3.4 STEAM AND POWER CONVERSION SYSTEMS

3.4.1 Introduction

This section provides the results of the aging management reviews for components in the steam and power conversion systems that are subject to aging management review. The following systems are addressed in this section (the system description is available in the referenced section).

- Main Steam (Section 2.3.4.1)
- Main Feedwater (Section 2.3.4.2)
- Auxiliary Feedwater (Section 2.3.4.3)
- Steam Generator Blowdown (Section 2.3.4.4)
- IP2 AFW Pump Room Fire Event (Section 2.3.4.5)
- Condensate (Section 2.3.4.6)

Table 3.4.1, Summary of Aging Management Programs for Steam and Power Conversion System Evaluated in Chapter VIII of NUREG-1801, provides the summary of the programs evaluated in NUREG-1801 for the steam and power conversion system component group. This table uses the format described in the introduction to Section 3. Hyperlinks are provided to the program evaluations in Appendix B.

3.4.2 Results

The following system tables summarize the results of aging management reviews and the NUREG-1801 comparison for the condensate storage system.

- Table 3.4.2-1-IP2 Main Steam System—Summary of Aging Management Review
- Table 3.4.2-1-IP3 Main Steam System—Summary of Aging Management Review
- Table 3.4.2-2-IP2 Main Feedwater System—Summary of Aging Management Review
- Table 3.4.2-2-IP3 Main Feedwater System—Summary of Aging Management Review
- Table 3.4.2-3-IP2 Auxiliary Feedwater System—Summary of Aging Management Review
- Table 3.4.2-3-IP3 Auxiliary Feedwater System—Summary of Aging Management Review
- Table 3.4.2-4-IP2 Steam Generator Blowdown System—Summary of Aging Management Review
- Table 3.4.2-4-IP3 Steam Generator Blowdown System—Summary of Aging Management Review

- IP2 AFW Pump Room Fire Event

  Aging management of the systems required to supply feedwater to the steam generators during a fire in the AFW pump room is not based on an analysis of materials, environments and aging effects. The components in the systems required to supply feedwater to the steam generators during the short duration of the fire event are in service at the time the event occurs or their availability is checked daily. Therefore, integrity of the systems and components required to perform post-fire intended functions for at least one hour is continuously confirmed by normal plant operation. During the event these systems and components must continue to perform their intended functions to supply feedwater to the steam generators for a minimum of one hour. Significant degradation that could threaten the performance of the intended functions will be apparent in the period immediately preceding the event and corrective action will be required to sustain continued operation. For the minimal one hour period that these systems would be required to provide make up to the steam generators, further aging degradation that would not have been apparent prior to the event is negligible. Therefore, no aging effects are identified, and no Summary of Aging Management Review table is provided.

  The IP1 condensate storage tanks are only subject to intermittent service. Therefore, a daily check of tank level and intermittent usage of piping and valves from the IP1 CSTs to the IP2 condenser confirm availability. Significant degradation that could threaten the performance of the intended functions will be apparent in the period immediately preceding the event and corrective action will be required to sustain continued operation.

  The use of this approach for confirmation of the integrity of systems required to perform the post-fire intended function of supplying water to the steam generators is analogous to the approach used for confirmation of condenser integrity in the MSIV leakage pathway of boiling water reactors. In this MSIV leakage pathway scenario, the intended function of the condenser (holdup and plateout of MSIV leakage) is continuously confirmed by normal plant operation. The use of this approach has been accepted by the staff (NUREG-1796, Dresden and Quad Cities SER, Section 3.4.2.4.4, and NUREG-1769, Peach Bottom SER, Section 3.4.2.3), where they concluded that main condenser integrity is continually verified during normal plant operation and no aging management program is required to assure the post-accident intended function.

- Condensate

  Because condensate system components subject to aging management review are evaluated with other systems, including miscellaneous systems in scope for (a)(2), there are no tables associated specifically with the condensate system. See Section 2.3.4.6 for further information.

3.4.2.1 Materials, Environment, Aging Effects Requiring Management and Aging Management Programs

The following sections list the materials, environments, aging effects requiring management, and aging management programs for the steam and power conversion systems. Programs are described in Appendix B. Further details are provided in the system tables.

3.4.2.1.1 Main Steam

Materials

Main steam system components are constructed of the following materials.

- carbon steel
- stainless steel

Environment

Main steam system components are exposed to the following environments.

- air – indoor
- air – outdoor
- steam

Aging Effects Requiring Management

The following aging effects associated with the main steam system require management.

- cracking
- cracking – fatigue
- loss of material

Aging Management Programs

The following aging management programs manage the aging effects for the main steam system components.

- External Surfaces Monitoring
- Flow-Accelerated Corrosion
- Water Chemistry Control – Primary and Secondary

3.4.2.1.2 Main Feedwater

Materials

Main feedwater system components are constructed of the following materials.

- carbon steel
- stainless steel

Environment

Main feedwater system components are exposed to the following environments.

- air – indoor
- treated water
- treated water > 140°F

Aging Effects Requiring Management

The following aging effects associated with the main feedwater system require management.

- cracking
- cracking – fatigue
- loss of material

Aging Management Programs

The following aging management programs manage the aging effects for the main feedwater system components.

- Flow-Accelerated Corrosion
- Water Chemistry Control – Primary and Secondary

3.4.2.1.3 Auxiliary Feedwater

Materials

Auxiliary feedwater system components are constructed of the following materials.

- aluminum
- carbon steel
- copper alloy
- glass
- stainless steel

Environment

Auxiliary feedwater system components are exposed to the following environments.

- air – indoor
- air – outdoor
- concrete and oiled sand
- condensation
- gas
- lube oil
- soil
- steam
- treated water

Aging Effects Requiring Management

The following aging effects associated with the auxiliary feedwater system require management.

- cracking
- cracking – fatigue
- fouling
- loss of material

Aging Management Programs

The following aging management programs manage the aging effects for the auxiliary feedwater system components.

- Aboveground Steel Tanks
- Bolting Integrity
- Buried Piping and Tanks Inspection
- External Surfaces Monitoring
- Flow-Accelerated Corrosion
- Oil Analysis
- One-Time Inspection
- Periodic Surveillance and Preventive Maintenance
- Water Chemistry Control – Primary and Secondary

3.4.2.1.4 Steam Generator Blowdown

Materials

Steam generator blowdown system components are constructed of the following materials.

- carbon steel
- cast austenitic stainless steel (CASS)
- stainless steel

Environment

Steam generator blowdown system components are exposed to the following environments.

- air – indoor
- treated water
- treated water > 140°F

Aging Effects Requiring Management

The following aging effects associated with the steam generator blowdown system require management.

- cracking
- cracking – fatigue
- loss of material

Aging Management Programs

The following aging management programs manage the aging effects for the steam generator blowdown system components.

- Flow-Accelerated Corrosion
- Water Chemistry Control – Primary and Secondary

3.4.2.2 Further Evaluation of Aging Management as Recommended by NUREG-1801

NUREG-1801 indicates that further evaluation is necessary for certain aging effects and other issues discussed in Section 3.4.2.2 of NUREG-1800. The following sections are numbered in accordance with the discussions in NUREG-1800 and explain the approach to those areas requiring further evaluation. Programs are described in Appendix B.

3.4.2.2.1 Cumulative Fatigue Damage

Where identified as an aging effect requiring management, the analysis of fatigue is a TLAA as defined in 10 CFR 54.3. TLAAs are evaluated in accordance with 10 CFR 54.21(c). Evaluation of this TLAA is addressed in Section 4.3.

3.4.2.2.2 Loss of Material Due to General, Pitting, and Crevice Corrosion

1. Loss of material due to general, pitting and crevice corrosion for carbon steel piping and piping components, heat exchanger components and tanks exposed to treated water and for carbon steel piping and components exposed to steam is an aging effect requiring management in the steam and power conversion and other systems at IPEC, which is managed by the Water Chemistry Control – Primary and Secondary Program. The effectiveness of the Water Chemistry Control – Primary and Secondary Program will be confirmed by the One-Time Inspection Program through an inspection of a representative sample of components crediting this program including susceptible locations such as areas of stagnant flow.

   This item is also compared to carbon steel components exposed to steam in the auxiliary systems. For steel auxiliary systems components exposed to steam from systems with controlled water chemistry such as the house service boiler system, the Water Chemistry Control – Auxiliary Systems Program manages loss of material. The One-Time Inspection Program for Water Chemistry will use visual inspections or non-destructive examinations of representative samples to verify that the Water Chemistry Control – Auxiliary Systems have been effective at managing aging effects.

2. Loss of material due to general, pitting and crevice corrosion in steel piping and components exposed to lubricating oil is managed by the Oil Analysis Program, which includes periodic sampling and analysis of lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment that is not conducive to corrosion. The One-Time Inspection Program will use visual inspections or non-destructive examinations of representative samples to confirm that the Oil Analysis Program has been effective at managing aging effects for components that credit this program.

3.4.2.2.3 Loss of Material due to General, Pitting, Crevice, and Microbiologically-Influenced Corrosion (MIC), and Fouling

Loss of material due to general, pitting, crevice, and MIC, and fouling in steel piping and components in the steam and power conversion systems exposed to raw water is managed by the Periodic Surveillance and Preventive Maintenance Program. The program includes visual inspections and other NDE techniques to manage loss of material of the components. These inspections will manage the aging effect of loss of material such that the intended function of the components will not be affected.

3.4.2.2.4 Reduction of Heat Transfer due to Fouling

1. Reduction of heat transfer due to fouling could occur for stainless steel and copper alloy heat exchanger tubes exposed to treated water. Reduction of heat transfer for copper alloy heat exchanger tubes exposed to treated water is managed by the Water Chemistry Control – Primary and Secondary Program. The effectiveness of the Water Chemistry Control – Primary and Secondary Program will be confirmed by the One-Time Inspection Program through an inspection of a representative sample of components crediting this program including susceptible locations such as areas of stagnant flow. The steam and power conversion systems at IPEC have no stainless steel heat exchanger tubes with intended functions exposed to treated water.

2. Reduction of heat transfer due to fouling for copper alloy heat exchanger tubes exposed to lubricating oil in steam and power conversion systems is managed by the Oil Analysis Program. There are no stainless steel or steel heat exchanger tubes with a heat transfer intended function exposed to lubricating oil in the steam and power conversion systems. This program includes periodic sampling and analysis of lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment that is not conducive to fouling. The One-Time Inspection Program will use visual inspections or non-destructive examinations of representative samples to confirm that the Oil Analysis Program has been effective at managing aging effects for components that credit this program.

3.4.2.2.5 Loss of Material due to General, Pitting, Crevice, and Microbiologically-Influenced Corrosion

1. Loss of material due to general, pitting, crevice, and MIC for carbon steel (with or without coating or wrapping) piping and components buried in soil in the steam and power conversion systems at IPEC is managed by the Buried Piping and Tanks Inspection Program. This program will include (a) preventive measures to mitigate corrosion and (b) inspections to manage the effects of corrosion on the pressure-retaining capability of buried carbon steel components. Buried

components will be inspected when excavated during maintenance. An inspection will be performed within ten years of entering the period of extended operation and within ten years after entering the period of extended operation, unless an opportunistic inspection occurred within these ten-year periods. This program will manage the aging effect of loss of material such that the intended function of the components will not be affected.

2. Loss of material due to general, pitting, crevice corrosion and MIC for carbon steel heat exchanger components exposed to lubricating oil is an aging effect requiring management in the steam and power conversion systems at IPEC and is managed by the Oil Analysis Program. This program includes periodic sampling and analysis of lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment that is not conducive to corrosion. The One-Time Inspection Program will use visual inspections or non-destructive examinations of representative samples to confirm that the Oil Analysis Program has been effective at managing aging effects for components that credit this program.

3.4.2.2.6 Cracking due to Stress Corrosion Cracking (SCC)

Cracking due to SCC in stainless steel components exposed to steam or treated water is managed by the Water Chemistry Control – Primary and Secondary Program. The effectiveness of the Water Chemistry Control – Primary and Secondary Program will be confirmed by the One-Time Inspection Program through an inspection of a representative sample of components crediting this program including susceptible locations such as areas of stagnant flow.

3.4.2.2.7 Loss of Material due to Pitting and Crevice Corrosion

1. Loss of material due to pitting and crevice corrosion for stainless steel and copper alloy components exposed to treated water is managed by the Water Chemistry Control – Primary and Secondary Program. The steam and power conversion systems at IPEC have no aluminum components with intended functions that are exposed to treated water. The effectiveness of the Water Chemistry Control – Primary and Secondary Program will be confirmed by the One-Time Inspection Program through an inspection of a representative sample of components crediting this program including susceptible locations such as areas of stagnant flow.

2. Loss of material due to pitting and crevice corrosion could occur for stainless steel piping, piping components, and piping elements exposed to soil. There are no stainless steel components exposed to soil in the steam and power conversion systems. Therefore, this item is not applicable to IPEC.

3. Loss of material due to pitting and crevice corrosion for copper alloy piping and components exposed to lubricating oil is managed by the Oil Analysis Program, which includes periodic sampling and analysis of lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment that is not conducive to corrosion. The One-Time Inspection Program will use visual inspections or non-destructive examinations of representative samples to confirm that the Oil Analysis Program has been effective at managing aging effects for components that credit this program.

3.4.2.2.8 Loss of Material due to Pitting, Crevice, and Microbiologically-Influenced Corrosion

Loss of material due to pitting, crevice, and MIC in stainless steel piping and components exposed to lubricating oil is managed by the Oil Analysis Program, which includes periodic sampling and analysis of lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment that is not conducive to corrosion. The One-Time Inspection Program will use visual inspections or non-destructive examinations of representative samples to confirm that the Oil Analysis Program has been effective at managing aging effects for components that credit this program.

3.4.2.2.9 Loss of Material due to General, Pitting, Crevice, and Galvanic Corrosion

Loss of material due to general, pitting, crevice, and galvanic corrosion can occur for steel heat exchanger components exposed to treated water. This item corresponds to a NUREG-1801 line applicable only to BWRs As described in 3.4.2.2.2 item 1, loss of material for steel heat exchanger components exposed to treated water is managed by the Water Chemistry Control – Primary and Secondary Program. The effectiveness of the Water Chemistry Control – Primary and Secondary Program will be confirmed by the One-Time Inspection Program through an inspection of a representative sample of components crediting this program including susceptible locations such as areas of stagnant flow.

3.4.2.2.10 Quality Assurance for Aging Management of Nonsafety-Related Components

See Appendix B Section B.0.3 for discussion of IPEC quality assurance procedures and administrative controls for aging management programs.

3.4.2.3 Time-Limited Aging Analysis

The only time-limited aging analysis identified for the steam and power conversion systems components is metal fatigue. This is evaluated in Section 4.3.

3.4.3 Conclusion

The steam and power conversion system components that are subject to aging management review have been identified in accordance with the requirements of 10 CFR 54.21. The aging management programs selected to manage the effects of aging on steam and power conversion system components are identified in Section 3.4.2.1 and in the following tables. A description of these aging management programs is provided in Appendix B, along with the demonstration that the identified aging effects will be managed for the period of extended operation.

Therefore, based on the demonstrations provided in Appendix B, the effects of aging associated with the steam and power conversion system components will be managed such that there is reasonable assurance that the intended functions will be maintained consistent with the current licensing basis during the period of extended operation.

Table 3.4.1
Summary of Aging Management Programs for the Steam and Power Conversion System Evaluated in Chapter VIII of NUREG-1801

Table 3.4.1: Steam and Power Conversion Systems, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4.1-1	Steel piping, piping components, and piping elements exposed to steam or treated water	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes, TLAA	Fatigue is a TLAA. See Section 3.4.2.2.1.
3.4.1-2	Steel piping, piping components, and piping elements exposed to steam	Loss of material due to general, pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801 for steam and power conversion system components. Loss of material in steel components exposed to steam is managed by the Water Chemistry Control – Primary and Secondary Program. The One-Time Inspection Program will be used to verify the effectiveness of the water chemistry program. For some auxiliary systems components, loss of material is managed by the Water Chemistry Control – Auxiliary Systems Program. See Section 3.4.2.2.2 item 1.

Table 3.4.1: Steam and Power Conversion Systems, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4.1-3	Steel heat exchanger components exposed to treated water	Loss of material due to general, pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. Loss of material in steel heat exchanger components exposed to treated water is managed by the Water Chemistry Control – Primary and Secondary Program. The One-Time Inspection Program will be used to verify the effectiveness of the water chemistry program. The component to which this NUREG-1801 line item applies is included in scope under criterion 10 CFR 54.4(a)(2) and listed in the series 3.3.2-19-xx tables. See Section 3.4.2.2.2 item 1.
3.4.1-4	Steel piping, piping components, and piping elements exposed to treated water	Loss of material due to general, pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. Loss of material in steel components exposed to treated water is managed by the Water Chemistry Control – Primary and Secondary Program. The One-Time Inspection Program will be used to verify the effectiveness of the water chemistry program. See Section 3.4.2.2.2 item 1.
3.4.1-5	BWR only				

Table 3.4.1: Steam and Power Conversion Systems, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4.1-6	Steel and stainless steel tanks exposed to treated water	Loss of material due to general (steel only) pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. Loss of material in steel and stainless steel tanks exposed to treated water is managed by the Water Chemistry Control – Primary and Secondary Program. The One-Time Inspection Program will be used to verify the effectiveness of the water chemistry program. See Section Section 3.4.2.2.2 item 1 and Section Section 3.4.2.2.7 item 1.
3.4.1-7	Steel piping, piping components, and piping elements exposed to lubricating oil	Loss of material due to general, pitting and crevice corrosion	Lubricating Oil Analysis and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Loss of material in steel components exposed to lubricating oil is managed by the Oil Analysis Program. The One-Time Inspection Program will be used to confirm the effectiveness of the Oil Analysis Program. The components to which this NUREG-1801 line item applies are included in scope under criterion 10 CFR 54.4(a)(2) and listed in series 3.3.2-19-xx tables. See Section 3.4.2.2.2 item 2.

Table 3.4.1: Steam and Power Conversion Systems, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4.1-8	Steel piping, piping components, and piping elements exposed to raw water	Loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion, and fouling	Plant specific	Yes, plant specific	The Periodic Surveillance and Preventive Maintenance Program manages loss of material in steel components exposed to raw water. The components to which this NUREG-1801 line item applies are included in scope under criterion 10 CFR 54.4(a)(2) and listed in series 3.3.2-19-xx tables. See Section 3.4.2.2.3.
3.4.1-9	Stainless steel and copper alloy heat exchanger tubes exposed to treated water	Reduction of heat transfer due to fouling	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. The reduction of heat transfer in copper alloy heat exchanger tubes exposed to treated water is managed by the Water Chemistry Control – Primary and Secondary Program. The One-Time Inspection Program will be used to verify the effectiveness of the water chemistry program. There are no stainless steel heat exchanger tubes exposed to treated water in the steam and power conversion systems. See Section 3.4.2.2.4 item 1.

Table 3.4.1: Steam and Power Conversion Systems, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4.1-10	Steel, stainless steel, and copper alloy heat exchanger tubes exposed to lubricating oil	Reduction of heat transfer due to fouling	Lubricating Oil Analysis and One-Time Inspection	Yes, detection of aging effects is to be evaluated	The reduction of heat transfer in copper alloy heat exchanger tubes exposed to lubricating oil is managed by the Oil Analysis Program. The One-Time Inspection Program will be used to confirm the effectiveness of the Oil Analysis Program. There are no steel or stainless steel heat exchanger tubes with a heat transfer intended function exposed to lubricating oil in the steam and power conversion systems. See Section 3.4.2.2.4 item 2.
3.4.1-11	Buried steel piping, piping components, piping elements, and tanks (with or without coating or wrapping) exposed to soil	Loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion	Buried Piping and Tanks Surveillance or Buried Piping and Tanks Inspection	No Yes, detection of aging effects and operating experience are to be further evaluated	Consistent with NUREG-1801. The Buried Piping and Tanks Inspection Program manages loss of material for buried steel components. See Section 3.4.2.2.5 item 1.

Table 3.4.1: Steam and Power Conversion Systems, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4.1-12	Steel heat exchanger components exposed to lubricating oil	Loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion	Lubricating Oil Analysis and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Loss of material in steel heat exchanger components exposed to lubricating oil is managed by the Oil Analysis Program. The One-Time Inspection Program will be used to confirm the effectiveness of the Oil Analysis Program. See Section 3.4.2.2.5 item 2.
3.4.1-13	BWR only				
3.4.1-14	Stainless steel piping, piping components, piping elements, tanks, and heat exchanger components exposed to treated water >60°C (>140°F)	Cracking due to stress corrosion cracking	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. Cracking in stainless steel components exposed to treated water > 140°F is managed by the Water Chemistry Control – Primary and Secondary Program. The One-Time Inspection Program will be used to verify the effectiveness of the water chemistry program. See Section 3.4.2.2.6.

Table 3.4.1: Steam and Power Conversion Systems, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4.1-15	Aluminum and copper alloy piping, piping components, and piping elements exposed to treated water	Loss of material due to pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. Loss of material in copper alloy components exposed to treated water is managed by the Water Chemistry Control – Primary and Secondary Program. The One-Time Inspection Program will be used to verify the effectiveness of the water chemistry program. There are no aluminum components exposed to treated water with intended functions in the steam and power conversion systems. See Section 3.4.2.2.7 item 1.
3.4.1-16	Stainless steel piping, piping components, and piping elements; tanks, and heat exchanger components exposed to treated water	Loss of material due to pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. Loss of material in stainless steel components exposed to treated water is managed by the Water Chemistry Control – Primary and Secondary Program. The One-Time Inspection Program will be used to verify the effectiveness of the water chemistry program. See Section 3.4.2.2.7 item 1.

