWR Containments

A1. Concrete Containments (Reinforced and Prestressed)

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

II. CONTAINMENT STRUCTURES

A. PWR Containments

A1. Concrete Containments (Reinforced and Prestressed)

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

II. CONTAINMENT STRUCTURES

A. PWR Containments

A1. Concrete Containments (Reinforced and Prestressed)

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

II. CONTAINMENT STRUCTURES

A. PWR Containments

A1. Concrete Containments (Reinforced and Prestressed)

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

II. CONTAINMENT STRUCTURES

A. PWR Containments

A1. Concrete Containments (Reinforced and Prestressed)

Item	Structure/ Component	Region of Interest	Material	Environment	Aging Effect	Aging Mechanism	References
A1.2	Steel Elements	Liner		Inside and/or Outside Containment	Crack Initiation and Growth		*Same as A1.2, Corrosion Aging Mechanism*
A1.3	Prestressing System	Tendons and Anchorage Components	Carbon Steel	Inside and/or Outside Containment	Loss of Material	Corrosion of Tendons/ Anchorage Components	*Same as A1.1, Freeze/Thaw Aging Mechanism* IN 99-10

II. CONTAINMENT STRUCTURES

A. PWR Containments

A1. Concrete Containments (Reinforced and Prestressed)

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
No Program is Required	*No Program is Required.* NUREG-1611 identifies stress corrosion cracking of the steel liner as non-significant. This aging effect is not significant for the liner itself. See Item A3.1.	No.
10CFR50.55a/ASME Section XI Subsection IWL Note: 10CFR50.55a and IWL do not apply to bonded post-tensioning systems.	See Chapter XI for an evaluation of 10CFR50.55a/ASME Section XI, Subsection IWL NUREG-1611 identifies 10CFR50.55a/IWL for managing tendon and anchor corrosion IN 99-10 describe conditions in tendon access galleries conducive to corrosion of tendon anchorage components	No.

II. CONTAINMENT STRUCTURES

A. PWR Containments

A1. Concrete Containments (Reinforced and Prestressed)

Item	Subsystem	Component	Material	Environment	Aging Effect	Aging Mechanism	References
A1.3	Prestressing System	Tendons and Anchorage Components	Carbon Steel	Inside and/or Outside Containment	Loss of Prestress	Relaxation; Shrinkage; Creep; Elevated Temperature	10CFR50.55a ASME Section XI, Subsection IWL NUREG-1611 10CFR54 Regulatory Guide 1.35.1 ACI 318-95

II. CONTAINMENT STRUCTURES

A. PWR Containments

A1. Concrete Containments (Reinforced and Prestressed)

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
10CFR50.55a/ASME Section XI, Subsection IWL Note: 10CFR50.55a and IWL do not apply to bonded post-tensioning systems. Tendon Loss Of Prestress is a TLAA.	See Chapter XI evaluation of 10CFR50.55a/ASME Section XI, Subsection IWL is augmented as follows: ***(5) Monitoring and Trending:*** 10 CFR 50.55a and IWL do not provide guidance on how to calculate expected tendon prestressing forces that are needed to compare against the measured tendon lift-off forces. This guidance is provided in NRC Regulatory Guide 1.35.1. NUREG-1611 identifies both 10CFR50.55a/IWL and TLAA to manage loss of prestress The guidance provided in Reg. Guide 1.35 represents an acceptable method for demonstrating that the loss of prestress in tendons is adequately managed. There are other equivalent methods (such as ACI 318-95) which are acceptable.The guidancein Reg. Guide 1.35.1 has the following attributes, which satisfy the TLAA requirements of 10CFR54.21(c)(1)(ii). The basic attributes are: 1. Calculation of the minimum required prestressing force value (MRV) for each tendon group. 2. Calculated predicted lower limit (PLL) prestressing force for each group of tendons (See NRC R.G. 1.35.1). During each inspection, the measured prestressing forces in the sampled tendons are compared against the PLL. 3. The PLL developed for the 40 year period of operation shall be extended to 60 years. The applicant has to demonstrate that the trend of the measured prestressing forces during the extended period remain above the PLL or MRV as appropriate for each tendon group. If this can not be achieved, then a systematic plan of retensioning selected tendons should be developed which would result in the trend lines remaining above the PLL or a reanalysis of the containment demonstrating design adequacy is needed. If the approach described above is not feasible due to the lack of available tendon lift-off force data needed to develop trend lines, then a TLAA for containment prestressing forces performed in accordance with 10 CFR 54.21(c)(1)(iii) is acceptable. In this case, the TLAA must satisfy the ten (10) criteria for an acceptable aging management program and must specifically include the following: ***(3)Parameters Monitored:*** The parameters to be monitored are the prestressing forces in accordance with requirements specified in Subsection IWL of Section XI of the ASME Code as incorporated by reference in 10 CFR 50.55a. ***(5) Monitoring and Trending:*** The prestressing forces are monitored and plotted over time. ***(6) Acceptance Criteria:*** The prestressing force trend lines must be shown to be above the predicted lower limit (PLL) lines or MRV as appropriate.	No, Provided Regulatory Guide 1.35.1 is followed. Otherwise plant-specific evaluation is necessary. Yes. Methodology for TLAA must be evaluated.