Table 3.4.1: Steam and Power Conversion Systems, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4.1-17	Stainless steel piping, piping components, and piping elements exposed to soil	Loss of material due to pitting and crevice corrosion	Plant specific	Yes, plant specific	Not applicable. There are no stainless steel components exposed to soil in the steam and power conversion systems. See Section 3.4.2.2.7 item 2.
3.4.1-18	Copper alloy piping, piping components, and piping elements exposed to lubricating oil	Loss of material due to pitting and crevice corrosion	Lubricating Oil Analysis and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Loss of material in copper alloy components exposed to lubricating oil is managed by the Oil Analysis Program. The One-Time Inspection Program will be used to confirm the effectiveness of the Oil Analysis Program. See Section 3.4.2.2.7 item 3.
3.4.1-19	Stainless steel piping, piping components, piping elements, and heat exchanger components exposed to lubricating oil	Loss of material due to pitting, crevice, and microbiologically-influenced corrosion	Lubricating Oil Analysis and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Loss of material in stainless steel components exposed to lubricating oil is managed by the Oil Analysis Program. The One-Time Inspection Program will be used to confirm the effectiveness of the Oil Analysis Program. The components to which this NUREG-1801 line item applies are included in scope under criterion 10 CFR 54.4(a)(2) and listed in series 3.3.2-19-xx tables. See Section 3.4.2.2.8

Table 3.4.1: Steam and Power Conversion Systems, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4.1-20	Steel tanks exposed to air – outdoor (external)	Loss of material/ general, pitting, and crevice corrosion	Aboveground Steel Tanks	No	Consistent with NUREG-1801. Loss of material in steel tanks exposed to outdoor air is managed by the Aboveground Steel Tanks Program.
3.4.1-21	High-strength steel closure bolting exposed to air with steam or water leakage	Cracking due to cyclic loading, stress corrosion cracking	Bolting Integrity	No	Not applicable. High-strength steel closure bolting is not used in the steam and power conversion systems.

Table 3.4.1: Steam and Power Conversion Systems, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4.1-22	Steel bolting and closure bolting exposed to air with steam or water leakage, air – outdoor (external), or air – indoor uncontrolled (external);	Loss of material due to general, pitting and crevice corrosion; loss of preload due to thermal effects, gasket creep, and self-loosening	Bolting Integrity	No	Consistent with NUREG-1801 for bolting susceptible to loss of material. The Bolting Integrity Program manages the loss of material for steel bolting. Loss of preload is not an applicable aging effect. Loss of preload is a design-driven effect and not an aging effect requiring management. Bolting at IPEC is standard grade B7 low alloy steel, or similar material, except in rare specialized applications such as where stainless steel bolting is utilized. Loss of preload due to stress relaxation (creep) would only be a concern in very high temperature applications (> 700°F), as stated in the ASME Code, Section II, Part D, Table 4. No IPEC bolting operates at > 700°F. Therefore, loss of preload due to stress relaxation (creep) is not an applicable aging effect for steam and power conversion systems. Other issues such as gasket creep and self loosening that may result in pressure boundary joint leakage are improper design or maintenance issues. (continued)

Table 3.4.1: Steam and Power Conversion Systems, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
					Improper bolting application (design) and maintenance issues are current plant operational concerns and not related to aging effects or mechanisms that require management during the period of extended operation. As described in the Bolting Integrity Program, IPEC has taken actions to address NUREG–1339, *Resolution to Generic Safety Issue 29: Bolting Degradation or Failure in Nuclear Power Plants*. These actions include implementation of good bolting practices in accordance with EPRI NP-5067, Good Bolting Practices. Proper joint preparation and make-up in accordance with industry standards is expected to preclude loss of preload. This has been confirmed by operating experience at IPEC.
3.4.1-23	Stainless steel piping, piping components, and piping elements exposed to closed-cycle cooling water >60°C (>140°F)	Cracking due to stress corrosion cracking	Closed-Cycle Cooling Water System	No	Not applicable. There are no stainless steel components exposed to closed cycle cooling water > 140°F in the steam and power conversion systems.

Table 3.4.1: Steam and Power Conversion Systems, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4.1-24	Steel heat exchanger components exposed to closed cycle cooling water	Loss of material due to general, pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	No	Consistent with NUREG-1801. Loss of material in steel components exposed to closed cycle cooling water is managed by the Water Chemistry Control – Closed Cooling Water Program. These components are included in scope under criterion 10 CFR 54.4(a)(2) and listed in series 3.3.2-19-xx tables.
3.4.1-25	Stainless steel piping, piping components, piping elements, and heat exchanger components exposed to closed cycle cooling water	Loss of material due to pitting and crevice corrosion	Closed-Cycle Cooling Water System	No	Consistent with NUREG-1801. Loss of material in stainless steel components exposed to closed cycle cooling water is managed by the Water Chemistry Control – Closed Cooling Water Program. These components are included in scope under criterion 10 CFR 54.4(a)(2) and listed in series 3.3.2-19-xx tables.
3.4.1-26	Copper alloy piping, piping components, and piping elements exposed to closed cycle cooling water	Loss of material due to pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	No	Consistent with NUREG-1801. Loss of material in copper alloy components exposed to closed cycle cooling water is managed by the Water Chemistry Control – Closed Cooling Water Program. These components are included in scope under criterion 10 CFR 54.4(a)(2) and listed in series 3.3.2-19-xx tables.

Table 3.4.1: Steam and Power Conversion Systems, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4.1-27	Steel, stainless steel, and copper alloy heat exchanger tubes exposed to closed cycle cooling water	Reduction of heat transfer due to fouling	Closed-Cycle Cooling Water System	No	Not applicable. There are no heat exchanger tubes with a heat transfer intended function exposed to closed cycle cooling water in the steam and power conversion systems.
3.4.1-28	Steel external surfaces exposed to air – indoor uncontrolled (external), condensation (external), or air outdoor (external)	Loss of material due to general corrosion	External Surfaces Monitoring	No	Consistent with NUREG-1801 for components susceptible to loss of material. The External Surfaces Monitoring Program manages the loss of material for external surfaces of steel components.
3.4.1-29	Steel piping, piping components, and piping elements exposed to steam or treated water	Wall thinning due to flow-accelerated corrosion	Flow-Accelerated Corrosion	No	Consistent with NUREG-1801. The Flow-Accelerated Corrosion Program manages loss of material in steel components exposed to steam or treated water.

Table 3.4.1: Steam and Power Conversion Systems, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4.1-30	Steel piping, piping components, and piping elements exposed to air outdoor (internal) or condensation (internal)	Loss of material due to general, pitting, and crevice corrosion	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	No	The only steel components with intended functions in the steam and power conversion systems with internal surfaces exposed to outdoor air or condensation are the condensate storage tanks. The tank vapor space is nitrogen blanketed but the environment is conservatively assumed to be condensation. Loss of material for these tank surfaces is managed by controlling the tank water chemistry with the Water Chemistry Control – Primary and Secondary Program. The One-Time Inspection Program will be used to verify the effectiveness of the water chemistry program.
3.4.1-31	Steel heat exchanger components exposed to raw water	Loss of material due to general, pitting, crevice, galvanic, and microbiologically-influenced corrosion, and fouling	Open-Cycle Cooling Water System	No	Not applicable. There are no steel heat exchanger components with intended functions exposed to raw water in the steam and power conversion systems.

Table 3.4.1: Steam and Power Conversion Systems, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4.1-32	Stainless steel and copper alloy piping, piping components, and piping elements exposed to raw water	Loss of material due to pitting, crevice, and microbiologically-influenced corrosion	Open-Cycle Cooling Water System	No	The Periodic Surveillance and Preventive Maintenance Program uses periodic visual inspections to manage loss of material for copper alloy components exposed to raw water. The One-Time Inspection Program will use visual or other NDE techniques to confirm the absence of significant loss of material for stainless steel components exposed to raw water. The components to which this NUREG-1801 line item applies are included in scope under criterion 10 CFR 54.4(a)(2) and listed in series 3.3.2-19-xx tables for systems other than service water.
3.4.1-33	Stainless steel heat exchanger components exposed to raw water	Loss of material due to pitting, crevice, and microbiologically-influenced corrosion, and fouling	Open-Cycle Cooling Water System	No	Not applicable. There are no stainless steel heat exchanger components exposed to raw water in the steam and power conversion systems.

Table 3.4.1: Steam and Power Conversion Systems, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4.1-34	Steel, stainless steel, and copper alloy heat exchanger tubes exposed to raw water	Reduction of heat transfer due to fouling	Open-Cycle Cooling Water System	No	Not applicable. There are no heat exchanger tubes exposed to raw water with an intended function of heat transfer in the steam and power conversion systems.
3.4.1-35	Copper alloy >15% Zn piping, piping components, and piping elements exposed to closed cycle cooling water, raw water, or treated water	Loss of material due to selective leaching	Selective Leaching of Materials	No	Consistent with NUREG-1801. Loss of material in copper alloy > 15% Zinc components is managed by the Selective Leaching Program. The components to which this NUREG-1801 line item applies are in scope under criterion 10 CFR 54.4(a)(2), listed in series 3.3.2-19-xx tables.
3.4.1-36	Gray cast iron piping, piping components, and piping elements exposed to soil, treated water, or raw water	Loss of material due to selective leaching	Selective Leaching of Materials	No	Not applicable. There are no gray cast iron components exposed to soil, treated water, or raw water with intended functions in the steam and power conversion systems.

Table 3.4.1: Steam and Power Conversion Systems, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4.1-37	Steel, stainless steel, and nickel-based alloy piping, piping components, and piping elements exposed to steam	Loss of material due to pitting and crevice corrosion	Water Chemistry	No	Consistent with NUREG-1801 for steam and power conversion system components. The loss of material in steel and stainless steel components exposed to steam is managed by the Water Chemistry Control – Primary and Secondary Program. There are no nickel alloy components exposed to steam in the steam and power conversion systems. For stainless steel components exposed to steam in systems with controlled water chemistry, such as the house service boiler system, the Water Chemistry Control – Auxiliary Systems Program manages loss of material. The One-Time Inspection Program for Water Chemistry will use inspections or non-destructive examinations of representative samples to verify that the Water Chemistry Control – Auxiliary Systems and Water Chemistry Control – Primary and Secondary Programs have been effective at managing aging effects.

Table 3.4.1: Steam and Power Conversion Systems, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4.1-38	Steel bolting and external surfaces exposed to air with borated water leakage	Loss of material due to boric acid corro-sion	Boric Acid Corrosion	No	Not applicable. There are no steel components exposed to air with borated water leakage in the steam and power conversion systems.
3.4.1-39	Stainless steel piping, piping components, and piping elements exposed to steam	Cracking due to stress corrosion cracking	Water Chemistry	No	Consistent with NUREG-1801 for steam and power conversion system components. Cracking of stainless steel components exposed to steam is managed by the Water Chemistry Control – Primary and Secondary Program. For stainless steel components exposed to steam in systems with controlled water chemistry, such as the house service boiler system, the Water Chemistry Control – Auxiliary Systems Program manages cracking. The One-Time Inspection Program for Water Chemistry will use inspections or non-destructive examinations of representative samples to verify that the Water Chemistry Control – Auxiliary Systems and Water Chemistry Control – Primary and Secondary Programs have been effective at managing aging effects.

Table 3.4.1: Steam and Power Conversion Systems, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4.1-40	Glass piping elements exposed to air, lubricating oil, raw water, and treated water	None	None	NA - No AEM or AMP	Consistent with NUREG-1801.
3.4.1-41	Stainless steel, copper alloy, and nickel alloy piping, piping components, and piping elements exposed to air – indoor uncontrolled (external)	None	None	NA - No AEM or AMP	Consistent with NUREG-1801.
3.4.1-42	Steel piping, piping components, and piping elements exposed to air – indoor controlled (external)	None	None	NA - No AEM or AMP	Not applicable. There are no steel components exposed to air – indoor controlled in the steam and power conversion systems. All indoor air environments are conservatively considered to be uncontrolled.
3.4.1-43	Steel and stainless steel piping, piping components, and piping elements in concrete	None	None	NA - No AEM or AMP	Not applicable. There are no steel or stainless steel components with intended functions embedded in concrete in the steam and power conversion systems.

Table 3.4.1: Steam and Power Conversion Systems, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4.1-44	Steel, stainless steel, aluminum, and copper alloy piping, piping components, and piping elements exposed to gas	None	None	NA - No AEM or AMP	Consistent with NUREG-1801 for steel, stainless steel and aluminum components exposed to gas. There are no copper alloy components exposed to gas in the steam and power conversion systems.

Notes for Tables 3.4.2-1-IP2 through 3.4.2-4-IP3

Generic Notes

A. Consistent with NUREG-1801 item for component, material, environment, aging effect and aging management program. AMP is consistent with NUREG-1801 AMP.

B. Consistent with NUREG-1801 item for component, material, environment, aging effect and aging management program. AMP has exceptions to NUREG-1801 AMP.

C. Component is different, but consistent with NUREG-1801 item for material, environment, aging effect and aging management program. AMP is consistent with NUREG-1801 AMP.

D. Component is different, but consistent with NUREG-1801 item for material, environment, aging effect and aging management program. AMP has exceptions to NUREG-1801 AMP.

E. Consistent with NUREG-1801 material, environment, and aging effect but a different aging management program is credited.

F. Material not in NUREG-1801 for this component.

G. Environment not in NUREG-1801 for this component and material.

H. Aging effect not in NUREG-1801 for this component, material and environment combination.

I. Aging effect in NUREG-1801 for this component, material and environment combination is not applicable.

J. Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant-Specific Notes

401. These components remain at high temperature during normal operation which precludes moisture condensation and the resulting corrosion.

402. This environment is inside the condensate storage tank. The tank vapor space is nitrogen blanketed but the environment is conservatively assumed to be condensation.

403. This treated water environment is controlled by the Water Chemistry Control – Auxiliary Systems Program. Although this environment does not directly compare with any NUREG-1801 defined environment, it approximates the NUREG-1801 defined closed cycle cooling water environment.

404. The One-Time Inspection Program will verify effectiveness of the Water Chemistry Control – Primary and Secondary Program.

405. The One-Time Inspection Program will verify effectiveness of the Oil Analysis Program.

406. This treated water environment is similar or equivalent to secondary coolant. For the purposes of evaluating the aging effect of cracking due to fatigue, this environment may be compared to treated borated water.

407. This treated water environment includes water that has been treated but is not maintained by a chemistry control program, such as water from the city water system. There is no environment in NUREG-1801 that will support a useful comparison for this line.

Table 3.4.2-1-IP2
Main Steam System
Summary of Aging Management Review

Table 3.4.2-1-IP2: Main Steam System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	None	None	VIII.H-4 (S-34)	3.4.1-22	I, 401
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	C
Flow element	Pressure boundary	Carbon steel	Air – indoor (ext)	None	None	VIII.H-7 (S-29)	3.4.1-28	I, 401
Flow element	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1-10 (S-08)	3.4.1-1	A
Flow element	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Flow-Accelerated Corrosion	VIII.B1-9 (S-15)	3.4.1-29	A
Flow element	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1-8 (S-07)	3.4.1-37	A
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	None	None	VIII.H-7 (S-29)	3.4.1-28	I, 401
Piping	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	External Surfaces Monitoring	V.A-19 (S-29)	3.2.1-32	E

Table 3.4.2-1-IP2: Main Steam System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Piping	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H-8 (S-41)	3.4.1-28	A
Piping	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1-10 (S-08)	3.4.1-1	A
Piping	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Flow-Accelerated Corrosion	VIII.B1-9 (S-15)	3.4.1-29	A
Piping	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1-8 (S-07)	3.4.1-37	A
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
Piping	Pressure boundary	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.B1-2 (SP-44)	3.4.1-39	A
Piping	Pressure boundary	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	--	--	H
Piping	Pressure boundary	Stainless steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1-3 (SP-43)	3.4.1-37	A
Silencer	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	External Surfaces Monitoring	V.A-19 (S-29)	3.2.1-32	E

Table 3.4.2-1-IP2: Main Steam System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Silencer	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H-8 (S-41)	3.4.1-28	A
Steam trap	Pressure boundary	Carbon steel	Air – indoor (ext)	None	None	VIII.H-7 (S-29)	3.4.1-28	I, 401
Steam trap	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1-10 (S-08)	3.4.1-1	A
Steam trap	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Flow-Accelerated Corrosion	VIII.B1-9 (s-15)	3.4.1-29	A
Steam trap	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1-8 (S-07)	3.4.1-37	A
Strainer	Filtration	Stainless steel	Steam (ext)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.B1-2 (SP-44)	3.4.1-39	A
Strainer	Filtration	Stainless steel	Steam (ext)	Cracking – fatigue	TLAA – metal fatigue	--	--	F
Strainer	Filtration	Stainless steel	Steam (ext)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1-3 (SP-43)	3.4.1-37	A
Strainer	Filtration	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.B1-2 (SP-44)	3.4.1-39	A

Table 3.4.2-1-IP2: Main Steam System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Strainer	Filtration	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	--	--	H
Strainer	Filtration	Stainless steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1-3 (SP-43)	3.4.1-37	A
Strainer housing	Pressure boundary	Carbon steel	Air – indoor (ext)	None	None	VIII.H-7 (S-29)	3.4.1-28	I, 401
Strainer housing	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1-10 (S-08)	3.4.1-1	A
Strainer housing	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Flow-Accelerated Corrosion	VIII.B1-9 (S-15)	3.4.1-29	A
Strainer housing	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1-8 (S-07)	3.4.1-37	A
Thermowell	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
Thermowell	Pressure boundary	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.B1-2 (SP-44)	3.4.1-39	A
Thermowell	Pressure boundary	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	--	--	H

Table 3.4.2-1-IP2: Main Steam System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Thermowell	Pressure boundary	Stainless steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1-3 (SP-43)	3.4.1-37	A
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
Tubing	Pressure boundary	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.B1-2 (SP-44)	3.4.1-39	A
Tubing	Pressure boundary	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	--	--	H
Tubing	Pressure boundary	Stainless steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1-3 (SP-43)	3.4.1-37	A
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	None	None	VIII.H-7 (S-29)	3.4.1-28	I, 401
Valve body	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1-10 (S-08)	3.4.1-1	A
Valve body	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Flow-Accelerated Corrosion	VIII.B1-9 (S-15)	3.4.1-29	A
Valve body	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1-8 (S-07)	3.4.1-37	A

Table 3.4.2-1-IP2: Main Steam System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
Valve body	Pressure boundary	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.B1-2 (SP-44)	3.4.1-39	A
Valve body	Pressure boundary	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	--	--	H
Valve body	Pressure boundary	Stainless steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1-3 (SP-43)	3.4.1-37	A

Table 3.4.2-1-IP3
Main Steam System
Summary of Aging Management Review

Table 3.4.2-1-IP3: Main Steam System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	None	None	VIII.H-4 (S-34)	3.4.1-22	I, 401
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	C
Flow element	Pressure boundary	Carbon steel	Air – indoor (ext)	None	None	VIII.H-7 (S-29)	3.4.1-28	I, 401
Flow element	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1-10 (S-08)	3.4.1-1	A
Flow element	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Flow-Accelerated Corrosion	VIII.B1-9 (S-15)	3.4.1-29	A
Flow element	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1-8 (S-07)	3.4.1-37	A
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	None	None	VIII.H-7 (S-29)	3.4.1-28	I, 401
Piping	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	External Surfaces Monitoring	V.A-19 (S-29)	3.2.1-32	E

Table 3.4.2-1-IP3: Main Steam System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Piping	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H-8 (S-41)	3.4.1-28	A
Piping	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1-10 (S-08)	3.4.1-1	A
Piping	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Flow-Accelerated Corrosion	VIII.B1-9 (S-15)	3.4.1-29	A
Piping	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1-8 (S-07)	3.4.1-37	A
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
Piping	Pressure boundary	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.B1-2 (SP-44)	3.4.1-39	A
Piping	Pressure boundary	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	--	--	H
Piping	Pressure boundary	Stainless steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1-3 (SP-43)	3.4.1-37	A
Silencer	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	External Surfaces Monitoring	V.A-19 (S-29)	3.2.1-32	E

Table 3.4.2-1-IP3: Main Steam System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Silencer	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H-8 (S-41)	3.4.1-28	A
Steam trap	Pressure boundary	Carbon steel	Air – indoor (ext)	None	None	VIII.H-7 (S-29)	3.4.1-28	I, 401
Steam trap	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1-10 (S-08)	3.4.1-1	A
Steam trap	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Flow-Accelerated Corrosion	VIII.B1-9 (S-15)	3.4.1-29	A
Steam trap	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1-8 (S-07)	3.4.1-37	A
Strainer	Filtration	Stainless steel	Steam (ext)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.B1-2 (SP-44)	3.4.1-39	A
Strainer	Filtration	Stainless steel	Steam (ext)	Cracking – fatigue	TLAA – metal fatigue	--	--	F
Strainer	Filtration	Stainless steel	Steam (ext)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1-3 (SP-43)	3.4.1-37	A
Strainer	Filtration	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.B1-2 (SP-44)	3.4.1-39	A

Table 3.4.2-1-IP3: Main Steam System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Strainer	Filtration	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	--	--	H
Strainer	Filtration	Stainless steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1-3 (SP-43)	3.4.1-37	A
Strainer housing	Pressure boundary	Carbon steel	Air – indoor (ext)	None	None	VIII.H-7 (S-29)	3.4.1-28	I, 401
Strainer housing	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1-10 (S-08)	3.4.1-1	A
Strainer housing	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Flow-Accelerated Corrosion	VIII.B1-9 (S-15)	3.4.1-29	A
Strainer housing	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1-8 (S-07)	3.4.1-37	A
Thermowell	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
Thermowell	Pressure boundary	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.B1-2 (SP-44)	3.4.1-39	A
Thermowell	Pressure boundary	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	--	--	H

Table 3.4.2-1-IP3: Main Steam System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Thermowell	Pressure boundary	Stainless steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1-3 (SP-43)	3.4.1-37	A
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
Tubing	Pressure boundary	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.B1-2 (SP-44)	3.4.1-39	A
Tubing	Pressure boundary	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	--	--	H
Tubing	Pressure boundary	Stainless steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1-3 (SP-43)	3.4.1-37	A
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	None	None	VIII.H-7 (S-29)	3.4.1-28	I, 401
Valve body	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1-10 (S-08)	3.4.1-1	A
Valve body	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Flow-Accelerated Corrosion	VIII.B1-9 (S-15)	3.4.1-29	A
Valve body	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1-8 (S-07)	3.4.1-37	A