II. CONTAINMENT STRUCTURES

A. PWR Containments

A1. Concrete Containments (Reinforced and Prestressed)

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

Existing Aging Management Program (AMP)	Evaluation and Technical Basis	Further Evaluation
	(7) Corrective Actions: Where tendon forces fall below the acceptance standards, corrective actions may include retensioning, replacement of selected tendons with new tendons, or reanalysis. ***(10) Operating Experience:*** The program shall incorporate any operating experience that occurs at the plant requesting license renewal as well as other plants.	

CHAPTER XI

EXISTING AGING MANAGEMENT PROGRAMS (AMP) AND ACTIVITIES

Existing Aging Management Programs (AMP) and Activities

A.1 Aging Management Program for Electrical Cables and Connections Exposed to an Adverse Localized Environment Caused by Heat or Radiation

A.2 Aging Management Program for Electrical Cables Used in Instrumentation Circuits that are Sensitive to Reduction in Conductor Insulation Resistance (IR) Exposed to an Adverse Localized Environment Caused by Heat or Radiation

A.3 Aging Management Program for Inaccessible Medium-Voltage Cables Exposed to an Adverse Localized Environment Caused by Moisture and Voltage Exposure

A.4 Borated Water Leakage Surveillance Program for Electrical Connectors

A.5 ASME Section XI, Subsection IWE

A.6 ASME Section XI, Subsection IWL

DESCRIPTION

10CFR50.55a imposes the examination requirements of ASME B&PV Code Section XI on reinforced and prestressed concrete containments. Examination requirements of ASME Class MC pressure retaining components, metallic shell/liners of Class CC containments, integral attachments, seals and gaskets, pressure retaining bolting, and surface areas including welds are covered in Subsection IWE. Therefore, ASME Code Section XI, Subsection IWE (1992 Edition with 1992 Addenda or later versions including authorized Relief Requests), along with additional requirements specified in 10CFR50.55a(b)(2), constitute an existing mandated program which should be referenced by the applicant's containment inservice inspection program for managing aging of steel containments and liners of concrete containments for license renewal.

EVALUATION AND TECHNICAL BASIS

Per NUREG-1611, an application for License Renewal should reference ASME Code Section XI, Subsection IWE and associated modifications/additions specified in 10CFR50.55a for managing aging of containment steel elements.

Evaluation of 10CFR50.55a/IWE against the ten (10) attributes for an acceptable aging management program is presented below. An applicant should ensure that its implementation of 10CFR50.55a/IWE for containment steel elements is consistent with this evaluation.

(1) Scope of Program: Subsection IWE-1000 specifies the components within the scope of IWE (1992 edition with 1992 Addenda or later versions) for steel containments and liners of concrete containments. The components within the scope of IWE are Class MC pressure retaining components (steel containments) and their integral attachments; metallic shell and penetration liners of Class CC containments and their integral attachments; containment seals and gaskets; containment pressure retaining bolting; and surface areas, including welds and base metal. The concrete portions of containment are in accordance with IWL. IWE exempts from examination (1) components that are outside the boundaries of the containment as defined in the Design Specifications; (2) embedded or inaccessible portions of containment components that met the requirements of the original Construction Code; (3) components that become embedded or inaccessible as a result of vessel repair or replacement if IWE-1232 and IWE-5220 are met; and (4) piping, pumps, and valves that are part of the containment system, or which penetrate or are attached to the containment vessel (governed by IWB or IWC). (10CFR 50.55a(b)(2)ix) specifies additional requirements, one of which covers inaccessible areas. It states that the licensee shall evaluate the acceptability of inaccessible areas when conditions exist in

accessible areas that could indicate the presence of or result in degradation to such inaccessible areas.