Table 3.4.2-1-IP3: Main Steam System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
Valve body	Pressure boundary	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.B1-2 (SP-44)	3.4.1-39	A
Valve body	Pressure boundary	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	--	--	H
Valve body	Pressure boundary	Stainless steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1-3 (SP-43)	3.4.1-37	A

Table 3.4.2-2-IP2
Main Feedwater System
Summary of Aging Management Review

Table 3.4.2-2-IP2: Main Feedwater System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	None	None	--	--	I, 401
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	C
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	None	None	--	--	I, 401
Piping	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.D1-7 (S-11)	3.4.1-1	A
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Flow-Accelerated Corrosion	VIII.D1-9 (S-16)	3.4.1-29	A
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.D1-8 (S-10)	3.4.1-4	A, 404
Thermowell	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
Thermowell	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.D1-5 (SP-17)	3.4.1-14	A, 404

Table 3.4.2-2-IP2: Main Feedwater System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Thermowell	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E1-16 (A-57)	3.3.1-2	C, 406
Thermowell	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.D1-4 (SP-16)	3.4.1-16	A, 404
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.D1-5 (SP-17)	3.4.1-14	A, 404
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E1-16 (A-57)	3.3.1-2	C, 406
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.D1-4 (SP-16)	3.4.1-16	A, 404
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	None	None	--	--	I, 401
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.D1-7 (S-11)	3.4.1-1	A
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Flow-Accelerated Corrosion	VIII.D1-9 (S-16)	3.4.1-29	A

Table 3.4.2-2-IP2: Main Feedwater System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.D1-8 (S-10)	3.4.1-4	A, 404
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
Valve body	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.D1-5 (SP-17)	3.4.1-14	A, 404
Valve body	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E1-16 (A-57)	3.3.1-2	C, 406
Valve body	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.D1-4 (SP-16)	3.4.1-16	A, 404

Table 3.4.2-2-IP3
Main Feedwater System
Summary of Aging Management Review

Table 3.4.2-2-IP3: Main Feedwater System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	None	None	--	--	I, 401
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	C
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	None	None	--	--	I, 401
Piping	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.D1-7 (S-11)	3.4.1-1	A
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Flow-Accelerated Corrosion	VIII.D1-9 (S-16)	3.4.1-29	A
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.D1-8 (S-10)	3.4.1-4	A, 404
Thermowell	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
Thermowell	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.D1-5 (SP-17)	3.4.1-14	A, 404

Table 3.4.2-2-IP3: Main Feedwater System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Thermowell	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E1-16 (A-57)	3.3.1-2	C, 406
Thermowell	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.D1-4 (SP-16)	3.4.1-16	A, 404
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.D1-5 (SP-17)	3.4.1-14	A, 404
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E1-16 (A-57)	3.3.1-2	C, 406
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.D1-4 (SP-16)	3.4.1-16	A, 404
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	None	None	--	--	I, 401
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.D1-7 (S-11)	3.4.1-1	A
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Flow-Accelerated Corrosion	VIII.D1-9 (S-16)	3.4.1-29	A

Table 3.4.2-2-IP3: Main Feedwater System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.D1-8 (S-10)	3.4.1-4	A, 404
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
Valve body	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.D1-5 (SP-17)	3.4.1-14	A, 404
Valve body	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E1-16 (A-57)	3.3.1-2	C, 406
Valve body	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.D1-4 (SP-16)	3.4.1-16	A, 404

Table 3.4.2-3-IP2
Auxiliary Feedwater System
Summary of Aging Management Review

Table 3.4.2-3-IP2: Auxiliary Feedwater System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VIII.H-4 (S-34)	3.4.1-22	A
Bolting	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	Bolting Integrity	VIII.H-1 (S-32)	3.4.1-22	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	C
Bolting	Pressure boundary	Stainless steel	Air – outdoor (ext)	Loss of material	Bolting Integrity	--	--	G
Flex hose	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
Flex hose	Pressure boundary	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.A-10 (SP-44)	3.4.1-39	C
Flex hose	Pressure boundary	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	--	--	H
Flex hose	Pressure boundary	Stainless steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.A-12 (SP-43)	3.4.1-37	C

Table 3.4.2-3-IP2: Auxiliary Feedwater System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Flow element	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
Flow element	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.G-32 (SP-16)	3.4.1-16	A, 404
Heat exchanger (shell)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H-7 (S-29)	3.4.1-28	A
Heat exchanger (shell)	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VIII.G-6 (S-17)	3.4.1-12	B, 405
Heat exchanger (tubes)	Heat transfer	Copper alloy	Lube oil (ext)	Fouling	Oil Analysis	VIII.G-8 (SP-53)	3.4.1-10	B, 405
Heat exchanger (tubes)	Heat transfer	Copper alloy	Treated water (int)	Fouling	Water Chemistry Control – Primary and Secondary	VIII.G-10 (SP-58)	3.4.1-9	A, 404
Heat exchanger (tubes)	Pressure boundary	Copper alloy	Lube oil (ext)	Loss of material	Oil Analysis	VIII.G-19 (SP-32)	3.4.1-18	B, 405
Heat exchanger (tubes)	Pressure boundary	Copper alloy	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.A-5 (SP-61)	3.4.1-15	C, 404

Table 3.4.2-3-IP2: Auxiliary Feedwater System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Orifice	Pressure boundary Flow control	Stainless steel	Air – indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
Orifice	Pressure boundary Flow control	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.G-32 (SP-16)	3.4.1-16	A, 404
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H-7 (S-29)	3.4.1-28	A
Piping	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H-8 (S-41)	3.4.1-28	A
Piping	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	Water Chemistry Control – Primary and Secondary	--	--	G, 402
Piping	Pressure boundary	Carbon steel	Gas (int)	None	None	VIII.I-15 (SP-4)	3.4.1-44	A
Piping	Pressure boundary	Carbon steel	Soil (ext)	Loss of material	Buried Piping and Tanks Inspection	VIII.G-1 (S-01)	3.4.1-11	A
Piping	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1-10 (S-08)	3.4.1-1	C
Piping	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Flow-Accelerated Corrosion	VIII.B1-9 (S-15)	3.4.1-29	C

Table 3.4.2-3-IP2: Auxiliary Feedwater System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Piping	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.A-16 (S-06)	3.4.1-2	C, 404
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	--	--	G, 407
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.G-38 (S-10)	3.4.1-4	A, 404
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
Piping	Pressure boundary	Stainless steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	--	--	G
Piping	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	Water Chemistry Control – Primary and Secondary	--	--	G, 402
Piping	Pressure boundary	Stainless steel	Gas (int)	None	None	VIII.I-12 (SP-15)	3.4.1-44	A
Piping	Pressure boundary	Stainless steel	Treated water (ext)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.G-32 (SP-16)	3.4.1-16	A, 404

Table 3.4.2-3-IP2: Auxiliary Feedwater System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Piping	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.G-32 (SP-16)	3.4.1-16	A, 404
Pump casing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H-7 (S-29)	3.4.1-28	A
Pump casing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.G-38 (S-10)	3.4.1-4	A, 404
Sight glass	Pressure boundary	Copper alloy	Air – indoor (ext)	None	None	VIII.I-2 (SP-6)	3.4.1-41	A
Sight glass	Pressure boundary	Copper alloy	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.A-5 (SP-61)	3.4.1-15	C, 404
Sight glass	Pressure boundary	Glass	Air – indoor (ext)	None	None	VIII.I-4 (SP-33)	3.4.1-40	A
Sight glass	Pressure boundary	Glass	Treated water (int)	None	None	VIII.I-8 (SP-35)	3.4.1-40	A
Steam trap	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H-7 (S-29)	3.4.1-28	A
Steam trap	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1-10 (S-08)	3.4.1-1	C

Table 3.4.2-3-IP2: Auxiliary Feedwater System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Steam trap	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Flow-Accelerated Corrosion	VIII.B1-9 (S-15)	3.4.1-29	C
Steam trap	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.A-16 (S-06)	3.4.1-2	C, 404
Steam trap	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.G-38 (S-10)	3.4.1-4	A, 404
Strainer	Filtration	Stainless steel	Steam (ext)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.A-10 (SP-44)	3.4.1-39	C
Strainer	Filtration	Stainless steel	Steam (ext)	Cracking – fatigue	TLAA – metal fatigue	--	--	F
Strainer	Filtration	Stainless steel	Steam (ext)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.A-12 (SP-43)	3.4.1-37	C
Strainer	Filtration	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.A-10 (SP-44)	3.4.1-39	C
Strainer	Filtration	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	--	--	H
Strainer	Filtration	Stainless steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.A-12 (SP-43)	3.4.1-37	C

Table 3.4.2-3-IP2: Auxiliary Feedwater System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Strainer housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H-7 (S-29)	3.4.1-28	A
Strainer housing	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1-10 (S-08)	3.4.1-1	C
Strainer housing	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Flow-Accelerated Corrosion	VIII.B1-9 (S-15)	3.4.1-29	C
Strainer housing	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.A-16 (S-06)	3.4.1-2	C, 404
Strainer housing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.G-38 (S-10)	3.4.1-4	A, 404
Tank	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	Aboveground Steel Tanks	VIII.G-40 (S-31)	3.4.1-20	A
Tank	Pressure boundary	Carbon steel	Concrete and oiled sand (ext)	Loss of material	Aboveground Steel Tanks	--	--	G
Tank	Pressure boundary	Carbon steel	Condensation (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.G-34 (SP-60)	3.4.1-30	E, 402
Tank	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.G-41 (S-13)	3.4.1-6	A, 404

Table 3.4.2-3-IP2: Auxiliary Feedwater System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Thermowell	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H-7 (S-29)	3.4.1-28	A
Thermowell	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.G-38 (S-10)	3.4.1-4	A, 404
Tubing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H-7 (S-29)	3.4.1-28	A
Tubing	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1-10 (S-08)	3.4.1-1	C
Tubing	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.A-16 (S-06)	3.4.1-2	C, 404
Tubing	Pressure boundary	Copper alloy	Air – indoor (ext)	None	None	VIII.I-2 (SP-6)	3.4.1-41	A
Tubing	Pressure boundary	Copper alloy	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	--	--	G
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
Tubing	Pressure boundary	Stainless steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	--	--	G

Table 3.4.2-3-IP2: Auxiliary Feedwater System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Tubing	Pressure boundary	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.A-10 (SP-44)	3.4.1-39	C
Tubing	Pressure boundary	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	--	--	H
Tubing	Pressure boundary	Stainless steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.A-12 (SP-43)	3.4.1-37	C
Tubing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	One-Time Inspection	--	--	G, 407
Tubing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.G-32 (SP-16)	3.4.1-16	A, 404
Turbine housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H-7 (S-29)	3.4.1-28	A
Turbine housing	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.A-16 (S-06)	3.4.1-2	C, 404
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H-7 (S-29)	3.4.1-28	A
Valve body	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H-8 (S-41)	3.4.1-28	A

Table 3.4.2-3-IP2: Auxiliary Feedwater System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Carbon steel	Gas (int)	None	None	VIII.I-15 (SP-4)	3.4.1-44	A
Valve body	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1-10 (S-08)	3.4.1-1	C
Valve body	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Flow-Accelerated Corrosion	VIII.B1-9 (S-15)	3.4.1-29	C
Valve body	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.A-16 (S-06)	3.4.1-2	C, 404
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	--	--	G, 407
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.G-38 (S-10)	3.4.1-4	A, 404
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
Valve body	Pressure boundary	Stainless steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	--	--	G
Valve body	Pressure boundary	Stainless steel	Gas (int)	None	None	VIII.I-12 (SP-15)	3.4.1-44	A

Table 3.4.2-3-IP2: Auxiliary Feedwater System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.A-10 (SP-44)	3.4.1-39	C
Valve body	Pressure boundary	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	--	--	H
Valve body	Pressure boundary	Stainless steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.A-12 (SP-43)	3.4.1-37	C
Valve body	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	One-Time Inspection	--	--	G, 407
Valve body	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.G-32 (SP-16)	3.4.1-16	A, 404
Valve body	Pressure boundary Flow control	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H-7 (S-29)	3.4.1-28	A
Valve body	Pressure boundary Flow control	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1-10 (S-08)	3.4.1-1	C
Valve body	Pressure boundary Flow control	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.A-16 (S-06)	3.4.1-2	C, 404

Table 3.4.2-3-IP2: Auxiliary Feedwater System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Valve body	Pressure boundary Flow control	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.G-38 (S-10)	3.4.1-4	A, 404
Valve body	Pressure boundary Flow control	Stainless steel	Air – indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
Valve body	Pressure boundary Flow control	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.A-10 (SP-44)	3.4.1-39	C
Valve body	Pressure boundary Flow control	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	--	--	H
Valve body	Pressure boundary Flow control	Stainless steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.A-12 (SP-43)	3.4.1-37	C

Table 3.4.2-3-IP3
Auxiliary Feedwater System
Summary of Aging Management Review

Table 3.4.2-3-IP3: Auxiliary Feedwater System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VIII.H-4 (S-34)	3.4.1-22	A
Bolting	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	Bolting Integrity	VIII.H-1 (S-32)	3.4.1-22	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	C
Bolting	Pressure boundary	Stainless steel	Air – outdoor (ext)	Loss of material	Bolting Integrity	--	--	G
Flex hose	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
Flex hose	Pressure boundary	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.A-10 (SP-44)	3.4.1-39	C
Flex hose	Pressure boundary	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	--	--	H
Flex hose	Pressure boundary	Stainless steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.A-12 (SP-43)	3.4.1-37	C

Table 3.4.2-3-IP3: Auxiliary Feedwater System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Flow element	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
Flow element	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.G-32 (SP-16)	3.4.1-16	A, 404
Heat exchanger (shell)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H-7 (S-29)	3.4.1-28	A
Heat exchanger (shell)	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VIII.G-6 (S-17)	3.4.1-12	B, 405
Heat exchanger (tubes)	Heat transfer	Copper alloy	Lube oil (ext)	Fouling	Oil Analysis	VIII.G-8 (SP-53)	3.4.1-10	B, 405
Heat exchanger (tubes)	Heat transfer	Copper alloy	Treated water (int)	Fouling	Water Chemistry Control – Primary and Secondary	VIII.G-10 (SP-58)	3.4.1-9	A, 404
Heat exchanger (tubes)	Pressure boundary	Copper alloy	Lube oil (ext)	Loss of material	Oil Analysis	VIII.G-19 (SP-32)	3.4.1-18	B, 405
Heat exchanger (tubes)	Pressure boundary	Copper alloy	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.A-5 (SP-61)	3.4.1-15	C, 404

Table 3.4.2-3-IP3: Auxiliary Feedwater System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Orifice	Pressure boundary Flow control	Stainless steel	Air – indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
Orifice	Pressure boundary Flow control	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.G-32 (SP-16)	3.4.1-16	A, 404
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H-7 (S-29)	3.4.1-28	A
Piping	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H-8 (S-41)	3.4.1-28	A
Piping	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	Water Chemistry Control – Primary and Secondary	--	--	G, 402
Piping	Pressure boundary	Carbon steel	Gas (int)	None	None	VIII.I-15 (SP-4)	3.4.1-44	A
Piping	Pressure boundary	Carbon steel	Soil (ext)	Loss of material	Buried Piping and Tanks Inspection	VIII.G-1 (S-01)	3.4.1-11	A
Piping	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1-10 (S-08)	3.4.1-1	C
Piping	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Flow-Accelerated Corrosion	VIII.B1-9 (S-15)	3.4.1-29	C

Table 3.4.2-3-IP3: Auxiliary Feedwater System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Piping	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.A-16 (S-06)	3.4.1-2	C, 404
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	--	--	G, 407
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.G-38 (S-10)	3.4.1-4	A, 404
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
Piping	Pressure boundary	Stainless steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	--	--	G
Piping	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	Water Chemistry Control – Primary and Secondary	--	--	G, 402
Piping	Pressure boundary	Stainless steel	Gas (int)	None	None	VIII.I-12 (SP-15)	3.4.1-44	A
Piping	Pressure boundary	Stainless steel	Treated water (ext)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.G-32 (SP-16)	3.4.1-16	A, 404

Table 3.4.2-3-IP3: Auxiliary Feedwater System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Piping	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.G-32 (SP-16)	3.4.1-16	A, 404
Pump casing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H-7 (S-29)	3.4.1-28	A
Pump casing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.G-38 (S-10)	3.4.1-4	A, 404
Sight glass	Pressure boundary	Copper alloy	Air – indoor (ext)	None	None	VIII.I-2 (SP-6)	3.4.1-41	A
Sight glass	Pressure boundary	Copper alloy	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.A-5 (SP-61)	3.4.1-15	C, 404
Sight glass	Pressure boundary	Glass	Air – indoor (ext)	None	None	VIII.I-4 (SP-33)	3.4.1-40	A
Sight glass	Pressure boundary	Glass	Treated water (int)	None	None	VIII.I-8 (SP-35)	3.4.1-40	A
Steam trap	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H-7 (S-29)	3.4.1-28	A
Steam trap	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1-10 (S-08)	3.4.1-1	C

Table 3.4.2-3-IP3: Auxiliary Feedwater System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Steam trap	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Flow-Accelerated Corrosion	VIII.B1-9 (S-15)	3.4.1-29	C
Steam trap	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.A-16 (S-06)	3.4.1-2	C, 404
Steam trap	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.G-38 (S-10)	3.4.1-4	A, 404
Strainer	Filtration	Stainless steel	Steam (ext)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.A-10 (SP-44)	3.4.1-39	C
Strainer	Filtration	Stainless steel	Steam (ext)	Cracking – fatigue	TLAA – metal fatigue	--	--	F
Strainer	Filtration	Stainless steel	Steam (ext)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.A-12 (SP-43)	3.4.1-37	C
Strainer	Filtration	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.A-10 (SP-44)	3.4.1-39	C
Strainer	Filtration	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	--	--	H
Strainer	Filtration	Stainless steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.A-12 (SP-43)	3.4.1-37	C

Table 3.4.2-3-IP3: Auxiliary Feedwater System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Strainer housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H-7 (S-29)	3.4.1-28	A
Strainer housing	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1-10 (S-08)	3.4.1-1	C
Strainer housing	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Flow-Accelerated Corrosion	VIII.B1-9 (S-15)	3.4.1-29	C
Strainer housing	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.A-16 (S-06)	3.4.1-2	C, 404
Strainer housing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.G-38 (S-10)	3.4.1-4	A, 404
Tank	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	Aboveground Steel Tanks	VIII.G-40 (S-31)	3.4.1-20	A
Tank	Pressure boundary	Carbon steel	Concrete and oiled sand (ext)	Loss of material	Aboveground Steel Tanks	--	--	G
Tank	Pressure boundary	Carbon steel	Condensation (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.G-34 (SP-60)	3.4.1-30	E, 402
Tank	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.G-41 (S-13)	3.4.1-6	A, 404

Table 3.4.2-3-IP3: Auxiliary Feedwater System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Thermowell	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H-7 (S-29)	3.4.1-28	A
Thermowell	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.G-38 (S-10)	3.4.1-4	A, 404
Tubing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H-7 (S-29)	3.4.1-28	A
Tubing	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1-10 (S-08)	3.4.1-1	C
Tubing	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.A-16 (S-06)	3.4.1-2	C, 404
Tubing	Pressure boundary	Copper alloy	Air – indoor (ext)	None	None	VIII.I-2 (SP-6)	3.4.1-41	A
Tubing	Pressure boundary	Copper alloy	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	--	--	G
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
Tubing	Pressure boundary	Stainless steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	--	--	G

Table 3.4.2-3-IP3: Auxiliary Feedwater System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Tubing	Pressure boundary	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.A-10 (SP-44)	3.4.1-39	C
Tubing	Pressure boundary	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	--	--	H
Tubing	Pressure boundary	Stainless steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.A-12 (SP-43)	3.4.1-37	C
Tubing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	One-Time Inspection	--	--	G, 407
Tubing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.G-32 (SP-16)	3.4.1-16	A, 404
Turbine housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H-7 (S-29)	3.4.1-28	A
Turbine housing	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.A-16 (S-06)	3.4.1-2	C, 404
Valve body	Pressure boundary	Aluminum	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	--	--	G
Valve body	Pressure boundary	Aluminum	Gas (int)	None	None	VIII.I-1 (SP-23)	3.4.1-44	A

Table 3.4.2-3-IP3: Auxiliary Feedwater System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H-7 (S-29)	3.4.1-28	A
Valve body	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H-8 (S-41)	3.4.1-28	A
Valve body	Pressure boundary	Carbon steel	Gas (int)	None	None	VIII.I-15 (SP-4)	3.4.1-44	A
Valve body	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1-10 (S-08)	3.4.1-1	C
Valve body	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Flow-Accelerated Corrosion	VIII.B1-9 (S-15)	3.4.1-29	C
Valve body	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.A-16 (S-06)	3.4.1-2	C, 404
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	--	--	G, 407
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.G-38 (S-10)	3.4.1-4	A, 404
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	A

Table 3.4.2-3-IP3: Auxiliary Feedwater System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.A-10 (SP-44)	3.4.1-39	C
Valve body	Pressure boundary	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	--	--	H
Valve body	Pressure boundary	Stainless steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.A-12 (SP-43)	3.4.1-37	C
Valve body	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	One-Time Inspection	--	--	G, 407
Valve body	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.G-32 (SP-16)	3.4.1-16	A, 404
Valve body	Pressure boundary Flow control	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H-7 (S-29)	3.4.1-28	A
Valve body	Pressure boundary Flow control	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1-10 (S-08)	3.4.1-1	C
Valve body	Pressure boundary Flow control	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.A-16 (S-06)	3.4.1-2	C, 404

Table 3.4.2-3-IP3: Auxiliary Feedwater System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary Flow control	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.G-38 (S-10)	3.4.1-4	A, 404
Valve body	Pressure boundary Flow control	Stainless steel	Air – indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
Valve body	Pressure boundary Flow control	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.A-10 (SP-44)	3.4.1-39	C
Valve body	Pressure boundary Flow control	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	--	--	H
Valve body	Pressure boundary Flow control	Stainless steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.A-12 (SP-43)	3.4.1-37	C

Table 3.4.2-4-IP2
Steam Generator Blowdown System
Summary of Aging Management Review

Table 3.4.2-4-IP2: Steam Generator Blowdown System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	None	None	--	--	I, 401
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	C
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	None	None	--	--	I, 401
Piping	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1-10 (S-08)	3.4.1-1	C
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Flow-Accelerated Corrosion	VIII.F-26 (S-16)	3.4.1-29	A
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.F-25 (S-10)	3.4.1-4	A, 404
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	None	None	--	--	I, 401
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1-10 (S-08)	3.4.1-1	C

Table 3.4.2-4-IP2: Steam Generator Blowdown System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Flow-Accelerated Corrosion	VIII.F-26 (S-16)	3.4.1-29	A
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.F-25 (S-10)	3.4.1-4	A, 404

Table 3.4.2-4-IP3
Steam Generator Blowdown System
Summary of Aging Management Review

Table 3.4.2-4-IP3: Steam Generator Blowdown System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	None	None	--	--	I, 401
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	C
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	None	None	--	--	I, 401
Piping	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1-10 (S-08)	3.4.1-1	C
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Flow-Accelerated Corrosion	VIII.F-26 (S-16)	3.4.1-29	A
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.F-25 (S-10)	3.4.1-4	A, 404
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
Piping	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.F-24 (SP-17)	3.4.1-14	A, 404

Table 3.4.2-4-IP3: Steam Generator Blowdown System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Piping	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E1-16 (A-57)	3.3.1-2	C, 406
Piping	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.F-23 (SP-16)	3.4.1-16	A, 404
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.F-24 (SP-17)	3.4.1-14	A, 404
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E1-16 (A-57)	3.3.1-2	C, 406
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.F-23 (SP-16)	3.4.1-16	A, 404
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	None	None	--	--	I, 401
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1-10 (S-08)	3.4.1-1	C
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Flow-Accelerated Corrosion	VIII.F-26 (S-16)	3.4.1-29	A

Table 3.4.2-4-IP3: Steam Generator Blowdown System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.F-25 (S-10)	3.4.1-4	A, 404
Valve body	Pressure boundary	CASS	Air – indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
Valve body	Pressure boundary	CASS	Treated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.F-24 (SP-17)	3.4.1-14	A, 404
Valve body	Pressure boundary	CASS	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E1-16 (A-57)	3.3.1-2	C, 406
Valve body	Pressure boundary	CASS	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.F-23 (SP-16)	3.4.1-16	A, 404
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I-10 (SP-12)	3.4.1-41	A
Valve body	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.F-24 (SP-17)	3.4.1-14	A, 404
Valve body	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E1-16 (A-57)	3.3.1-2	C, 406
Valve body	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.F-23 (SP-16)	3.4.1-16	A, 404

3.5 STRUCTURES AND COMPONENT SUPPORTS

3.5.1 Introduction

This section provides the results of the aging management review for structural components and commodities that are subject to aging management review. The following structures and commodity groups are addressed in this section (descriptions are available in the referenced sections).