(2) Preventive Action: No preventive actions are specified; IWE is a monitoring program.

(3) Parameters Monitored or Inspected: Table IWE-2500-1 specifies six categories for examination. Table 2500-1 references the applicable section in 3500, which identifies the aging effects, which are evaluated.

Category	Parts Examined	Examination Method
E-A	Containment Surface	General Visual, Visual VT-3
E-B *	Pressure Retaining Welds	Visual VT-1
E-C	Containment Surfaces Requiring Augmented Examination	Visual VT-1, Volumetric
E-D	Seals, Gaskets, and Moisture Barriers	Visual VT-3
E-F *	Pressure Retaining Dissimilar Metal Welds	Surface
E-G	Pressure Retaining Bolting	Visual VT-1, Bolt torque or tension test
E-P	All Pressure Retaining Components (Pressure boundary, penetration bellows, airlocks, seals and gaskets)	10 CFR 50, Appendix J (Containment Leak Rate Testing)

* These two categories are optional per 10 CFR 50.55a(b)(2)(ix)(C).
** The applicable examination method (where multiple methods are listed) depends on the particular subcategory within each category.

(4) Detection of Aging Effects: The frequency and scope of examinations are sufficient to ensure the aging effects are detected before they compromise the design basis requirements. Under IWE, inservice examinations and pressure tests must be performed in accordance with one of two Inspection Programs A or B on a specified schedule. Under Inspection Program A there are four inspection intervals (at 3, 10, 23, and 40 years) for which a 100% of the required examinations must be completed. Within each interval there are various inspection periods for which a certain percentage of the examinations must be performed to reach 100% at the end of that interval. In addition, a general visual examination is performed once each inspection period. After 40 years of operation, any future examinations must be performed in accordance with the

Inspection Program B. Under Inspection Program B there is an initial interval of 12 years and successive intervals of 10 years each, during which 100% of the required examinations must be completed. Regarding the extent of examination, all accessible surfaces receive a visual examination. Selected areas, such as containment surfaces requiring augmented examination (E-C) require volumetric examination.

(5) Monitoring and Trending: With the exception of inaccessible areas, all surfaces are monitored by virtue of the examination requirements on a scheduled basis as described above. When component examination results require evaluation of flaws, areas of degradation, or repairs and the component is found to be acceptable for continued service, the areas containing such flaws, degradation or repairs shall be reexamined during the next inspection in accordance with Examination Category E-C (containment surfaces requiring augmented examination). When these reexaminations reveal that the flaws, areas of degradation, or repairs remain essentially unchanged for three consecutive inspection periods, these areas no longer require augmented examination in accordance with Examination Category E-C. Except as permitted by 10 CFR 50.55a(b)(2)(ix)(D), IWE requires that examinations performed during any one inspection that reveal flaws or areas of degradation exceeding the acceptance standards shall be extended to include an additional number of examinations within the same category approximately equal to the initial number of examinations. Also, except as permitted by 10 CFR 50.55a(b)(2)(ix)(D), when additional flaws or areas of degradation that exceed the acceptance standards are revealed, all of the remaining examinations within the same category must be performed to the extent specified in Table IWE 2500-1 for the inspection interval.

(6) Acceptance Criteria: Table IWE-3410-1 presents criteria to evaluate the acceptability of the containment components for service following the preservice examination and each inservice examination. This table specifies the acceptance standard for each Examination Category (E-A, E-B, E-C, etc.). Most of the acceptance standards rely upon visual examinations, an engineering evaluation or require corrective action . For some examinations such as Augmented Examinations, numerical values are specified for the acceptance standards.. For containment steel shell or liner, material loss exceeding 10% of the nominal containment wall thickness, or material loss that is projected to exceed 10% of the nominal containment wall thickness prior to the next examination, shall be documented. Such areas shall be accepted by engineering evaluation or corrected by repair or replacement in accordance with IWE-3122.

(7) Corrective Actions: IWE states that components whose examination results indicate flaws or areas of degradation that do not meet the acceptance standards listed in Table-3410-1 can be considered acceptable if an engineering evaluation indicates that the flaw or area of degradation is nonstructural in nature or has no effect on the structural integrity of the containment. Components that do not meet the acceptance standards are required to satisfy additional examination

requirements and the flaw or area of degradation must be removed by mechanical methods or the component repaired. For repair of components within the scope of IWE, IWE-4000 and IWE-3124 state that repairs and reexaminations shall comply with the requirements of IWA-4000. IWA-4000 provides rules and requirements for the repair of pressure retaining components including metal containments and metallic liners of concrete containments.