- Containment Building (Section 2.4.1)
- Water Control Structures (Section 2.4.2)
- Turbine Building, Auxiliary Building, and Other Structures (Section 2.4.3)
- Bulk Commodities (Section 2.4.4)

Table 3.5.1, Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801, provides the summary of the programs evaluated in NUREG-1801 for structures and component supports. Hyperlinks are provided to the program evaluations in Appendix B.

3.5.2 Results

The following tables summarize the results of aging management reviews and the NUREG-1801 comparison for structures and component supports.

- Table 3.5.2-1 Containment Building—Summary of Aging Management Review
- Table 3.5.2-2 Water Control Structures—Summary of Aging Management Review
- Table 3.5.2-3 Turbine Building, Auxiliary Building, and Other Structures—Summary of Aging Management Review
- Table 3.5.2-4 Bulk Commodities—Summary of Aging Management Review

3.5.2.1 Materials, Environments, Aging Effects Requiring Management and Aging Management Programs

The following sections list the materials, environments, aging effects requiring management, and aging management programs for structural components and commodities subject to aging management review. Programs are described in Appendix B. Further details are provided in the structure and commodities tables.

3.5.2.1.1 Containment Building

Materials

Containment building components subject to aging management review are constructed of the following materials.

- carbon steel
- concrete
- elastomer
- Lubrite
- nickel alloy
- stainless steel

Environment

Containment building components subject to aging management review are exposed to the following environments.

- air – indoor uncontrolled
- air – outdoor
- air with borated water leakage
- exposed to fluid environment
- soil

Aging Effects Requiring Management

The following aging effects associated with containment building components require management.

- cracking
- change in material properties
- loss of material

Aging Management Programs

The following programs are credited for managing the effects of aging on containment building components.

- Boric Acid Corrosion Prevention
- Containment Inservice Inspection (CII– IWE)
- Containment Inservice Inspection (CII– IWL)
- Containment Leak Rate
- Fire Protection
- ISI – IWF
- Periodic Surveillance and Preventive Maintenance
- Structures Monitoring
- Water Chemistry Control – Primary and Secondary

3.5.2.1.2 Water Control Structures

Materials

Water control structures components subject to aging management review are constructed of the following materials.

- carbon steel
- concrete
- concrete brick
- galvanized steel

Environment

Water control structures components subject to aging management review are exposed to the following environments.

- air – indoor uncontrolled
- air – outdoor
- exposed to fluid environment
- soil

Aging Effects Requiring Management

The following aging effects associated with water control structures components require management.

- cracking
- loss of material

Aging Management Programs

The following aging management programs are credited for managing the aging effects for the water control structures components.

- Masonry Wall
- Structures Monitoring

3.5.2.1.3 Turbine Building, Auxiliary Building, and Other Structures

Materials

Turbine building, auxiliary building, and other structures components subject to aging management review are constructed of the following materials.

- carbon steel
- concrete
- concrete block
- concrete brick
- galvanized steel
- stainless steel

Environment

Turbine building, auxiliary building, and other structures components subject to aging management review are exposed to the following environments.

- air – indoor uncontrolled
- air – outdoor
- exposed to fluid environment
- soil

Aging Effects Requiring Management

The following aging effects associated with turbine building, auxiliary building, and other structures components require management.

- cracking
- loss of material

Aging Management Programs

The following aging management programs are credited for managing the effects of aging on turbine building, auxiliary building, and other structures components.

- Fire Protection
- Masonry Wall

- Structures Monitoring
- Water Chemistry Control – Primary and Secondary

3.5.2.1.4 Bulk Commodities

Materials

Bulk commodities subject to aging management review are constructed of the following materials.

- aluminum
- carbon steel
- cera blanket
- cerafiber
- concrete
- elastomer
- fiberglass/calcium silicate
- galvanized steel
- mineral wool
- pyrocrete
- stainless steel

Environment

Bulk commodities subject to aging management review are exposed to the following environments.

- air – indoor uncontrolled
- air – outdoor
- air with borated water leakage
- exposed to fluid environment
- soil

Aging Effects Requiring Management

The following aging effects associated with bulk commodities require management.

- cracking
- cracking/delamination
- change in material properties
- loss of material
- separation

Aging Management Programs

The following aging management programs are credited for managing the effects of aging on bulk commodities.

- Boric Acid Corrosion Prevention
- Fire Protection
- Fire Water System
- Inservice Inspection (ISI-IWF)
- Structures Monitoring
- Water Chemistry Control – Primary and Secondary

3.5.2.2 Further Evaluation of Aging Management as Recommended by NUREG-1801

NUREG-1801 indicates that further evaluation is necessary for certain aging effects and other issues discussed in Section 3.5.2.2 of NUREG-1800. The following sections are numbered in accordance with the discussions in NUREG-1800 and explain the IPEC approach to those areas requiring further evaluation. Programs are described in Appendix B.

3.5.2.2.1 PWR and BWR Containments

3.5.2.2.1.1 Aging of Inaccessible Concrete Areas

Concrete in accessible and inaccessible areas is designed in accordance with American Concrete Institute (ACI) specification ACI 318, Building Code Requirements for Reinforced Concrete, which results in low permeability and resistance to aggressive chemical attack by requiring the following.

- high cement content
- low water-to-cement ratio
- proper curing
- adequate air entrainment

IPEC concrete also meets requirements of later ACI guide ACI 201.2R-77, Guide to Durable Concrete, since both documents use the same American Society for Testing and Material (ASTM) standards for selection, application and testing of concrete.

The below-grade environment is not aggressive (pH > 5.5, chlorides < 500 ppm, and sulfates < 1,500 ppm). Concrete was provided with at least the minimum required air content between 4% and 6% and a low water/cement ratio. Water/cement ratios were in accordance with requirements of the version of ACI 318 used in IPEC construction, which allows a ratio of up to 0.576 for concrete with the compressive strength specified for IPEC concrete. Although specified water/cement ratios fall outside the established range of 0.35 to 0.45 provided in the guidance of NUREG-1801, IPEC concrete meets the specifications of ACI to ensure acceptable quality concrete is

obtained. Therefore, increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack, and cracking, loss of bond, and loss of material (spalling, scaling) due to corrosion of embedded steel are not applicable for concrete in inaccessible areas. The absence of concrete aging effects is confirmed under the Containment Inservice Inspection (CII– IWL) and Structures Monitoring Programs.

3.5.2.2.1.2 Cracks and Distortion due to Increased Stress Levels from Settlement; Reduction of Foundation Strength, Cracking and Differential Settlement due to Erosion of Porous Concrete Subfoundations, if Not Covered by Structures Monitoring Program

IPEC does not rely on a dewatering system for control of settlement. Structures are founded on bedrock. IN 97-11 does not identify IPEC as a plant susceptible to erosion of a porous concrete containment subfoundation. IPEC does not have a porous concrete containment foundation.

As a result, cracking and distortion due to increased stress level from settlement and reduction of foundation strength cracking and differential settlement due to erosion of porous concrete subfoundation are not aging effects requiring management for IPEC concrete structures. The absence of concrete aging effects is confirmed under the Containment Inservice Inspection (CII– IWL) and Structures Monitoring Program.

3.5.2.2.1.3 Reduction of Strength and Modulus of Concrete Structures due to Elevated Temperature

The aging effect "change in material properties" is equivalent to the NUREG-1801 aging effect "reduction of strength and modulus of elasticity."

ACI 349 specifies long-term concrete temperature limits of 150°F for general areas and 200°F for local areas. The effects of aging due to elevated temperature exposure are not significant below these temperatures.

For Unit 2 containment during normal operation, areas are maintained below a bulk average temperature of 130ºF. Piping penetrations through the containment cylinder wall associated with pipes carrying hot fluid are cooled using air-to-air heat exchangers and the pipes are insulated to maintain the temperature in the adjoining concrete below 250°F. NUREG-1801 allows for concrete temperatures higher than 200°F for local areas if tests or calculations are provided to evaluate the reduction in strength. Concrete associated with the Unit 2 hot piping penetrations has been evaluated and determined acceptable at temperatures up to 250°F.

For Unit 3 containment during normal operation, areas are maintained below a bulk average temperature of 130ºF. Piping penetrations through the containment cylinder

wall associated with pipes carrying hot fluid are cooled using air-to-air heat exchangers and the pipes are insulated to maintain the temperature in the adjoining concrete below 200°F.

Therefore, change in material properties due to elevated temperature is not an aging effect requiring management for containment concrete. The absence of concrete aging effects is confirmed under the Containment Inservice Inspection (CII– IWL) and Structures Monitoring Program.

3.5.2.2.1.4 Loss of Material Due to General, Pitting and Crevice Corrosion

IPEC containment building concrete is designed in accordance with specification ACI 318, Building Code Requirements for Reinforced Concrete. The concrete meets requirements of later ACI guide ACI 201.2R-77 since both documents use the same ASTM standards for selection, application and testing of concrete. Spills (e.g., borated water spill) are cleaned up in timely manner. Interior concrete is monitored for cracks under the Structures Monitoring Program. The steel liner plate and moisture barrier where the steel liner becomes embedded in the concrete floor are inspected in accordance with the Containment Inservice Inspection (CII– IWE).

To prevent corrosion of the lower portion of the liner plate, the interior and exterior surfaces are protected from contact with the atmosphere by complete concrete encasement. It is not credible for ground water to reach the liner plate, assuming a crack in the concrete, since the concrete at this location is greater than five feet thick and poured in multiple horizontal planes. Therefore, corrosion of the liner plate is not expected.

3.5.2.2.1.5 Loss of Prestress due to Relaxation, Shrinkage, Creep, and Elevated Temperature

The IPEC containment structures are constructed of reinforced concrete. There are no prestressed tendons associated with the design. Therefore, loss of prestress due to relaxation, shrinkage, creep, and elevated temperature do not apply.

3.5.2.2.1.6 Cumulative Fatigue Damage

TLAA are evaluated in accordance with 10 CFR 54.21(c) as documented in Section 4. Fatigue TLAAs for containment steel liner and associated penetrations are evaluated as documented in Section 4.6. The only associated TLAA involves the liner plate at the penetration for feedwater line #22 on IP2.

A fatigue analysis does not exist for the other penetration components.

The NUREG-1801 BWR components, i.e., suppression pool shell and unbraced downcomers, are not applicable to the IPEC containment.

3.5.2.2.1.7 Cracking due to Stress Corrosion Cracking

NUREG-1801 recommends further evaluation of inspection methods to detect cracking due to SCC since visual VT-3 examinations may be unable to detect this aging effect. Potentially susceptible components at IPEC are penetration sleeves and bellows.

Stress corrosion cracking (SCC) is an aging mechanism that requires the simultaneous action of an aggressive chemical environment, sustained tensile stress, and a susceptible material. Elimination of any one of these elements will eliminate susceptibility to SCC. Stainless steel elements of containment, including dissimilar welds, are not susceptible to SCC because these elements are not subject to an aggressive chemical environment. A review of plant operating experience did not identify cracking of these components.

3.5.2.2.1.8 Cracking due to Cyclic Loading

This subsection lists components associated with containment that require aging management for cracking due to cyclic loading given that CLB fatigue analyses were not part of their original design bases. Specifically, components requiring aging management for cracking due to cyclic loading include containment mechanical penetrations, penetration sleeves and associated dissimilar metal welds. These components are designed to stress levels without requiring fatigue analyses and thus fine cracks are unlikely to occur. Therefore, existing requirements for leak rate testing per the Containment Leak Rate Program and surface inspection per the Containment In-Service Inspection (CII-IWE) Program are adequate to detect cracking due to cyclic loading.

This subsection also lists components associated with BWR primary containment that require aging management for crack initiation and growth due to stress corrosion cracking (SCC). These components are not applicable to IPEC, a PWR.

3.5.2.2.1.9 Loss of Material (Scaling, Cracking, and Spalling) due to Freeze-Thaw

IPEC inaccessible and accessible concrete areas are designed in accordance with American Concrete Institute (ACI) specification ACI 318, Building Code Requirements for Reinforced Concrete, which results in low permeability and resistance to aggressive chemical solutions by requiring the following.

- high cement content
- low water-to-cement ratio

- proper curing
- adequate air entrainment

IPEC concrete also meets requirements of later ACI guide ACI 201.2R-77, Guide to Durable Concrete, since both documents use the same American Society for Testing and Material (ASTM) standards for selection, application and testing of concrete. Therefore loss of material (scaling, cracking and spalling) due to freeze-thaw is not applicable for concrete in inaccessible areas. The absence of concrete aging effects is confirmed under the Containment Inservice Inspection (CII– IWL) and Structures Monitoring Program.

3.5.2.2.1.10 Cracking due to Expansion and Reaction with Aggregate, and Increase in Porosity and Permeability due to Leaching of Calcium Hydroxide

In accordance with NUREG-1801, aging management is not required because IPEC containment concrete (walls, dome, basemat and ring girder) is designed in accordance with specification ACI 318, Building Code Requirements for Reinforced Concrete, and concrete specification requires that the potential reactivity of aggregates be tested in accordance with ASTM C 289 and ASTM C 227. Also ASTM C 295 shall be used to identify elements in the aggregate which may be unfavorably reactive with alkalis in cement. Concrete structures are not exposed to flowing water and the concrete used was constructed in accordance with the recommendations in ACI 201.2R-77 for durability. Therefore, reaction with aggregates and increase in porosity and permeability due to leaching of calcium hydroxide is not an applicable aging mechanism for IPEC concrete structures. The absence of concrete aging effects is confirmed under the Containment Inservice Inspection (CII– IWL) and Structures Monitoring Program.

3.5.2.2.2 Safety-Related and Other Structures and Component Supports

Structure groups and component support groups as used in the following discussions are defined in NUREG-1800, Section 3.5.1.

3.5.2.2.2.1 Aging of Structures Not Covered by Structures Monitoring Program

IPEC concrete structures subject to aging management review, except for containment concrete covered by Containment Inservice Inspection (CII– IWL), are included in the Structures Monitoring Program and supplemented by other aging management programs as appropriate. This is true for concrete items even if the aging management review did not identify aging effects requiring management. Aging effects discussed below for structural steel items are also addressed by the structures monitoring program. Additional discussion of specific aging effects follows.

1. Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling) Due to Corrosion of Embedded Steel for Groups 1-5, 7, 9 Structures

   The aging mechanisms associated with cracking, loss of bond, and loss of material (spalling, scaling) due to corrosion of embedded steel are applicable only to below-grade concrete/grout structures. The below-grade environment for IPEC is not aggressive and concrete is designed in accordance with specification ACI 318, Building Code Requirements for Reinforced Concrete, which results in low permeability and resistance to aggressive chemical solutions by providing a high cement, low water/cement ratio, proper curing and adequate air content (between 4% and 6%). Water/cement ratios were in accordance with requirements of the version of ACI 318 used in IPEC construction, which allows a ratio of up to 0.576 for concrete with the compressive strength specified for IPEC concrete. Although specified water/cement ratios fall outside the established range of 0.35 to 0.45 provided in the guidance of NUREG-1801, IPEC concrete meets the specifications of ACI to ensure acceptable quality concrete is obtained. Therefore, cracking, loss of bond, and loss of material (spalling, scaling) due to corrosion of embedded steel are not aging effects requiring management for IPEC Groups 1-5, 7, 9 structures.

2. Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling) Due to Aggressive Chemical Attack for Groups 1-5, 7, 9 Structures

   Aggressive chemical attack becomes significant to concrete exposed to an aggressive environment. Resistance to mild acid attack is enhanced by using a dense concrete with low permeability and a low water-to-cement ratio. These groups of structures at IPEC use a dense low-permeable concrete with a water-to-cement ratio that met the ACI 318 requirements, which provides an acceptable degree of protection against aggressive chemical attack. Water chemical analysis results confirm that the site groundwater is non-aggressive. IPEC concrete is constructed in accordance with the recommendations in ACI 201.2R-77 for durability.

   IPEC below-grade environment is not aggressive. Therefore, increase in porosity and permeability cracking, loss of material (spalling, scaling) due to aggressive chemical attack are not aging effects requiring management for IPEC Groups 1-5, 7, 9 concrete structures.

3. Loss of Material Due to Corrosion for Groups 1-5, 7, 8 Structures

   IPEC Structures Monitoring Program and Containment Inservice Inspection (CII–IWE) for containment steel liner will be used to manage this aging effect for IPEC Groups 1-5, 7, 8 structures.

4. Loss of Material (Spalling, Scaling) and Cracking Due to Freeze-Thaw for Groups 1-3, 5, 7-9 Structures

   Aggregates were in accordance with specifications and materials conforming to ACI and ASTM standards. IPEC structures are constructed of a dense, durable mixture of sound coarse aggregate, fine aggregate, cement, water, and admixture. Water/cement ratios are within the limits provided in ACI 318 and air entrainment percentages are within the range prescribed in NUREG-1801. Therefore, loss of material (spalling, scaling) and cracking due to freeze thaw are not aging effects requiring management for IPEC Groups 1-3, 5, 7-9 structures.

5. Cracking Due to Expansion and Reaction with Aggregates for Groups 1-5, 7-9 Structures

   Aggregates were selected locally and were in accordance with specifications and materials conforming to ACI and ASTM standards at the time of construction, which are in accordance with the recommendations in ACI 201.2R-77 for concrete durability. IPEC structures are constructed of a dense, durable mixture of sound coarse aggregate, fine aggregate, cement, water, and admixture. Water/ cement ratios are within the limits provided in ACI 318, and air entrainment percentages were within the range prescribed in NUREG-1801. Therefore, cracking due to expansion and reaction with aggregates for Groups 1-5, 7-9 structures is not an aging effect requiring management.

6. Cracks and Distortion Due to Increased Stress Levels from Settlement for Groups 1-3, 5-9 Structures

   For Groups 1-3, 5-9 structures at IPEC, settlement is not credible since structures are founded on bedrock. Therefore, cracks and distortion due to increased stress levels from settlement for Groups 1-3, 5-9 structures is not an aging effect requiring management for IPEC concrete.

7. Reduction in Foundation Strength, Cracking, Differential Settlement Due to Erosion of Porous Concrete Subfoundation for Groups 1-3, 5-9 Structures

   IPEC concrete was provided in accordance with ACI 318 requirements resulting in dense, well-cured, high-strength concrete with low permeability, and a porous subfoundation is not provided. Structures are supported on bedrock, and erosion of the subfoundation is not credible since the subfoundation bears directly against the bedrock and the possibility of loss of soil resulting in voids below the subgrade is not credible. Operating history has not identified settlement and therefore reduction in foundation strength, cracking, differential settlement due to erosion of porous concrete subfoundation are not aging effects requiring management for IPEC Groups 1-3, 5-9 structures.

8. Lock Up Due to Wear for Lubrite® Radial Beam Seats in BWR Drywell and Other Sliding Support Surfaces

   IPEC is a reinforced concrete containment and does not contain radial beam seats; therefore, lockup due to wear for this component is not applicable. IPEC does use lubrite plate in support applications inside containment; however, owing to the wear-resistant material used, the low frequency of movement, and the slow movement between sliding surfaces, lock-up due to wear is not an aging effect requiring management at IPEC. Nevertheless, Lubrite® plates are included within the Inservice Inspection (ISI-IWF) Program to confirm the absence of aging effects requiring management for these components.

3.5.2.2.2.2 Aging Management of Inaccessible Areas

IPEC concrete for Group 1-3, 5 and 7-9 inaccessible concrete areas was provided in accordance with specification ACI 318, Building Code Requirements for Reinforced Concrete, which requires the following, resulting in low permeability and resistance to aggressive chemical solution.

- high cement content
- low water permeability
- proper curing
- adequate air entrainment

IPEC concrete also meets requirements of later ACI guide ACI 201.2R-77, Guide to Durable Concrete, since both documents use the same ASTM standards for selection, application and testing of concrete.

Inspections of accessible concrete have not revealed degradation related to corrosion of embedded steel. IPEC below-grade environment is not aggressive as defined in NUREG-1801. Therefore, loss of material due to corrosion of embedded steel is not an aging effect requiring management for IPEC concrete.

3.5.2.2.2.3 Reduction of Strength and Modulus of Concrete Structures due to Elevated Temperature

For reduction of strength and modulus of concrete structures due to elevated temperatures for Groups 1-5, NUREG-1801 recommends a plant-specific AMP and further evaluation if the general temperature is greater than 150ºF or if the local temperature is greater than 200ºF. During normal operation, bulk average temperature of Groups 1-5 concrete elements is maintained below 150ºF and local temperatures remain below 200ºF.

Group 1-5 concrete elements remain at temperatures below the temperature limits associated with aging degradation due to elevated temperature. Therefore, reduction of strength and modulus due to elevated temperatures is not an aging effect requiring management for IPEC Group 1-5 concrete elements.

3.5.2.2.2.4 Aging Management of Inaccessible Areas for Group 6 Structures

For inaccessible areas of certain Group 6 structures, aging effects are covered by inspections in accordance with the Structures Monitoring Program. The Structures Monitoring Program will include guidance to perform periodic engineering evaluations of groundwater samples to assess aggressiveness of groundwater to concrete.

1. Increase in Porosity and Permeability, Cracking, Loss of Material (Spalling, Scaling)/Aggressive Chemical Attack; and Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling)/Corrosion of Embedded Steel in Below-Grade Inaccessible Concrete Areas of Group 6 Structures

   Below-grade exterior reinforced concrete at IPEC is not exposed to an aggressive environment (pH less than 5.5), or to chloride or sulfate solutions beyond defined limits (greater than 500 ppm chloride, or greater than 1500 ppm sulfate). Therefore, increase in porosity and permeability, cracking, loss of material (spalling, scaling)/ aggressive chemical attack; and cracking, loss of bond, and loss of material (spalling, scaling)/ corrosion of embedded steel are not aging effects requiring management for below-grade inaccessible concrete areas of IPEC Group 6 structures.

2. Loss of Material (Spalling, Scaling) and Cracking Due to Freeze-thaw in Below-Grade Inaccessible Concrete Areas of Group 6 Structures

   Aggregates were selected locally and were in accordance with specifications and materials conforming to ACI and ASTM standards at the time of construction. IPEC structures are constructed of a dense, durable mixture of sound coarse aggregate, fine aggregate, cement, water, and admixture. Water/cement ratios are within the limits provided in ACI 318, and air entrainment percentages were within the range prescribed in NUREG-1801. Therefore, loss of material (spalling, scaling) and cracking due to freeze thaw are not aging effects requiring management for IPEC Groups 6 structures.

3. Cracking Due to Expansion and Reaction with Aggregates, Increase in Porosity and Permeability, and Loss of Strength Due to Leaching of Calcium Hydroxide in Below-Grade Inaccessible Concrete Areas of Group 6 Structures

   Aggregates were selected locally and were in accordance with specifications and materials conforming to ACI and ASTM standards at the time of construction,

which are in accordance with the recommendations in ACI 201.2R-77 for concrete durability. IPEC structures are constructed of a dense, durable mixture of sound coarse aggregate, fine aggregate, cement, water, and admixture. Water/ cement ratios are within the limits provided in ACI 318-63, and air entrainment percentages were within the range prescribed in NUREG-1801. IPEC below-grade environment is not aggressive (pH > 5.5, chlorides < 500 ppm, and sulfates < 1,500 ppm).

Therefore, cracking due to expansion and reaction with aggregates, increase in porosity and permeability, and loss of strength due to leaching of calcium hydroxide in below-grade inaccessible concrete areas of Group 6 Structures is not an aging effect requiring management for IPEC concrete.

3.5.2.2.2.5 Cracking due to Stress Corrosion Cracking and Loss of Material due to Pitting and Crevice Corrosion

NUREG-1800 Section 3.5.2.2.2.5 applies to stainless steel liners for concrete or steel tanks. No tanks with stainless steel liners are included in the scope of license renewal.

3.5.2.2.2.6 Aging of Supports Not Covered by Structures Monitoring Program

NUREG-1801 recommends further evaluation of certain component support/aging effect combinations if they are not covered by the applicant's structures monitoring program. Component supports at IPEC are included in the Structures Monitoring Program for Groups B2 through B5 and Inservice Inspection (ISI-IWF) program for Group B1.

(1) Reduction in concrete anchor capacity due to degradation of the surrounding concrete for Groups B1 through B5 supports

IPEC concrete anchors and surrounding concrete are included in the Structures Monitoring Program (Groups B2 through B5) and Inservice Inspection (ISI-IWF) Program (Group B1).

(2) Loss of material due to general and pitting corrosion, for Groups B2 through B5 supports

Loss of material due to corrosion of steel support components is an aging effect requiring management at IPEC. The Structures Monitoring Program manages this aging effect. For components subject to loss of material due to boric acid corrosion, the Boric Acid Corrosion Prevention Program manages this aging effect.

(3) Reduction/loss of isolation function due to degradation of vibration isolation elements for Group B4 supports

The IPEC aging management review did not identify any component support structure/aging effect combination corresponding to NUREG-1801 Volume 2 Item III.B4.2-a.

3.5.2.2.2.7 Cumulative Fatigue Damage due to Cyclic Loading

TLAA are evaluated in accordance with 10 CFR 54.21(c) as documented in Section 4. During the process of identifying TLAAs in the IPEC current licensing basis, no fatigue analyses were identified for ASME component support members, anchor bolts, and welds.

3.5.2.2.3 Quality Assurance for Aging Management of Nonsafety-Related Components

See Appendix B Section B.0.3 for discussion of IPEC quality assurance procedures and administrative controls for aging management programs.

3.5.2.3 Time-Limited Aging Analyses

Potential TLAA identified for structural components and commodities include fatigue analyses for concrete containment liner plate and penetration fatigue analyses. These topics are discussed in Section 4.6.

3.5.3 Conclusion

The structural components and commodities subject to aging management review have been identified in accordance with the criteria of 10 CFR 54.21. The aging management programs selected to manage the effects of aging on structural components and commodities are identified in Section 3.5.2.1 and the following tables. A description of the aging management programs is provided in Appendix B of this application, along with the demonstration that the identified aging effects will be managed for the period of extended operation.

Therefore, based on the demonstrations provided in Appendix B, the effects of aging associated with the structural components and commodities will be managed such that there is reasonable assurance that the intended functions will be maintained consistent with the current licensing basis during the period of extended operation.

Table 3.5.1
Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
PWR Concrete (Reinforced and Prestressed) and Steel Containment *BWR Concrete (Mark II and III) and Steel (Mark I, II, and III) Containment*					
3.5.1-1	Concrete elements: walls, dome, basemat, ring girder, buttresses, containment (as applicable).	Aging of accessible and inaccessible concrete areas due to aggressive chemical attack, and corrosion of embedded steel	ISI (IWL) and for inaccessible concrete, an examination of representative samples of below-grade concrete and periodic monitoring of groundwater if environment is nonaggressive. A plant specific program is to be evaluated if environment is aggressive.	Yes, plant-specific, if the environment is aggressive	See Section 3.5.2.2.1.1 for further discussion. Concrete elements are included in the CII-IWL and Structures Monitoring Program. IPEC does not rely on a dewatering system.

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-2	Concrete elements; All	Cracks and distortion due to increased stress levels from settlement	Structures Monitoring Program. If a de-watering system is relied upon for control of settlement, then the licensee is to ensure proper functioning of the de-watering system through the period of extended operation.	Yes, if not within the scope of the applicant's structures monitoring program or a de-watering system is relied upon	Concrete elements are included in the CII-IWL and Structures Monitoring Program. IPEC does not rely on a de-watering system. See Section 3.5.2.2.1.2 for further discussion.
3.5.1-3	Concrete elements: foundation, subfoundation	Reduction in foundation strength, cracking, differential settlement due to erosion of porous concrete subfoundation	Structures Monitoring Program. If a dewatering system is relied upon to control erosion of cement from porous concrete subfoundations, then the licensee is to ensure proper functioning of the de-watering system through the period of extended operation.	Yes, if not within the scope of the applicant's structures monitoring program or a de-watering system is relied upon	Erosion of porous concrete subfoundations is not applicable to the containment structures at IPEC. For further discussion, see Section 3.5.2.2.1.2.

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-4	Concrete elements: dome, wall, basemat, ring girder, buttresses, containment, concrete fill-in annulus (as applicable)	Reduction of strength and modulus due to elevated temperature	A plant-specific aging management program is to be evaluated	Yes, plant-specific if temperature limits are exceeded	Reduction of strength and modulus due to elevated temperature is not applicable to the containment structures. For further discussion, see Section 3.5.2.2.1.3.
3.5.1-5	BWR only				
3.5.1-6	Steel elements: steel liner, liner anchors, integral attachments	Loss of material due to general, pitting and crevice corrosion	ISI (IWE) and 10 CFR Part 50, Appendix J	Yes, if corrosion is significant for inaccessible areas	CII-IWL, Containment Leak Rate and Structures Monitoring Programs will manage this aging effect. For further discussion, see Section 3.5.2.2.1.4.
3.5.1-7	Prestressed containment tendons	Loss of prestress due to relaxation, shrinkage, creep, and elevated temperature	TLAA evaluated in accordance with 10 CFR 54.21(c)	Yes, TLAA	This item applies to prestressed concrete containments. It is not applicable to the IPEC steel-lined reinforced concrete containments. For further discussion, see Section 3.5.2.2.1.5.
3.5.1-8	BWR only				

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-9	Steel, stainless steel elements, dissimilar metal welds: penetration sleeves, penetration bellows; suppression pool shell, unbraced downcomers	Cumulative fatigue damage (CLB fatigue analysis exists)	TLAA evaluated in accordance with 10 CFR 54.21(c)	Yes, TLAA	Refer to the evaluation in Section 3.5.2.2.1.6.
3.5.1-10	Stainless steel penetration sleeves, penetration bellows, dissimilar metal welds	Cracking due to stress corrosion cracking	ISI (IWE) and 10 CFR Part 50, Appendix J and additional appropriate examinations/ evaluations for bellows assemblies and dissimilar metal welds	Yes, detection of aging effects is to be evaluated	Cracking due to SCC is not applicable to these stainless steel components. For further discussion, see Section 3.5.2.2.1.7.
3.5.1-11	BWR only				
3.5.1-12	Steel, stainless steel elements, dissimilar metal welds: penetration sleeves, penetration bellows; suppression pool shell, unbraced downcomers	Cracking due to cyclic loading	ISI (IWE) and 10 CFR Part 50, Appendix J supplemented to detect fine cracks	Yes, detection of aging effects is to be evaluated	CII-IWE and Containment Leak Rate Programs will manage this aging effect. The CII-IWE Program includes augmented ultrasonic exams to detect fine cracks. For further discussion, see Section 3.5.2.2.1.8.
3.5.1-13	BWR only				

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-14	Concrete elements: dome, wall, basemat ring girder, buttresses, containment (as applicable)	Loss of material (Scaling, cracking, and spalling) due to freeze-thaw	ISI (IWL) Evaluation is needed for plants that are located in moderate to severe weathering conditions (weathering index >100 day-inch/yr) (NUREG-1557).	Yes, for plants located in moderate to severe weathering conditions	Loss of material due to freeze-thaw is not applicable. For further discussion, see Section 3.5.2.2.1.9. Nonetheless, components are included in the CII-IWL and Structures Monitoring Program.
3.5.1-15	Concrete elements: walls, dome, basemat, ring girder, buttresses, containment, concrete fill-in annulus (as applicable).	Cracking due to expansion and reaction with aggregate; increase in porosity, permeability due to leaching of calcium hydroxide	ISI (IWL) for accessible areas. None for inaccessible areas if concrete was constructed in accordance with the recommendations in ACI 201.2R-77.	Yes, if concrete was not constructed as stated for inaccessible areas	Cracking due to expansion and reaction with aggregate, increase in porosity, permeability due to leaching of calcium hydroxide is not applicable. For further discussion, see Section 3.5.2.2.1.10. Nonetheless, components are included in the CII-IWL and Structures Monitoring Program.

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-16	Seals, gaskets, and moisture barriers	Loss of sealing and leakage through containment due to deterioration of joint seals, gaskets, and moisture barriers (caulking, flashing, and other sealants)	ISI (IWE) and 10 CFR Part 50, Appendix J	No	The aging effect cited in the NUREG-1801 item is loss of sealing. Loss of sealing is a consequence of the aging effects cracking and change in material properties. The terminology is considered technically equivalent. For IPEC the CII-IWE and Containment Leak Rate Programs are used to manage loss of sealant and leakage through containment due to deterioration of seals and gaskets. The CII-IWE Program is used to manage loss of seal and leakage of the moisture barrier at the containment liner to concrete floor slab interface.

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-17	Personnel airlock, equipment hatch and CRD hatch locks, hinges, and closure mechanisms	Loss of leak tightness in closed position due to mechanical wear of locks, hinges and closure mechanisms	10 CFR Part 50, Appendix J and Plant Technical Specifications	No	Locks, hinges, and closure mechanisms are active components and are therefore not subject to aging management review. Containment Leak Rate Program, supplemented by the CII-IWE program, and IPEC technical specifications require testing to ensure leak tightness of airlocks and hatches.
3.5.1-18	Steel penetration sleeves and dissimilar metal welds; personnel airlock, equipment hatch and CRD hatch	Loss of material due to general, pitting, and crevice corrosion	ISI (IWE) and 10 CFR Part 50, Appendix J	No	CII-IWE and Containment Leak Rate Program will manage this aging effect.
3.5.1-19	BWR only				
3.5.1-20	BWR only				
3.5.1-21	BWR only				
3.5.1-22	Prestressed containment: tendons and anchorage components	Loss of material due to corrosion	ISI (IWL)	No	This item applies to prestressed concrete containments. It is not applicable to the IPEC steel-lined reinforced concrete containments.

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
Safety-Related and Other Structures; and Component Supports					
3.5.1-23	All Groups except Group 6: interior and above grade exterior concrete	Cracking, loss of bond, and loss of material (spalling, scaling) due to corrosion of embedded steel	Structures Monitoring Program	Yes, if not within the scope of the applicant's structures monitoring program	Corrosion of embedded steel becomes significant if exposed to an aggressive environment. Corrosion is not significant if the concrete has a low water-to cement ratio, low permeability, and is designed in accordance with ACI Standards (ACI-318 or ACI-349). Loss of bond is included with cracking for the purpose of this review. The design and construction of these structures at IPEC prevents corrosion of embedded steel. See Section 3.5.2.2.2.1 for further discussion. Nonetheless, components are included in the CII-IWL for containment concrete supplemented by the Structures Monitoring Program. For the remaining groups except Group 6, concrete is included in the Structures Monitoring Program.

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-24	All Groups except Group 6: interior and above grade exterior concrete	Increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack	Structures Monitoring Program	Yes, if not within the scope of the applicant's structures monitoring program	Listed aging effects do not require management at IPEC. See Section 3.5.2.2.2.1 for further discussion. Nonetheless, components are included in the CII-IWL for containment concrete supplemented by the Structures Monitoring Program. For the remaining groups except Group 6, concrete is included in the Structures Monitoring Program.
3.5.1-25	All Groups except Group 6: steel components: all structural steel	Loss of material due to corrosion	Structures Monitoring Program. If protective coatings are relied upon to manage the effects of aging, the structures monitoring program is to include provisions to address protective coating monitoring and maintenance.	Yes, if not within the scope of the applicant's structures monitoring program	Consistent with NUREG-1801. Structures Monitoring Program manages loss of material. Protective coatings are not relied upon to manage the effects of aging. In some cases the Fire Protection Program supplements the Structures Monitoring Program.

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-26	All Groups except Group 6: accessible and inaccessible concrete: foundation	Loss of material (spalling, scaling) and cracking due to freeze-thaw	Structures Monitoring Program. Evaluation is needed for plants that are located in moderate to severe weathering conditions (weathering index >100 day-inch/yr) (NUREG-1557).	Yes, if not within the scope of the applicant's structures monitoring program or for plants located in moderate to severe weathering conditions	Freeze-thaw is not an applicable aging mechanism for these groups of structures at IPEC. See Section 3.5.2.2.2.1 for further discussion. Nonetheless, components are included in the CII-IWL for containment concrete supplemented by the Structures Monitoring Program. For the remaining groups except Group 6, concrete is included in the Structures Monitoring Program. In some cases the Fire Protection Program supplements the Structures Monitoring Program.

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-27	All Groups except Group 6: accessible and inaccessible interior/exterior concrete	Cracking due to expansion due to reaction with aggregates	Structures Monitoring Program None for inaccessible areas if concrete was constructed in accordance with the recommendations in ACI 201.2R-77.	Yes, if not within the scope of the applicant's structures monitoring program or concrete was not constructed as stated for inaccessible areas	Reaction with aggregates is not an applicable aging mechanism for concrete for these groups of structures at IPEC. See Section 3.5.2.2.2.1 for further discussion. Nonetheless, components are included in the CII-IWL for containment concrete supplemented by the Structures Monitoring Program. For the remaining groups except Group 6, concrete is included in the Structures Monitoring Program. In some cases the Fire Protection Program supplements the Structures Monitoring Program.
3.5.1-28	Groups 1-3, 5-9: all	Cracks and distortion due to increased stress levels from settlement	Structures Monitoring Program. If a de-watering system is relied upon for control of settlement, then the licensee is to ensure proper functioning of the de-watering system through the period of extended operation.	Yes, if not within the scope of the applicant's structures monitoring program or a de-watering system is relied upon	IPEC structures are founded on bedrock. Plant operating experience has not identified settlement of structures resulting in cracks and distortion of component structures; therefore, cracks and distortion are not aging effects requiring management. See discussion in Section 3.5.2.2.2.1.

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-29	Groups 1-3, 5-9: foundation	Reduction in foundation strength, cracking, differential settlement due to erosion of porous concrete subfoundation	Structures Monitoring Program. If a de-watering system is relied upon for control of settlement, then the licensee is to ensure proper functioning of the de-watering system through the period of extended operation.	Yes, if not within the scope of the applicant's structures monitoring program or a de-watering system is relied upon	This aging effect is not applicable to IPEC structures in scope of license renewal. A dewatering system is not used for control of settlement nor to prevent leaching of cement from concrete. See additional discussion in Section 3.5.2.2.2.1.
3.5.1-30	Group 4: Radial beam seats in BWR drywell; RPV support shoes for PWR with nozzle supports; Steam generator supports	Lock-up due to wear	ISI (IWF) or Structures Monitoring Program	Yes, if not within the scope of ISI or structures monitoring program	Lubrite plates are used in the support system for steam generator and RCP framing. Lubrite materials for nuclear applications are designed to resist deformation, have a low coefficient of friction, resist softening at elevated temperatures, resist corrosion, withstand high intensities of radiation, and will not score or mar; therefore, they are not susceptible to aging effects requiring management. Nonetheless, lubrite components associated with these components are included in the ISI-IWF Program.

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-31	Groups 1-3, 5, 7-9: below-grade concrete components, such as exterior walls below grade and foundation	Increase in porosity and permeability, cracking, loss of material (spalling, scaling)/ aggressive chemical attack; Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures monitoring Program; Examination of representative samples of below-grade concrete, and periodic monitoring of groundwater, if the environment is non-aggressive. A plant specific program is to be evaluated if environment is aggressive.	Yes, plant-specific, if environment is aggressive	IPEC concrete has a low water-to-cement ratio and low permeability and was designed in accordance with ACI Standards (ACI-318 or ACI-349). The design and construction of these groups of structures at IPEC prevents the effect of this aging from occurring; therefore, this aging effect does not require management. Loss of bond is included with cracking for the purpose of this review. Aging effects are not significant for accessible and inaccessible below-grade areas. See discussion in Section 3.5.2.2.2.1.

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-32	Groups 1-3, 5, 7-9: exterior above and below grade reinforced concrete foundations	Increase in porosity and permeability, loss of strength due to leaching of calcium hydroxide.	Structures Monitoring Program for accessible areas. None for inaccessible areas if concrete was constructed in accordance with the recommendations in ACI 201.2R-77.	Yes, if concrete was not constructed as stated for inaccessible areas	IPEC concrete has a low water-to-cement ratio and low permeability and was designed in accordance with ACI Standards (ACI-318 or ACI-349). The design and construction of these groups of structures at IPEC prevents the effect of this aging from occurring; therefore, this aging effect does not require management. Loss of bond is included with cracking for the purpose of this review. Aging effects are not significant for accessible and inaccessible below-grade areas. See discussion in Section 3.5.2.2.2.1. IPEC concrete elements do not exceed specified temperature limits. See discussion in Section 3.5.2.2.2.3.
3.5.1-33	Groups 1-5: concrete	Reduction of strength and modulus due to elevated temperature	Plant-specific	Yes, plant-specific if temperature limits are exceeded	IPEC concrete elements do not exceed specified temperature limits. See discussion in Section 3.5.2.2.2.3.