(8) Confirmation Process: When areas of degradation are identified, an evaluation is required to determine if repair or replacement is necessary. If the evaluation determines that repair or replacement is necessary, IWE requires confirmation to ensure that appropriate corrective actions have been completed and are effective. IWE states that repairs and reexaminations shall comply with the requirements of IWA-4000. Reexaminations are required to be conducted in accordance with the requirements of IWA-2000 and the recorded results must demonstrate that the repair meets the acceptance standards set forth in Table IWE-3410-1. (Additional confirmation of leak tightness is achieved through the pressure tests required by 10 CFR 50, Appendix J.)

(9) Administrative Controls: An approved site QA Program would be applicable to IWE. IWA-1400 provides requirements for Owner's Responsibility. This includes responsibility for preparation of plans, schedules, and inservice inspection summary reports, and submittal of these plans and reports to the enforcement and regulatory authorities having jurisdiction at the plant site. Owner is also responsible for the preparation of written examination instructions and procedures, verification of qualification level of personnel who perform the examinations, and documentation of a Quality Assurance Program. IWA-6000 specifically covers the requirements for the preparation, submittal, and retention of records and reports.

(10) Operating Experience: ASME Section XI, Subsection IWE was specifically developed to identify aging degradation of containment steel components. Since ASME Section XI, Subsection IWE was only recently adopted by 10CFR50.55a, long term experience in managing aging of containment components needs to be established. Examinations performed in accordance with Appendix J to 10 CFR Part 50 (which is similar to the visual inspections of IWE) have provided operating experience which supports the reasonableness and effectiveness of IWE. The license renewal applicant should provide plant-specific operating experience related to inservice inspection of containment and occurrences of degradation.

DESCRIPTION

10CFR50.55a imposes the examination requirements of ASME B&PV Code Section XI on reinforced and prestressed concrete containments. Examination requirements of ASME Class CC concrete components are covered in Subsection IWL. Therefore, ASME Code Section XI, Subsection IWL (1992 Edition with 1992 Addenda or later versions), including authorized Relief Requests along with additional requirements specified in 10CFR50.55a(b)(2), constitute an existing mandated program which should be referenced by the applicant's containment inservice inspection program for managing aging of concrete containments for license renewal.

EVALUATION AND TECHNICAL BASIS

Per NUREG-1611, an application for license renewal should reference ASME Code Section XI, Subsection IWL and associated modifications/additions specified in 10CFR50.55a for managing aging of containment concrete elements and prestressing systems.

Evaluation of 10CFR50.55a/IWL against the ten (10) attributes for acceptable aging management program is presented below. An applicant should ensure that its implementation of 10CFR50.55a/IWL for containment concrete elements and prestressing systems is consistent with this evaluation.

(1) **Scope of Program**: Subsection IWL-1000 specifies the components within the scope of IWL (1992 edition with 1992 Addenda or later versions]) for concrete containments. The components within the scope of IWL are reinforced concrete and unbonded post-tensioning systems of Class CC containments, as defined by CC-1000. Steel metallic liners are governed by IWE. IWL exempts from examination portions of the concrete containment that are inaccessible (e.g. concrete covered by liner, foundation material, or backfill, or are obstructed by adjacent structures or other components). 10 CFR 50.55a(b)(2)(viii) specifies additional requirements, one of which covers inaccessible areas. It states that the licensee shall evaluate the acceptability of inaccessible areas when conditions exist in accessible areas that could indicate the presence of or result in degradation to such inaccessible areas.

(2) **Preventive Action**: No preventive actions are specified; IWL is a monitoring program.

(3) **Parameters Monitored or Inspected**: Table IWL-2500-1 specifies two categories for examination of concrete surfaces. Category L-A for all concrete surfaces and Category L-B for concrete surfaces surrounding tendon anchorages. Both of these categories rely upon visual examination methods. Visual examination would identify loss of material and cracking of concrete

components. Table IWL-2500-1 specifies Category L-B for test and examination requirements for unbonded post tensioning systems.