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-34	Group 6: Concrete; all	Increase in porosity and permeability, cracking, loss of material due to aggressive chemical attack; Cracking, loss of bond, loss of material due to corrosion of embedded steel	Insp of Water-Control Structures or FERC/US Army Corps of Engineers dam inspections and maintenance programs, and for inaccessible concrete, exam of rep. samples of below-grade concrete, and periodic monitoring of groundwater, if environment is non-aggressive. Plant specific if environment is aggressive.	Yes, plant-specific if environment is aggressive	The listed aging effects are not significant for accessible and inaccessible areas because IPEC ground water is nonaggressive. The Structures Monitoring Program (SMP) will confirm the absence of aging effects requiring management for IPEC Group 6 components exposed to a fluid environment. SMP will include guidance to perform periodic evaluation of groundwater samples to assess aggressiveness of groundwater to concrete. See Section 3.5.2.2.2.4.

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-35	Group 6: exterior above and below grade concrete foundation	Loss of material (spalling, scaling) and cracking due to freeze-thaw	Inspection of Water-Control Structures or FERC/US Army Corps of Engineers dam inspections and maintenance programs. Evaluation is needed for plants that are located in moderate to severe weathering conditions (weathering index >100 day-inch/yr) (NUREG-1557).	Yes, for plants located in moderate to severe weathering conditions	Aging effects are not applicable for accessible and inaccessible areas. These concrete structures are exposed to saturated water conditions near the ground surface; however, the concrete used at IPEC is designed with entrained air content of between 4% and 5% in conformance with ACI-318, and plant experience has not identified any degradation related to freeze-thaw. Nonetheless, the Structures Monitoring Program will confirm the absence of aging effects requiring management for IPEC Group 6 concrete components. See Section 3.5.2.2.2.4 for additional discussion.

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-36	Group 6: all accessible/ inaccessible reinforced concrete	Cracking due to expansion/ reaction with aggregates	Accessible areas: Inspection of Water-Control Structures or FERC/US Army Corps of Engineers dam inspections and maintenance programs. None for inaccessible areas if concrete was constructed in accordance with the recommendations in ACI 201.2R-77.	Yes, if concrete was not constructed as stated for inaccessible areas	Reaction with aggregates is not an applicable aging mechanism for IPEC concrete components. See Section 3.5.2.2.2.1 (this discussion is also applicable to Group 6, although the NUREG-1801 item refers to Groups 1-5, 7, 9). See Section 3.5.2.2.2.4 for additional discussion. Nonetheless, the Structures Monitoring Program will confirm the absence of aging effects requiring management for IPEC Group 6 concrete components.
3.5.1-37	Group 6: exterior above and below grade reinforced concrete foundation interior slab	Increase in porosity and permeability, loss of strength due to leaching of calcium hydroxide	For accessible areas, Inspection of Water-Control Structures or FERC/US Army Corps of Engineers dam inspections and maintenance programs. None for inaccessible areas if concrete was constructed in accordance with the recommendations in ACI 201.2R-77.	Yes, if concrete was not constructed as stated for inaccessible areas	Not applicable. Nonetheless the Structures Monitoring Program will confirm the absence of aging effects requiring management for IPEC Group 6 concrete components. See Section 3.5.2.2.2.4.

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-38	Groups 7, 8: Tank liners	Cracking due to stress corrosion cracking; loss of material due to pitting and crevice corrosion	Plant-specific	Yes, plant specific	There are no concrete or steel tanks with stainless steel liners in the scope of IPEC license renewal.
3.5.1-39	Support members; welds; bolted connections; support anchorage to building structure	Loss of material due to general and pitting corrosion	Structures Monitoring Program	Yes, if not within the scope of the applicant's structures monitoring program	The Structures Monitoring Program will manage aging effects identified by this line item. In some cases the Fire Water System Program and Fire Protection Program supplement the Structures Monitoring Program.
3.5.1-40	Building concrete at locations of expansion and grouted anchors; grout pads for support base plates	Reduction in concrete anchor capacity due to local concrete degradation/ service-induced cracking or other concrete aging mechanisms	Structures Monitoring Program	Yes, if not within the scope of the applicant's structures monitoring program	IPEC concrete components are designed in accordance with accepted ACI standards. Plant experience has not identified reduction in concrete anchor capacity or other concrete aging mechanisms. Nonetheless, the Structures Monitoring Program will confirm absence of aging effects requiring management for IPEC concrete components. See Section 3.5.2.2.2.6 for additional discussion.

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-41	Vibration isolation elements	Reduction or loss of isolation function/ radiation hardening, temperature, humidity, sustained vibratory loading	Structures Monitoring Program	Yes, if not within the scope of the applicant's structures monitoring program	No vibration isolation elements at IPEC are in scope and subject to aging management review.
3.5.1-42	Groups B1.1, B1.2, and B1.3: support members: anchor bolts, welds	Cumulative fatigue damage (CLB fatigue analysis exists)	TLAA evaluated in accordance with 10 CFR 54.21(c)	Yes, TLAA	Not applicable. No CLB fatigue analysis exists. See Section 3.5.2.2.2.7 for additional discussion.
3.5.1-43	Groups 1-3, 5, 6: all masonry block walls	Cracking due to restraint shrinkage, creep, and aggressive environment	Masonry Wall Program	No	Consistent with NUREG-1801 for masonry walls within the station. The Masonry Wall Program manages this aging effect. In some cases Fire Protection Program supplements the Masonry Wall Program.
3.5.1-44	Group 6 elastomer seals, gaskets, and moisture barriers	Loss of sealing due to deterioration of seals, gaskets, and moisture barriers (caulking, flashing, and other sealants)	Structures Monitoring Program	No	Loss of sealing is a consequence of elastomer cracking and change in material properties. Component types include compressible joints and seals and gaskets. The Structures Monitoring Program manages cracking and change in material properties.

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-45	Group 6: exterior above and below grade concrete foundation; interior slab	Loss of material due to abrasion, cavitation	Inspection of Water-Control Structures or FERC/US Army Corps of Engineers dam inspections and maintenance	No	Abrasion and cavitation due to flowing water are insignificant at IPEC due to the low flow velocities for these structures. Nonetheless, the Structures Monitoring Program will confirm absence of aging effects requiring management for IPEC Group 6 concrete components.
3.5.1-46	Group 5: Fuel pool liners	Cracking due to stress corrosion cracking; loss of material due to pitting and crevice corrosion	Water Chemistry and Monitoring of spent fuel pool water level in accordance with technical specifications and leakage from the leak chase channel.	No	At IPEC, the Water Chemistry Control – Primary and Secondary Program manages aging effects on the spent fuel pool liner. Monitoring spent fuel pool water level in accordance with technical specifications and monitoring leakage from the leak chase channels (Unit 3) will also continue during the period of extended operation. Cracking due to stress corrosion is not an aging effect requiring management for treated water < 140°F. There are no stainless steel spent fuel components with intended functions exposed to treated water > 60°C (> 140°F).

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-47	Group 6: all metal structural members	Loss of material due to general (steel only), pitting and crevice corrosion	Inspection of Water-Control Structures or FERC/US Army Corps of Engineers dam inspections and maintenance programs. If protective coatings are relied upon to manage aging, protective coating monitoring and maintenance provisions should be included.	No	The listed aging management program is not used. The Structures Monitoring Program will confirm absence of aging effects requiring management for IPEC Group 6 steel components.
3.5.1-48	Group 6: earthen water control structures - dams, embankments, reservoirs, channels, canals, and ponds	Loss of material, loss of form due to erosion, settlement, sedimentation, frost action, waves, currents, surface runoff, seepage	Inspection of Water-Control Structures or FERC/US Army Corps of Engineers dam inspections and maintenance programs.	No	Not applicable. IPEC does not have earthen water control structures.
3.5.1-49	BWR only				

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-50	Groups B2, and B4: galvanized steel, aluminum, stainless steel support members; welds; bolted connections; support anchorage to building structure	Loss of material due to pitting and crevice corrosion	Structures Monitoring Program	No	Consistent with NUREG-1801. The Structures Monitoring Program manages loss of material.
3.5.1-51	Group B1.1: high strength low-alloy bolts	Cracking due to stress corrosion cracking; loss of material due to general corrosion	Bolting Integrity	No	This NUREG-1801 item is not applicable. There are no high tensile strength bolting as defined by yield strength > 150 KSI or low alloy steel bolts (SA 193 Grade B7) used for NSSS component supports.
3.5.1-52	Groups B2, and B4: sliding support bearing and sliding support surfaces	Loss of mechanical function due to corrosion, distortion, dirt, overload, fatigue due to vibratory and cyclic thermal loads	Structures Monitoring Program	No	Loss of mechanical function due to the listed mechanisms is not an aging effect. Such failures typically result from inadequate design or operating events rather than from the effects of aging. Failures due to cyclic thermal loads are rare for structural supports due to their relatively low temperatures.

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-53	Groups B1.1, B1.2, and B1.3: support members: welds; bolted connections; support anchorage to building structure	Loss of material due to general and pitting corrosion	ISI (IWF)	No	IPEC ISI-IWF Program manages this aging effect.
3.5.1-54	Groups B1.1, B1.2, and B1.3: Constant and variable load spring hangers; guides; stops	Loss of mechanical function due to corrosion, distortion, dirt, overload, fatigue due to vibratory and cyclic thermal loads	ISI (IWF)	No	Loss of mechanical function due to the listed mechanisms is not an aging effect. Loss of mechanical function due to distortion, dirt, overload, fatigue due to vibratory, and cyclic thermal loads is not an aging effect requiring management. Such failures typically result from inadequate design or events rather than the effects of aging. Loss of material due to corrosion, which could cause loss of mechanical function, is addressed under Item 3.5.1-53 for Groups B1.1, B1.2, and B1.3 support members.

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-55	Steel, galvanized steel, and aluminum support members; welds; bolted connections; support anchorage to building structure	Loss of material due to boric acid corrosion	Boric Acid Corrosion	No	Consistent with NUREG-1801. The Boric Acid Corrosion Prevention Program manages loss of material.
3.5.1-56	Groups B1.1, B1.2, and B1.3: Sliding surfaces	Loss of mechanical function due to corrosion, distortion, dirt, overload, fatigue due to vibratory and cyclic thermal loads	ISI (IWF)	No	Lubrite materials for nuclear applications are designed to resist deformation, have a low coefficient of friction, resist softening at elevated temperatures, resist corrosion, withstand high intensities of radiation, and will not score or mar; therefore, they are not susceptible to aging effects requiring management. Nonetheless, lubrite components associated with the steam generator and RCP supports are included in the ISI-IWF Program.

Table 3.5.1: Structures and Component Supports, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-57	Groups B1.1, B1.2, and B1.3: Vibration isolation elements	Reduction or loss of isolation function/ radiation hardening, temperature, humidity, sustained vibratory loading	ISI (IWF)	No	No supports with vibration isolation elements have been identified in the scope of license renewal for IPEC.
3.5.1-58	Galvanized steel and aluminum support members; welds; bolted connections; support anchorage to building structure exposed to air - indoor uncontrolled	None	None	NA - No AEM or AMP	Consistent with NUREG 1801.
3.5.1-59	Stainless steel support members; welds; bolted connections; support anchorage to building structure	None	None	NA - No AEM or AMP	Consistent with NUREG 1801.

Notes for Tables 3.5.2-1 through 3.5.2-4

Generic Notes

A. Consistent with NUREG-1801 item for component, material, environment, aging effect and aging management program. AMP is consistent with NUREG-1801 AMP.

B. Consistent with NUREG-1801 item for component, material, environment, aging effect and aging management program. AMP has exceptions to NUREG-1801 AMP.

C. Component is different, but consistent with NUREG-1801 item for material, environment, aging effect and aging management program. AMP is consistent with NUREG-1801 AMP.

D. Component is different, but consistent with NUREG-1801 item for material, environment, aging effect and aging management program. AMP has exceptions to NUREG-1801 AMP.

E. Consistent with NUREG-1801 material, environment, and aging effect but a different aging management program is credited.

F. Material not in NUREG-1801 for this component.

G. Environment not in NUREG-1801 for this component and material.

H. Aging effect not in NUREG-1801 for this component, material and environment combination.

I. Aging effect in NUREG-1801 for this component, material and environment combination is not applicable.

J. Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant-Specific Notes

501. The IPEC environment is not conducive to the listed aging effects. However, the identified AMP will be used to confirm the absence of significant aging effects for the period of extended operation.

502. Loss of insulating characteristics due to insulation degradation is not an aging effect requiring management for insulation material. Insulation products, which are made from fiberglass fiber, calcium silicate, stainless steel, and similar materials, in an air – indoor uncontrolled environment do not experience aging effects that would significantly degrade their ability to insulate as designed. A review of site operating experience identified no aging effects for insulation used at IPEC.

Table 3.5.2-1
Containment Buildings Structural Components and Commodities
Summary of Aging Management Review

3.5.2-1: Containment Building Structural Components and Commodities (IP2 and IP3)								
Structure and/or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Bellows penetration	PB, SSR	Stainless steel	Air – indoor uncontrolled	None	None	III.B1.1-9 (TP-5)	3.5.1-59	C
Bellows penetration	PB, SSR	Nickel alloy	Air – indoor uncontrolled	None	None			F
Jib cranes	SNS	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	VII B-3 (A-07)	3.3.1-73	E
Electrical penetration sleeves	PB, SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	CII-IWE Containment Leak Rate	II.A3-1 (C-12)	3.5.1-18	E
Equipment hatch	EN, PB, SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	CII-IWE Containment Leak Rate	II.A3-6 (C-16)	3.5.1-18	E
Fuel transfer tube penetration	PB, SSR	Stainless steel	Air – indoor uncontrolled	None	None	III.B1.1-9 (TP-5)	3.5.1-59	C
Liner plate and integral attachments	PB, SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	CII-IWE Containment Leak Rate	II.A1-11 (C-09)	3.5.1-6	E
Liner plate insulation jacket	EN, INS	Stainless steel	Air – indoor uncontrolled	None	None	III.B1.3-7 (TP-5)	3.5.1-59	C

3.5.2-1: Containment Building Structural Components and Commodities (IP2 and IP3)								
Structure and/or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Manipulator crane, crane rails and girders	SNS	Carbon steel	Air – indoor uncontrolled	Loss of material	Periodic Surveillance and Preventive Maintenance	VII B-3 (A-07)	3.3.1-73	E
Mechanical penetration sleeves	PB, SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	CII-IWE Containment Leak Rate	II.A3-3 (C-14)	3.5.1-12	E
Monorails	SNS	Carbon steel	Air – indoor uncontrolled	Loss of material	Periodic Surveillance and Preventive Maintenance	VII B-3 (A-07)	3.3.1-73	E
Personnel lock	EN, PB, SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	CII-IWE Containment Leak Rate	II.A3-6 (C-16)	3.5.1-18	E
Polar crane, rails and girders	SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	Periodic Surveillance and Preventive Maintenance	VII B-3 (A-07)	3.3.1-73	E
Pressurizer support framing	SSR	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion Prevention	III.B1.1-14 (T-25)	3.5.1-55	A
Pressurizer support framing	SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	ISI-IWF	III.B1.1-13 (T-24)	3.5.1-53	E

3.5.2-1: Containment Building Structural Components and Commodities (IP2 and IP3)								
Structure and/or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Reactor coolant pump framing	SSR	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion Prevention	III.B1.1-14 (T-25)	3.5.1-55	A
Reactor coolant pump framing	SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	ISI-IWF	III.B1.1-13 (T-24)	3.5.1-53	E
Reactor vessel support framing (ring girder)	SSR	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion Prevention	III.B1.1-14 (T-25)	3.5.1-55	A
Reactor vessel support framing	SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	ISI-IWF	III.B1.1-13 (T-24)	3.5.1-53	E
Refueling canal liner plate	EN, SSR	Stainless steel	Exposed to fluid environments	Loss of material	Water Chemistry Control – Primary and Secondary	III.A5-13 (T-14)	3.5.1-46	E
Structural steel: beams, columns, plates, trusses	EN, MB, SNS, SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.A1-12 III.A5-12 (T-11)	3.5.1-25	A
Sump liner and penetrations	EN, PB, SSR	Carbon steel	Exposed to fluid environment	Loss of material	CII-IWE Containment Leak Rate			G
Sump screens, strainer and flow barriers	EN, SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.A1-12 (T-11)	3.5.1-25	C

3.5.2-1: Containment Building Structural Components and Commodities (IP2 and IP3)								
Structure and/or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Sump screens, strainer	EN, SSR	Stainless steel	Air – indoor uncontrolled	None	None	III.B1.3-7 (TP-5)	3.5.1-59	C
Beams, columns, interior walls, slabs	EN, MB, SNS, SSR	Concrete	Air – indoor uncontrolled	None	Structures Monitoring			I, 501
Biological shield - pressurizer	EN, MB, SSR	Concrete	Air – indoor uncontrolled	None	Structures Monitoring			I, 501
Cylinder wall below grade (exterior)	FLB, PB, SSR	Concrete	Soil	None	CII-IWL Structures Monitoring			I, 501
Dome, cylinder wall, basemat	FB, MB, PB, SSR	Concrete	Air – indoor uncontrolled	None	CII-IWL Structures Monitoring Fire Protection			I, 501
Dome, cylinder wall, basemat	FB, MB, PB, SSR	Concrete	Air – outdoor	None	CII-IWL Structures Monitoring Fire Protection			I, 501
Foundation, subfoundation	FLB, PB, SSR	Concrete	Soil	None	CII-IWL Structures Monitoring			I, 501
Reactor vessel support (concrete portion)	SSR	Concrete	Air – indoor uncontrolled	None	Structures Monitoring			I, 501

3.5.2-1: Containment Building Structural Components and Commodities (IP2 and IP3)								
Structure and/or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Refuel canal slab and walls	EN, PB, SSR	Concrete	Air – indoor uncontrolled	None	Structures Monitoring			I, 501
Ring wall	EN, MB, SSR	Concrete	Air – indoor uncontrolled	None	Structures Monitoring			I, 501
Sumps	PB, SSR	Concrete	Air – indoor uncontrolled	None	Structures Monitoring			I, 501
Equipment hatch and personnel lock seals	PB, SSR	Elastomer	Air – indoor uncontrolled	Cracking Change in material properties	Containment Leak Rate	II.A3-7 (C-18)	3.5.1-16	E
Electrical penetration sealant	PB, SSR	Elastomer	Air – indoor uncontrolled	Cracking Change in material properties	Containment Leak Rate	II.A3-7 (C-18)	3.5.1-16	E
Lubrite sliding surfaces	SSR	Lubrite	Air – indoor uncontrolled	None	ISI-IWF			I, 501
Moisture barrier	EN, SSR	Elastomer	Air – indoor uncontrolled	Cracking Change in material properties	CII-IWE	II.A3-7 (C-18)	3.5.1-16	E

Table 3.5.2-2
Water Control Structures Structural Components and Commodities
Summary of Aging Management Review

3.5.2-2: Water Control Structures Structural Components and Commodities (IP2 and IP3)								
Structure and/or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Jib cranes	SNS	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	VII.B-3 (A-07)	3.3.1-73	E
Structural steel	EN, SNS, SSR	Galvanized steel	Air – indoor uncontrolled	None	None	III.B5-3 (TP-11)	3.5.1-58	A
Structural steel	EN, SNS, SSR	Galvanized steel	Air – outdoor	Loss of material	Structures Monitoring	III.A6-11 (T-21)	3.5.1-47	E
Structural steel	EN, SNS, SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.A6-11 (T-21)	3.5.1-47	E
Structural steel	EN, SNS, SSR	Carbon steel	Exposed to fluid environment	Loss of material	Structures Monitoring	III.A6-11 (T-21)	3.5.1-47	E
Structural steel	EN, SNS, SSR	Carbon steel	Air – outdoor	Loss of material	Structures Monitoring	III.A6-11 (T-21)	3.5.1-47	E
Beams, columns, floor slabs and walls (above grade)	HS, SNS, SSR	Concrete	Air – indoor uncontrolled	None	Structures Monitoring			I, 501
Beams, columns, floor slabs and walls (above grade)	HS, SNS, SSR	Concrete	Air – outdoor	None	Structures Monitoring			I, 501

3.5.2-2: Water Control Structures Structural Components and Commodities (IP2 and IP3)								
Structure and/or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Beams, columns, floor slabs and walls (below grade)	HS, SNS, SSR	Concrete	Exposed to fluid environment	Loss of material	Structures Monitoring	III.A6-7 (T-20)	3.5.1-45	E
Exterior walls below grade	HS, SNS, SSR	Concrete	Soil	None	Structures Monitoring			I, 501
Foundation	HS, SNS, SSR	Concrete	Exposed to fluid environment	Loss of material	Structures Monitoring	III.A6-7 (T-20)	3.5.1-45	E
Masonry wall	SRE	Concrete brick	Air – outdoor	Cracking	Masonry Wall	III.A6-10 (T-12)	3.5.1-43	A

Table 3.5.2-3
Turbine Building, Auxiliary Building, and Other Structures Structural Components and Commodities
Summary of Aging Management Review

Table 3.5.2-3: Turbine Building, Auxiliary Building, and Other Structures Structural Components and Commodities (IP2 and IP3)								
Structure and/ or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Control room ceiling support system	SNS	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.A1-12 (T-11)	3.5.1-25	A
Crane rails and girders	SNS	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	VII.B-3 (A-07)	3.3.1-73	E
Emergency lighting poles	SRE	Galvanized steel	Air – outdoor	Loss of material	Structures Monitoring	III.B4-7 (TP-6)	3.5.1-50	C
Fire protection panels	FB	Stainless steel	Air – indoor uncontrolled	None	None	III.B5-5 (TP-5)	3.5.1-59	C
Metal siding	EN, FB, SRE	Galvanized steel	Air – outdoor	Loss of material	Structures Monitoring	III.B4-7 (TP-6)	3.5.1-50	C
Monorails	SNS	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	VII.B-3 (A-07)	3.3.1-73	E
New fuel storage racks	EN, SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.A3-12 (T-11)	3.5.1-25	A
New fuel storage racks	EN, SSR	Stainless steel	Air – indoor uncontrolled	None	None	III.B5-5 (TP-5)	3.5.1-59	A
Roof decking	FB, SRE	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.A3-12 (T-11)	3.5.1-25	C

Table 3.5.2-3: Turbine Building, Auxiliary Building, and Other Structures Structural Components and Commodities (IP2 and IP3)								
Structure and/ or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Roof decking	FB, SRE	Carbon steel	Air – indoor uncontrolled	Loss of material	Fire Protection	III.A3-12 (T-11)	3.5.1-25	E
Spent fuel pit bridge crane, rails and girders	SNS	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	VII.B-3 (A-07)	3.3.1-73	E
Spent fuel pool liner plate and gate (IP2)	EN, SSR	Stainless steel	Exposed to fluid environments	Loss of material	Water Chemistry Control – Primary and Secondary Monitoring of spent fuel pool level per Tech Spec	III.A5-13 (T-14)	3.5.1-46	E
Spent fuel pool liner plate and gate (IP3)	EN, SSR	Stainless steel	Exposed to fluid environments	Loss of material	Water Chemistry Control – Primary and Secondary Monitoring of spent fuel pool level per Tech Spec and monitoring leakage from leak chase channel	III.A5-13 (T-14)	3.5.1-46	A
Spent fuel pool storage racks	SSR	Stainless steel	Exposed to fluid environment	Loss of material	Water Chemistry Control – Primary and Secondary	VII.A2-1 (AP-79)	3.3.1-91	C

Table 3.5.2-3: Turbine Building, Auxiliary Building, and Other Structures Structural Components and Commodities (IP2 and IP3)								
Structure and/ or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Structural steel: beams, columns, plates	MB, SNS, SRE, SSR	Carbon steel	Air – outdoor	Loss of material	Structures Monitoring	III.A1-12 III.A3-12 (T-11)	3.5.1-25	A
Structural steel: beams, columns, plates	EN, MB, SRE, SNS, SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.A1-12 III.A3-12 (T-11)	3.5.1-25	A
Structural steel: beams, columns, plates	EN, MB, SRE, SNS, SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.B5-7 (T-30)	3.5.1-39	A
Superheater stack	SNS	Carbon steel	Air – outdoor	Loss of material	Structures Monitoring	III.A3-12 (T-11)	3.5.1-25	C
Transmission towers	SRE	Galvanized steel	Air – outdoor	Loss of material	Structures Monitoring	III.B4-7 (TP-6)	3.5.1-50	C
Duct banks	EN, SRE, SSR	Concrete	Soil	None	Structures Monitoring			I, 501
Exterior walls	EN, FB, MB, PB, SNS, SRE, SSR	Concrete	Air – indoor uncontrolled	None	Structures Monitoring Fire Protection			I, 501
Exterior walls	EN, FB, MB, PB, SNS, SRE, SSR	Concrete	Air – outdoor	None	Structures Monitoring Fire Protection			I, 501

Table 3.5.2-3: Turbine Building, Auxiliary Building, and Other Structures Structural Components and Commodities (IP2 and IP3)								
Structure and/ or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Exterior walls-below grade	EN, MB, SNS, SRE, SSR	Concrete	Soil	None	Structures Monitoring			I, 501
Floor slabs, interior walls, and ceilings	EN, FB, MB, PB, SNS, SRE, SSR	Concrete	Air – indoor uncontrolled	None	Structures Monitoring Fire Protection			I, 501
Foundations (transmission towers, buildings, transformers, tanks, circuit breakers, emergency lighting poles)	EN, SRE, SSR	Concrete	Soil	None	Structures Monitoring			I, 501
Manholes	EN, SRE, SSR	Concrete	Air – outdoor	None	Structures Monitoring			I, 501
Manholes	EN, SRE, SSR	Concrete	Soil	None	Structures Monitoring			I, 501
Masonry walls	EN, FB, SNS, SRE, SSR	Concrete block	Air – indoor uncontrolled	Cracking	Masonry Wall Fire Protection	III.A1-11 III.A3-11 (T-12)	3.5.1-43	E

Table 3.5.2-3: Turbine Building, Auxiliary Building, and Other Structures Structural Components and Commodities (IP2 and IP3)								
Structure and/ or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Masonry walls	EN, FB, SNS	Concrete block	Air – outdoor	Cracking	Masonry Wall Fire Protection	III.A1-11 III.A3-11 (T-12)	3.5.1-43	E
Masonry walls	EN, FB, SNS	Concrete brick	Air – outdoor	Cracking	Masonry Wall Fire Protection	III.A1-11 III.A3-11 (T-12)	3.5.1-43	E
Masonry walls	EN, FB, SNS	Concrete brick	Air – indoor uncontrolled	Cracking	Masonry Wall Fire Protection	III.A1-11 III.A3-11 (T-12)	3.5.1-43	E
Roof slab	EN, FB, MB, PB, SNS, SRE, SSR	Concrete	Air – outdoor	None	Structures Monitoring Fire Protection			I, 501
Shield wall	EN, MB, SNS	Concrete	Air – indoor uncontrolled	None	Structures Monitoring			I, 501
Shield wall	EN, MB, SNS	Concrete	Air – outdoor	None	Structures Monitoring			I, 501

Table 3.5.2-4
Bulk Commodities
Summary of Aging Management Review

Table 3.5.2-4: Bulk Commodities								
Structure and/ or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Anchorage / embedments	SNS, SRE, SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.B2-10 III.B3-7 III.B4-10 III.B5-7 (T-30)	3.5.1-39	A
					ISI-IWF	III.B1.1-13 III.B1.2-10 III.B1.3-10 (T-24)	3.5.1-53	E
Anchorage / embedments	SNS, SRE, SSR	Carbon steel	Air – outdoor	Loss of material	Structures Monitoring	III.B2-10 III.B3-7 III.B4-10 III.B5-7 (T-30)	3.5.1-39	A
					ISI-IWF	III.B1.1-13 III.B1.2-10 III.B1.3-10 (T-24)	3.5.1-53	E

Table 3.5.2-4: Bulk Commodities								
Structure and/ or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Anchorage / embedments	SNS, SRE, SSR	Carbon steel	Exposed to fluid environment	Loss of material	Structures Monitoring	III.A6-11 (T-21)	3.5.1-47	E
Anchorage / embedments	SNS, SRE, SSR	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion Prevention	III.B1.1-14 (T-25)	3.5.1-55	A
Anchorage / embedments	SNS, SRE, SSR	Stainless steel	Air with borated water leakage	None	None	III.B1.1-10 (TP-4)	3.5.1-59	A
Anchorage / embedments	SNS, SRE, SSR	Stainless steel	Air – indoor	None	None	III.B1.1-9 (TP-5)	3.5.1-59	A
Base plates	SNS, SRE, SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.B2-10 III.B3-7 III.B4-10 III.B5-7 (T-30)	3.5.1-39	A
					ISI-IWF	III.B1.1-13 III.B1.2-10 III.B1.3-10 (T-24)	3.5.1-53	E
Base plates	SNS, SRE, SSR	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion Prevention	III.B1.1-14 III.B1.2-11 (T-25)	3.5.1-55	A

Table 3.5.2-4: Bulk Commodities								
Structure and/ or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Base plates	SNS, SRE, SSR	Carbon steel	Air – outdoor	Loss of material	Structures Monitoring	III.B2-10 III.B3-7 III.B4-10 III.B5-7 (T-30)	3.5.1-39	A
					ISI-IWF	III.B1.1-13 III.B1.2-10 III.B1.3-10 (T-24)	3.5.1-53	E
Cable tray	SNS, SRE, SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.B2-10 (T-30)	3.5.1-39	C
Cable tray	SNS, SRE, SSR	Galvanized steel	Air – indoor uncontrolled	None	None	III.B2-5 (TP-11)	3.5.1-58	A
Cable trays support	SNS, SRE, SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.B2-10 (T-30)	3.5.1-39	A
Cable trays support	SNS, SRE, SSR	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion Prevention	III.B2-11 T-25)	3.5.1-55	A
Cable trays support	SNS, SRE, SSR	Galvanized steel	Air – indoor uncontrolled	None	None	III.B2-5 (TP-11)	3.5.1-58	A
Cable trays support	SNS, SRE, SSR	Galvanized steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion Prevention	III.B2-6 (TP-3)	3.5.1-55	A

Table 3.5.2-4: Bulk Commodities								
Structure and/ or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Component and piping supports for ASME Class 1, 2, 3 and MC	SNS, SRE, SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	ISI-IWF	III.B1.1-13 III.B1.2-10 III.B1.3-10 (T-24)	3.5.1-53	E
Component and piping supports for ASME Class 1, 2, 3 and MC	SNS, SRE, SSR	Carbon steel	Air – outdoor	Loss of material	ISI-IWF	III.B1.1-13 III.B1.2-10 III.B1.3-10 (T-24)	3.5.1-53	E
Component and piping supports for ASME Class 1, 2, 3 and MC	SNS, SRE, SSR	Stainless steel	Air – indoor uncontrolled	None	None	III.B1.1-9 III.B1.2-7 III.B1.3-7 (TP-5)	3.5.1-59	A
Component and piping supports	SNS, SRE, SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.B2-10 III.B3-7 III.B4-10 III.B5-7 (T-30)	3.5.1-39	A

Table 3.5.2-4: Bulk Commodities								
Structure and/ or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Component and piping supports	SNS, SRE, SSR	Carbon steel	Air – outdoor	Loss of material	Structures Monitoring	III.B2-10 III.B3-7 III.B4-10 III.B5-7 (T-30)	3.5.1-39	A
Component and piping supports	SNS, SRE, SSR	Stainless steel	Air – indoor uncontrolled	None	None	III.B2-8 III.B3-5 III.B4-8 III.B5-5 (TP-5)	3.5.1-59	A
Conduits	SNS, SRE, SSR	Galvanized steel	Air – indoor uncontrolled	None	None	III.B2-5 (TP-11)	3.5.1-58	A
Conduits	SNS, SRE, SSR	Galvanized steel	Air – outdoor	Loss of material	Structures Monitoring	III.B2-7 (TP-6)	3.5.1-50	C
Conduit supports	SNS, SRE, SSR	Galvanized steel	Air – indoor uncontrolled	None	None	III.B2-5 (TP-11)	3.5.1-58	A
Conduit supports	SNS, SRE, SSR	Galvanized steel	Air – outdoor	Loss of material	Structures Monitoring	III.B2-7 (TP-6)	3.5.1-50	C
Conduit supports	SNS, SRE, SSR	Galvanized steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion Prevention	III.B2-6 (TP-3)	3.5.1-55	A
Conduit supports	SNS, SRE, SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.B2-10 (T-30)	3.5.1-39	A

Table 3.5.2-4: Bulk Commodities								
Structure and/ or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Conduit supports	SNS, SRE, SSR	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion Prevention	III.B2-11 (T-25)	3.5.1-55	A
Conduit supports	SNS, SRE, SSR	Carbon steel	Air – outdoor	Loss of material	Structures Monitoring	III.B2-10 (T-30)	3.5.1-39	A
Damper framing	FB, SRE	Carbon steel	Air – indoor uncontrolled	Loss of material	Fire Protection	III.B2-10 (T-30)	3.5.1-39	E
Electrical and instrument panels and enclosures	SNS, SRE, SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.B3-7 (T-30)	3.5.1-39	C
Electrical and instrument panels and enclosures	SNS, SRE, SSR	Carbon steel	Air – outdoor	Loss of material	Structures Monitoring	III.B3-7 (T-30)	3.5.1-39	C
Electrical and instrument panels and enclosures	SNS, SRE, SSR	Galvanized steel	Air – indoor uncontrolled	None	None	III.B3-3 (TP-11)	3.5.1-58	A
Electrical and instrument panels and enclosures	SNS, SRE, SSR	Galvanized steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion Prevention	III.B3-4 (TP-3)	3.5.1-55	A

Table 3.5.2-4: Bulk Commodities								
Structure and/ or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Electrical and instrument panels and enclosures	SNS, SRE, SSR	Galvanized steel	Air – outdoor	Loss of material	Structures Monitoring	III.B4-7 (TP-6)	3.5.1-50	C
Fire doors	FB	Carbon steel	Air – indoor uncontrolled	Loss of material	Fire Protection	VII.G-3 (A-21)	3.3.1-63	B
Fire hose reels	SRE	Carbon steel	Air – indoor uncontrolled	Loss of material	Fire Water System	III.B2-10 (T-30)	3.5.1-39	E
Flood, pressure and specialty doors	EN, FLB, PB	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.A1-12 III.A2-12 III.A3-12 (T-11)	3.5.1-25	C
Flood, pressure and specialty doors	EN, FLB, MB, PB	Carbon steel	Air – outdoor	Loss of material	Structures Monitoring	III.A1-12 III.A2-12 III.A3-12 (T-11)	3.5.1-25	C
HVAC duct supports	SNS, SRE, SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.B2-10 (T-30)	3.5.1-39	A
HVAC duct supports	SNS, SRE, SSR	Galvanized steel	Air – indoor uncontrolled	None	None	III.B2-5 (TP-11)	3.5.1-58	A
Instrument line supports	SNS, SRE, SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.B2-10 (T-30)	3.5.1-39	A

Table 3.5.2-4: Bulk Commodities								
Structure and/ or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Instrument line supports	SNS, SRE, SSR	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion Prevention	III.B2-11 (T-25)	3.5.1-55	A
Instrument line supports	SNS, SRE, SSR	Galvanized steel	Air – indoor uncontrolled	None	None	III.B2-5 (TP-11)	3.5.1-58	A
Instrument line supports	SNS, SRE, SSR	Galvanized steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion Prevention	III.B2-6 (TP-3)	3.5.1-55	A
Instrument line supports	SNS, SRE, SSR	Stainless steel	Air – indoor uncontrolled	None	None	III.B2-8 (TP-5)	3.5.1-59	A
Instrument racks, frames and tubing trays	SNS, SRE, SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.B3-7 (T-30)	3.5.1-39	C
Instrument racks, frames and tubing trays	SNS, SRE, SSR	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion Prevention	III.B2-11 (T-25)	3.5.1-55	A
Instrument racks, frames and tubing trays	SNS, SRE, SSR	Galvanized steel	Air – indoor uncontrolled	None	None	III.B2-5 (TP-11)	3.5.1-58	A
Instrument racks, frames and tubing trays	SNS, SRE, SSR	Galvanized steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion Prevention	III.B2-6 (TP-3)	3.5.1-55	A

Table 3.5.2-4: Bulk Commodities								
Structure and/ or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Insulation jacket	INS, SNS	Stainless steel	Air – indoor uncontrolled	None	None	III.B1.3-7 (TP-5)	3.5.1-59	C, 502
Insulation jacket	INS, SNS	Aluminum	Air – indoor uncontrolled	None	None	III.B1.3-4 (TP-8)	3.5.1-58	C, 502
Manways, hatches and hatch covers	EN, FLB, MB, PB, SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.A1-12 III.A2-12 (T-11)	3.5.1-25	C
						III.A6-11 (T-21)	3.5.1-47	E
Manways, hatches and hatch covers	EN, FLB, MB, PB, SRE, SSR, SNS	Carbon steel	Air – outdoor	Loss of material	Structures Monitoring	III.A1-12 III.A3-12 (T-11)	3.5.1-25	C
						III.A6-11 (T-21)	3.5.1-47	E
Missile shields	EN, MB	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.B5-7 (T-30)	3.5.1-39	A
Penetration sleeves (mechanical/ electrical not penetrating containment boundary)	SSR, SNS, FLB	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.B2-10 (T-30)	3.5.1-39	C

Table 3.5.2-4: Bulk Commodities								
Structure and/ or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Pipe whip restraints	SSR, SNS, EN	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.B5-7 (T-30)	3.5.1-39	A
Stairway, handrail, platform, grating, decking, and ladders	SNS	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.B5-7 (T-30)	3.5.1-39	A
Stairway, handrail, platform, grating, decking, and ladders	SNS	Galvanized steel	Air – indoor uncontrolled	None	None	III.B5-3 (TP-11)	3.5.1-58	A
Vents and louvers	SNS, SRE, SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.A1-12 III.A3-12 (T-11)	3.5.1-25	C
Vents and louvers	SNS, SRE, SSR	Carbon steel	Air – outdoor	Loss of material	Structures Monitoring	III.A1-12 III.A3-12 (T-11)	3.5.1-25	C
Vents and louvers	SNS, SRE, SSR	Aluminum	Air – outdoor	Loss of material	Structures Monitoring	III.B2-7 III.B4-7 (TP-6)	3.5.1-50	C

Table 3.5.2-4: Bulk Commodities								
Structure and/ or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Anchor bolts	SNS, SRE, SSR	Carbon steel (bolted connections)	Air – indoor uncontrolled	Loss of material	ISI-IWF	III.B1.1-13 III.B1.2-10 III.B1.3-10 (T-24)	3.5.1-53	E
Anchor bolts	SNS, SRE, SSR	Carbon steel (bolted connections)	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.B2-10 III.B3-7 III.B4-10 III.B5-7 (T-30)	3.5.1-39	A
Anchor bolts	SNS, SRE, SSR	Carbon steel (bolted connections)	Air – outdoor	Loss of material	ISI-IWF	III.B1.1-13 III.B1.2-10 III.B1.3-10 (T-24)	3.5.1-53	E
Anchor bolts	SNS, SRE, SSR	Carbon steel (bolted connections)	Air – outdoor	Loss of material	Structures Monitoring	III.B2-10 III.B3-7 III.B4-10 III.B5-7 (T-30)	3.5.1-39	A

Table 3.5.2-4: Bulk Commodities								
Structure and/ or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Anchor bolts	SNS, SRE, SSR	Stainless steel (bolted connections)	Air – indoor uncontrolled	None	None	III.B2-8 III.B3-5 III.B4-8 III.B5-5 (TP-5)	3.5.1-59	A
Anchor bolts	SNS, SRE, SSR	Stainless steel (bolted connections)	Air – outdoor	Loss of material	Structures Monitoring	III.B2-7 III.B4-7 (TP-6)	3.5.1-50	A
Anchor bolts	SNS, SRE, SSR	Galvanized steel (bolted connections)	Air – indoor uncontrolled	None	None	III.B2-5 III.B3-3 III.B4-5 III.B5-3 (TP-11)	3.5.1-58	A
Anchor bolts	SNS, SRE, SSR	Galvanized steel (bolted connections)	Air – outdoor	Loss of material	Structures Monitoring	III.B2-7 III.B4-7 (TP-6)	3.5.1-50	A
ASME Class 1, 2, 3 and MC Supports bolting	SNS, SRE, SSR	Carbon steel (bolted connections)	Air – indoor uncontrolled	Loss of material	ISI-IWF	III.B1.1-13 III.B1.2-10 III.B1.3-10 (T-24)	3.5.1-53	E

Table 3.5.2-4: Bulk Commodities								
Structure and/ or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
ASME Class 1, 2, 3 and MC Supports bolting	SNS, SRE, SSR	Carbon steel (bolted connections)	Air – outdoor	Loss of material	ISI-IWF	III.B1.1-13 III.B1.2-10 III.B1.3-10 (T-24)	3.5.1-53	E
ASME Class 1, 2, 3 and MC Supports bolting	SNS, SRE, SSR	Stainless steel (bolted connections)	Air – indoor uncontrolled	None	None	III.B2-8 III.B3-5 III.B4-8 III.B5-5 (TP-5)	3.5.1-59	A
ASME Class 1, 2, 3 and MC Supports bolting	SNS, SRE, SSR	Stainless steel (bolted connections)	Air – outdoor	Loss of material	Structures Monitoring	III.B2-7 III.B4-7 (TP-6)	3.5.1-50	A
Structural bolting	SNS, SRE, SSR	Carbon steel (bolted connections)	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.B2-10 III.B3-7 III.B4-10 III.B5-7 (T-30)	3.5.1-39	A
Structural bolting	SNS, SRE, SSR	Carbon steel (bolted connections)	Air – outdoor	Loss of material	Structures Monitoring	III.B2-10 III.B3-7 III.B4-10 III.B5-7 (T-30)	3.5.1-39	A

Table 3.5.2-4: Bulk Commodities								
Structure and/ or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Structural bolting	SNS, SRE, SSR	Carbon steel (bolted connections)	Air with borated water leakage	Loss of material	Boric Acid Corrosion Prevention	III.B2-11 III.B3-8 III.B4-11 III.B5-8 (T-25)	3.5.1-55	A
Structural bolting	SNS, SRE, SSR	Carbon steel (bolted connections)	Exposed to fluid environment	Loss of material	Structures Monitoring	III.A6-11 (T-21)	3.5.1-47	E
Structural bolting	SNS, SRE, SSR	Galvanized steel (bolted connections)	Air – indoor uncontrolled	None	None	III.B2-5 III.B3-3 III.B4-5 III.B5-3 (TP-11)	3.5.1-58	A
Structural bolting	SNS, SRE, SSR	Galvanized steel (bolted connections)	Air with borated water leakage	Loss of material	Boric Acid Corrosion Prevention	III.B2-6 III.B3-4 III.B4-6 III.B5-4 (TP-3)	3.5.1-55	A
Structural bolting	SNS, SRE, SSR	Galvanized steel (bolted connections)	Air – outdoor	Loss of material	Structures Monitoring	III.B2-7 III.B4-7 (TP-6)	3.5.1-50	A

Table 3.5.2-4: Bulk Commodities								
Structure and/ or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Structural bolting	SNS, SRE, SSR	Stainless steel (bolted connections)	Air – indoor uncontrolled	None	None	III.B2-8 III.B3-5 III.B4-8 III.B5-5 (TP-5)	3.5.1-59	A
Structural bolting	SNS, SRE, SSR	Stainless steel (bolted connections)	Air – outdoor	Loss of material	Structures Monitoring	III.B2-7 III.B4-7 (TP-6)	3.5.1-50	A
Equipment pads/ foundations	SNS, SRE, SSR	Concrete	Air – indoor uncontrolled	None	Structures Monitoring			I, 501
Equipment pads/ foundations	SNS, SRE, SSR	Concrete	Air – outdoor	None	Structures Monitoring			I, 501
Fire proofing	FB	Pyrocrete	Air – indoor uncontrolled	None	Structures Monitoring Fire Protection			I, 501
Manways, hatches and hatch covers	FB, FLB, PB, SNS, SRE, SSR	Concrete	Air – indoor uncontrolled	None	Structures Monitoring Fire Protection			I, 501
Missile shields	MB	Concrete	Air – indoor uncontrolled	None	Structures Monitoring			I, 501
Missile shields	MB	Concrete	Air – outdoor	None	Structures Monitoring			I, 501

Table 3.5.2-4: Bulk Commodities

Structure and/ or Component or Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Support pedestals	SNS, SRE, SSR	Concrete	Air – indoor uncontrolled	None	Structures Monitoring			I, 501
Support pedestals	SNS, SRE, SSR	Concrete	Air – outdoor	None	Structures Monitoring			I, 501
Support pedestals	SNS, SRE, SSR	Concrete	Exposed to fluid environment	Loss of material	Structures Monitoring	III. A6-7 (T-20)	3.5.1-45	E
Fire barrier penetration seal	EN, FB, PB	Elastomer	Air – indoor uncontrolled	Cracking Change in material properties	Fire Protection	VII G-1 (A-19)	3.3.1-61	B
Fire stops	FB	Cera blanket, mineral wool	Air – indoor uncontrolled	Cracking/ delamination Separation	Fire Protection			J
Fire wrap	FB	Cerafiber, cera blanket	Air – indoor uncontrolled	Loss of material	Fire Protection			J
Insulation	INS, SNS	Fiberglass/ calcium silicate	Air – indoor uncontrolled	None	None			J, 502
Seals and gaskets (floors, doors, manways and hatches)	PB, SSR	Elastomers	Air – indoor uncontrolled	Cracking Change in material properties	Structures Monitoring	III.A6-12 (TP-7)	3.5.1-44	C

Table 3.5.2-4: Bulk Commodities								
Structure and/ or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Water stops	FLB	Elastomers	Air – indoor uncontrolled	None	None			J

3.6 ELECTRICAL AND INSTRUMENTATION AND CONTROLS

3.6.1 Introduction

This section provides the results of the aging management review for electrical components which are subject to aging management review. Consistent with the methods described in NEI 95-10, the electrical and I&C aging management reviews focus on commodity groups rather than systems. The following electrical commodity groups requiring aging management review are addressed in this section.