(4) **Detection of Aging Effects**: The frequency and scope of examination are sufficient to ensure that aging effects are detected before the design basis requirements would be compromised. The frequency of inspection is specified in IWL-2400. Concrete inspections are performed in accordance with Examination Category L-A. Under IWL, inservice inspections for concrete and unbonded post-tensioning systems are required at 1, 3, and 5 years following the structural integrity test. Thereafter, inspections are performed at 5 year intervals. The required minimum number of each tendon type selected for inspection varies from 2 to 4 percent. Regarding the extent, all concrete surfaces receive a visual VT-3C examination. Selected areas, such as those that indicate suspect conditions and areas surrounding tendon anchorages receive a more rigorous VT-1 or VT-1C examination. In the case of tendons, only a sample of the tendons of each tendon type requires examination at each inspection. The tendons to be examined during an inspection are selected on a random basis. Table IWL-2521-1 specifies the number of tendons to be selected for each type (e.g. hoop, vertical, dome, helical, and inverted U) for each inspection period. Prestressing forces in sample tendons are measured. In addition, one sample tendon of each type is removed for examination and testing.

(5) **Monitoring and Trending**: With the exception of inaccessible areas, all concrete surfaces are monitored by virtue of the examination requirements on a regular basis as described above. In addition to the random sampling used for tendon examination, one tendon of each type is selected from the first year inspection sample and designated as a common tendon. Each common tendon is then examined during each inspection. This provides monitoring and trending information over the life of the plant. 10 CFR 50.55a and IWL also require that prestressing forces in all inspection sample tendons be measured by lift-off tests and compared to acceptance standards based on the predicted force for that type of tendon over its life.

(6) **Acceptance Criteria**: IWL-3000 provides acceptance criteria for concrete containments. For concrete surfaces, the acceptance criteria rely on the determination of the Responsible Engineer whether there is any evidence of damage or degradation sufficient to warrant further evaluation or repair. Although the acceptance criteria are qualitative, guidance is provided in IWL-2510, which references ACI 201.1R-92 for identification of concrete degradation. In addition, IWL-2320 requires the Responsible Engineer to be a registered professional engineer experienced in evaluating the inservice condition of structural concrete and knowledgeable of the design and construction codes and other criteria used in design and construction of concrete containments. Alternate acceptance criteria based on ACI 349.3R is also acceptable. The acceptance standards for the unbonded post-tensioning system is quantitative in nature. For the post-tensioning system, quantitative acceptance criteria are

given for tendon force, tendon wire or strand samples, and corrosion protection medium.

(7) **Corrective Actions**: IWL specifies that items with examination results which do not meet the acceptance standards shall be evaluated to IWL-3300 "Evaluation." Items which do not meet the acceptance standards are to be evaluated by the Owner. The Owner is responsible for preparation of an Engineering Evaluation Report. The report should include an evaluation whether the concrete containment is acceptable without repair of the item and if repair is required, the extent, method, and completion date for the repair or replacement. Also included in the report is the cause of the condition and the extent, nature, and frequency of additional examinations. IWL also provides repair procedures to follow in Article IWL-4000. This includes requirements for the concrete repair, repair of reinforcing steel, repair of the post-tensioning system, and examination of the repaired area.

(8) **Confirmation Process**: When areas of degradation are identified, an evaluation is performed to determine if repair or replacement is necessary. As part of this evaluation, IWL-3300 requires the Engineering Evaluation Report include the extent, nature, and frequency of additional examinations.

(9) **Administrative Controls**: An approved site QA Program would be applicable to IWL. IWA-1400 provides requirements for Owner's Responsibility. This includes responsibility for preparation of plans, schedules, and inservice inspection summary reports, and submittal of these plans and reports to the enforcement and regulatory authorities having jurisdiction at the plant site. Owner is also responsible for the preparation of written examination instructions and procedures, verification of qualification level of personnel who perform the examinations, and documentation of a Quality Assurance Program. IWA-6000 specifically covers the requirements for the preparation, submittal, and retention of records and reports.

(10) **Operating Experience**: ASME Section XI, Subsection IWL was specifically developed to manage aging degradation of containment concrete components. Since ASME Section XI, Subsection IWL was only recently adopted by 10CFR50.55a, long term experience w/IWL needs to be established. The license renewal applicant should provide plant-specific operating experience related to inservice inspection of containment and occurrences of degradation. The IWL inspections are comparable to the concrete inspections performed in accordance with 10 CFR 50 Appendix J. NUREG-1540 states that inspections mandated by Appendix J to 10 CFR Part 50, though basically visual, have been reasonably effective in identifying containment problems to date. Therefore, previous Appendix J inspections provide additional verification that a visual inspection of containment concrete is effective.