- high-voltage insulators
- insulated cables and connections
- metal-enclosed bus
- switchyard bus and connections
- transmission conductors and connections
- direct burial 138kv insulated transmission cables

Table 3.6.1, Summary of Aging Management Programs for Electrical Components Evaluated in Chapter VI of NUREG-1801, provides the summary of the programs evaluated in NUREG-1801 for the electrical and I&C components. This table uses the format described in the introduction to Section 3. Hyperlinks are provided to the program evaluations in Appendix B.

3.6.2 Results

Table 3.6.2-1, Electrical and I&C (EIC) Components-Summary of Aging Management Evaluation, summarizes the results of aging management reviews and the NUREG-1801 comparison for electrical and I&C components.

3.6.2.1 Materials, Environments, Aging Effects Requiring Management, and Aging Management Programs

The following sections list the materials, environments, aging effects requiring management, and aging management programs for electrical and I&C components subject to aging management review. Programs are described in Appendix B. Further details are provided in the system tables.

Materials

Electrical and I&C components subject to aging management review are constructed of the following materials.

- aluminum
- cement
- copper and copper alloys
- galvanized metals
- insulation material (various organic polymers)

- porcelain
- steel and steel alloys
- various metals used for electrical connections

Environment

Electrical and I&C components subject to aging management review are exposed to the following environments.

- air with borated water leakage
- heat and air
- moisture and air
- moisture and voltage stress
- outdoor weather
- radiation and air
- soil

Aging Effects Requiring Management

The following aging effects associated with electrical and I&C components require management.

- loosening of bolted connections
- loss of circuit continuity
- loss of material
- reduced insulation resistance (IR)

Aging Management Programs

The following aging management programs will manage the effects of aging on electrical and I&C components.

- Boric Acid Corrosion Prevention
- Metal-Enclosed Bus Inspection
- Non-EQ Bolted Cable Connections
- Non-EQ Inaccessible Medium-Voltage Cable
- Non-EQ Instrumentation Circuits Test Review
- Non-EQ Insulated Cables And Connections

3.6.2.2 Further Evaluation of Aging Management as Recommended by NUREG-1801

NUREG-1801 indicates that further evaluation is necessary for certain aging effects and other issues discussed in Section 3.6.2.2 of NUREG-1800. The following sections are numbered corresponding to the discussions in NUREG-1800 and explain the IPEC approach to these areas requiring further evaluation. Programs are described in Appendix B.

3.6.2.2.1 Electrical Equipment Subject to Environmental Qualification

Environmental qualification (EQ) analyses of electrical equipment are TLAAs as defined in 10 CFR 54.3. TLAAs are evaluated in accordance with 10 CFR 54.21(c). The evaluation of EQ TLAA is addressed in Section 4.4.

3.6.2.2.2 Degradation of Insulator Quality due to Presence of Any Salt Deposits and Surface Contamination, and Loss of Material due to Mechanical Wear

The discussion in NUREG-1800 concerns effects of these aging mechanisms on high-voltage insulators.

The insulators evaluated for IPEC license renewal are those used to support uninsulated, high-voltage electrical components such as overhead transmission conductors and switchyard buses. The high voltage insulators support conductors for the recovery of offsite power following SBO.

The Unit 2 path includes transmission conductors (overhead and underground) and switchyard bus located between the switchyard breakers and the station auxiliary transformer. The Unit 3 path includes overhead transmission conductors and switchyard bus between the switchyard breakers and the station auxiliary transformer. High voltage insulators associated with these paths are subject to aging management review.

Various airborne materials such as dust, salt and industrial effluents can contaminate insulator surfaces. A large buildup of contamination enables the conductor voltage to track along the surface more easily and can lead to insulator flashover. Surface contamination can be a problem in areas where there are greater concentrations of airborne particles, such as near facilities that discharge heavy pollutants or near the seacoast where salt spray is prevalent. The buildup of surface contamination is gradual and in most areas washed away by rain. The glazed and coated insulator surface aids this contamination removal. IPEC is not located near the seacoast where salt spray is considered, nor is IPEC located near a facility that discharges heavy pollutants. Plant operating experience does not identify any issues associated with the buildup of surface contamination on the high voltage insulators. In addition, this area normally receives moderate rainfall, and any gradual buildup is washed away by rain. Although abnormal weather conditions may affect insulators, these are event-driven effects, not age-related effects. Surface contamination is not a

significant aging effect for IPEC high-voltage insulators, so it is not an aging effect requiring management.

Mechanical wear is a potential aging effect for strain and suspension insulators subject to movement. Although this mechanism is possible, industry experience has shown overhead transmission conductors do not normally swing. When subjected to a substantial wind, movement will subside after a short period. A review of IPEC operating experience determined that wear has not been apparent during routine inspections. Loss of material due to wear is not significant and will not cause a loss of intended function of the insulators. Therefore, loss of material is not an aging effect requiring management for insulators.

There are no aging effects requiring management for IPEC high-voltage insulators.

3.6.2.2.3 Loss of Material due to Wind Induced Abrasion and Fatigue, Loss of Conductor Strength due to Corrosion, and Increased Resistance of Connection due to Oxidation or Loss of Pre-load

Overhead transmission conductors are uninsulated, stranded electrical cables used outside buildings in high-voltage applications. The transmission conductor commodity group includes the associated fastening hardware but excludes the high-voltage insulators. Major active equipment assemblies include their associated transmission conductor terminations.

Overhead transmission conductors are subject to aging management review if they are necessary for recovery of offsite power following an SBO. At IPEC, overhead transmission conductors located between the switchyard breaker and station auxiliary transformers support recovery of offsite power following an SBO. Other overhead transmission conductors are not subject to aging management review since they do not perform a license renewal intended function.

Wind loading can cause overhead transmission conductor vibration, or sway. Consideration is given to wind loading during the design and installation phase. Loss of material that could be caused by overhead transmission conductor vibration or sway is not a significant aging effect in that it would not cause a loss of intended function if left unmanaged for the extended period of operation. The effects of wind loading and vibration on strain and suspension insulators are discussed in Section 3.6.2.2.2.

The most prevalent mechanism contributing to loss of conductor strength of an aluminum conductor steel reinforced (ACSR) transmission conductor is corrosion, which includes corrosion of the steel core and aluminum strand pitting. Corrosion in ACSR conductors is a very slow-acting mechanism, and the corrosion rates depend largely on air quality, which includes suspended particles chemistry, SO_2

concentration in air, precipitation, fog chemistry, and meteorological conditions. Air quality in rural areas generally contains low concentrations of suspended particles and SO_2, which keeps the corrosion rate to a minimum. Although IPEC is located near urban areas there are no other industries in the immediate rural area. Tests performed by Ontario Hydroelectric showed a 30 percent loss of composite conductor strength of an 80-year-old ACSR conductor due to corrosion.

There is a set percentage of composite conductor strength established at which an ACSR transmission conductor is replaced. As illustrated below, there is ample strength margin to maintain the transmission conductor intended function through the period of extended operation.

The National Electrical Safety Code (NESC) requires that tension on installed conductors be a maximum of 60 percent of the ultimate conductor strength. The NESC also sets the maximum tension a conductor must be designed to withstand under heavy load requirements, which includes consideration of ice, wind and temperature. The aging management review of the IPEC transmission conductors reviewed these specific attributes.

The IPEC transmission conductors subject to aging management review were bounded by the Ontario Hydro test population. The IPEC transmission conductors have an ultimate strength margin greater than the Ontario Hydro test cables after 80 years of service. The installed configuration at IPEC is representative of the tested samples, so the conclusions in the Ontario Hydro study are valid for IPEC. Therefore, loss of conductor strength due to corrosion of the transmission conductors in not significant and is not an aging effect requiring management for the period of extended operation.

The design of the transmission conductor bolted connections precludes torque relaxation, and the IPEC plant-specific operating experience supports this statement, since plant operating experience has not identified any failures of switchyard connections due to aging. The typical design of switchyard bolted connections includes Belleville washers. The bolted connections and washers are coated with an anti-oxidant compound (a grease-type sealant) prior to tightening the connection to prevent the formation of oxides on the metal surface and to prevent moisture from entering the connection, thus reducing the chances of corrosion. Based on operating experience, this method of installation has been shown to provide a corrosion-resistant, low-electrical-resistance connection. The type of bolting plate and the use of Bellville washers is the industry standard to preclude torque relaxation. IPEC design incorporates the use of Belleville washers on bolted electrical connections of dissimilar metals to compensate for temperature changes, maintain the proper torque and prevent loosening. This method of assembly is consistent with the good bolting practices recommended by industry guidelines. Combined with the proper sizing of the conductors, this assembly virtually eliminates the need to consider this aging

mechanism; therefore, there will be no significant aging. These transmission connections are included in the infrared predictive maintenance of the 138 kV switchyard, which verifies the effectiveness of the connection design and installation practices. The infrared predictive maintenance is performed at least once every year. Based on this discussion, loosening of bolted connections for transmission conductors is not an aging effect requiring management.

There are no aging effects requiring management for transmission conductors or connectors.

Switchyard bus is uninsulated, un-enclosed, rigid electrical conductors used in medium- and high-voltage applications. Switchyard bus includes the hardware used to secure the bus to high-voltage insulators. Switchyard bus establishes electrical connections to disconnect switches, switchyard breakers, and transformers. The IPEC switchyard bus between the switchyard breakers and the station auxiliary transformers support recovery of offsite power following SBO event and is therefore subject to aging management review. Switchyard bus outside the path of offsite power recovery does not require aging management review since it does not perform a license renewal intended function.

The switchyard bus subject to aging management review is constructed of rigid aluminum pipe. The switchyard bus is connected to short lengths of flexible conductors to minimize vibration from supports and active components such as circuit breakers. Based on this design configuration, wind induced vibration is not a significant aging mechanism. The bolted connections associated with the switchyard bus are for the connections to station post insulators used to support the bus. All other connections to the bus are welded. The components involved in switchyard bus connections are constructed from aluminum, galvanized steel and stainless steel. No organic materials are involved.

With no rigid connections to moving or vibrating equipment, loss of material due to vibration is not a significant aging effect requiring management. Aluminum bus exposed to the service conditions of the IPEC 138kV switchyards does not experience any appreciable aging effects, except for minor oxidation, which does not impact the ability of the switchyard bus to perform its intended function. Therefore, it is concluded that general corrosion resulting in the oxidation of the switchyard bus is not an aging effect requiring management.

Connection surface oxidation and loosening of bolted connections for aluminum switchyard bus is not applicable since the switchyard bus connections requiring aging management review are welded connections. However, the flexible conductors, which are welded to the switchyard bus, are bolted to the other switchyard components. These switchyard component connections are also included in the infrared predictive maintenance of the 138 kV switchyard, which verifies the

effectiveness of the connection design and installation practices. The infrared predictive maintenance is performed at least once every year. Flexible conductors are included in the switchyard bus commodity. These flexible conductor bolted connections are assembled similar to the transmission conductor bolted connections discussed previously in this section. For environmental conditions at IPEC, no significant aging has been identified that could cause a loss of intended function for the period of extended operation. Vibration is not applicable since flexible connectors connect switchyard bus to active components.

Although not specifically stated, the switchyard connections requiring aging management review are welded and bolted connections. Neither of these connection types require aging management, because the loosening of bolted connections is not a significant aging effect.

Connection surface oxidation for aluminum switchyard bus is not applicable since switchyard bus connections requiring aging management review are welded connections. For ambient environmental conditions at IPEC, no aging effects have been identified that could cause a loss of intended function for the period of extended operation. Vibration is not applicable since flexible connectors connect switchyard bus.

There are no aging effects requiring management for aluminum switchyard bus or connections.

3.6.2.2.4 Quality Assurance for Aging Management of Nonsafety-Related Components

See Appendix B Section B.0.3 for discussion of IPEC quality assurance procedures and administrative controls for aging management programs.

3.6.2.3 Time-Limited Aging Analysis

The only TLAAs identified for the electrical and I&C commodity components are evaluations for EQ. The EQ TLAA is evaluated in Section 4.4.

3.6.3 Conclusion

The electrical and I&C components that are subject to aging management review have been identified in accordance with the requirements of 10 CFR 54.21(a)(1). The aging management programs selected to manage aging effects for the electrical and I&C components are identified in Section 3.6.2.1 and in the following tables. A description of aging management programs is provided in Appendix B of this application, along with the demonstration that the identified aging effects will be managed for the period of extended operation.

Based on the demonstrations provided in Appendix B, the effects of aging associated with electrical and I&C components will be managed such that there is reasonable assurance the

intended functions will be maintained consistent with the current licensing basis during the period of extended operation.

Table 3.6.1
Summary of Aging Management Programs for the Electrical and I&C Components Evaluated in Chapter VI of NUREG-1801

Table 3.6.1: Electrical Components, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.6.1-1	Electrical equipment subject to 10 CFR 50.49 environmental qualification (EQ) requirements	Degradation due to various aging mechanisms	Environmental Qualification of Electric Components	Yes, TLAA	EQ equipment is not subject to aging management review because replacement is based on qualified life. EQ analyses are evaluated as TLAAs in Section 4.4.
3.6.1-2	Electrical cables, connections and fuse holders (insulation) not subject to 10 CFR 50.49 EQ requirements	Reduced insulation resistance (IR) and electrical failure due to various physical, thermal, radiolytic, photolytic and chemical mechanisms	Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements	No	Consistent with NUREG-1801. The Non-EQ Insulated Cables And Connections Program will manage the effects of aging. This program includes inspection of non-EQ electrical and I&C penetration cables and connections.
3.6.1-3	Conductor insulation for electrical cables and connections used in instrumentation circuits not subject to 10 CFR 50.49 EQ requirements that are sensitive to reduction in conductor insulation resistance (IR)	Reduced insulation resistance (IR) and electrical failure due to various physical, thermal, radiolytic, photolytic and chemical mechanisms	Electrical Cables and Connections used in Instrumentation Circuits Not Subject to 10 CFR 50.49 EQ Requirements	No	Consistent with NUREG-1801. The Non-EQ Instrumentation Circuits Test Review Program will manage the effects of aging. This program includes review of calibration and surveillance testing results of instrumentation circuits.

Table 3.6.1: Electrical Components, NUREG-1801 Vol. 1

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.6.1-4	Conductor insulation for inaccessible medium-voltage (2kV to 35kV) cables (e.g., installed in conduit or direct buried) not subject to 10 CFR 50.49 EQ requirements	Localized damage and breakdown of insulation leading to electrical failure due to moisture intrusion, water trees	Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 EQ Requirements	No	Consistent with NUREG-1801. The Non-EQ Inaccessible Medium-Voltage Cable Program will manage the effects of aging. This program includes inspection of medium-voltage cables exposed to significant moisture and voltage and testing as required. In Table 3.6.2-1, reduced insulation resistance (IR) is considered equivalent to the aging effect listed for this item (breakdown of insulation).
3.6.1-5	Connector contacts for electrical connectors exposed to borated water leakage	Corrosion of connector contact surfaces due to intrusion of borated water	Boric Acid Corrosion	No	Consistent with NUREG-1801. The Boric Acid Corrosion Prevention Program will manage the effects of aging. This program includes periodic visual inspection of adjacent structures, components, and supports for evidence of leakage and corrosion. In Table 3.6.2-1, loss of circuit continuity is the aging effect resulting from corrosion of connector contact surfaces.

Table 3.6.1: Electrical Components, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.6.1-6	Fuse holders (not part of a larger assembly) - metallic clamp	Fatigue due to ohmic heating, thermal cycling, electrical transients, frequent manipulation, vibration, chemical contamination, corrosion, and oxidation	Fuse Holders	No	NUREG-1801 aging effects are not applicable to IPEC. A review of IPEC documents indicated that fuse holders utilizing metallic clamps are either part of an active device or located in circuits that perform no intended function. Therefore, fuse holders with metallic clamps at IPEC are not subject to aging management review.
3.6.1-7	Metal enclosed bus – Bus / connections	Loosening of bolted connections due to thermal cycling and ohmic heating	Metal Enclosed Bus	No	Consistent with NUREG-1801. The Metal-Enclosed Bus Inspection Program will manage the effects of aging. This program includes thermography of the exterior of the MEG and visual inspection of interior portions of the bus.
3.6.1-8	Metal enclosed bus – insulation / insulators	Reduced insulation resistance and electrical failure due to various physical, thermal, radiolytic, photolytic, and chemical mechanisms	Metal Enclosed Bus	No	Consistent with NUREG-1801. The Metal-Enclosed Bus Inspection Program will manage the effects of aging. This program includes visual inspection of interior portions of the bus. In Table 3.6.2-1, reduced insulation resistance (IR) is considered equivalent to the aging effect listed for this item.

Table 3.6.1: Electrical Components, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.6.1-9	Metal enclosed bus – enclosure assemblies	Loss of material due to general corrosion	Structures Monitoring Program	No	Not consistent with NUREG-1801. The Metal-Enclosed Bus Inspection Program will manage the effects of aging through visual inspection.
3.6.1-10	Metal enclosed bus – enclosure assemblies	Hardening and loss of strength / elastomers degradation	Structures Monitoring Program	No	NUREG-1801 aging effects are not applicable to IPEC. The only elastomers associated with the IPEC metal enclosed bus are access door gaskets, which are considered consumables. Therefore, there are no aging effects that require management.
3.6.1-11	High voltage insulators	Degradation of insulation quality due to presence of any salt deposits and surface contamination; loss of material caused by mechanical wear due to wind blowing on transmission conductors	Plant specific	Yes, plant specific	NUREG-1801 aging effects are not applicable to IPEC. See Section 3.6.2.2.2 for further evaluation.

Table 3.6.1: Electrical Components, NUREG-1801 Vol. 1					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.6.1-12	Transmission conductors and connections; switchyard bus and connections	Loss of material due to wind induced abrasion and fatigue; loss of conductor strength due to corrosion; increased resistance of connection due to oxidation or loss of preload	Plant specific	Yes, plant specific	NUREG-1801 aging effects are not applicable to IPEC. See Section 3.6.2.2.3 for further evaluation.
3.6.1-13	Cable connections metallic parts	Loosening of bolted connections due to thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion, and oxidation	Electrical Cable Connections not Subject to 10 CFR 50.49 Environmental Qualification Requirements	No	IPEC is providing a plant-specific one-time inspection program (Non-EQ Bolted Cable Connections Program) as an alternate to the NUREG-1801 XI.E6 program. This one-time inspection program will verify the absence of aging effects requiring management.
3.6.1-14	Fuse holders (not part of a larger assembly) – insulation material	None	None	NA – No AEM or AMP	Consistent with NUREG-1801.

Notes for Tables 3.6.2-1

Generic notes

A Consistent with NUREG-1801 item for component, material, environment, aging effect and aging management program. AMP is consistent with NUREG-1801 AMP.

B. Consistent with NUREG-1801 item for component, material, environment, aging effect and aging management program. AMP has exceptions to NUREG-1801 AMP.

C. Component is different, but consistent with NUREG-1801 item for material, environment, aging effect and aging management program. AMP is consistent with NUREG-1801 AMP.

D. Component is different, but consistent with NUREG-1801 item for material, environment, aging effect and aging management program. AMP has exceptions to NUREG-1801 AMP.

E. Consistent with NUREG-1801 material, environment, and aging effect but a different aging management program is credited.

F. Material not in NUREG-1801 for this component.

G. Environment not in NUREG-1801 for this component and material.

H. Aging effect not in NUREG-1801 for this component, material and environment combination.

I. Aging effect in NUREG-1801 for this component, material and environment combination is not applicable.

J. Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant-specific notes

601. Based on the NEI-NRC meeting on November 30, 2006, to discuss the NUREG-1801 XI.E6 program, IPEC will implement a plant-specific one-time inspection program prior to the period of extended operation to verify the absence of aging effects requiring management.

602. Based on vendor information, this transmission cable is not subject to water treeing, since it is designed for continuously wet conditions. Industry and plant operating experience has not provided any information on failures of this type of cable.

Table 3.6.2-1
Electrical Components
Summary of Aging Management

Table 3.6.2-1: Electrical Components								
Component Type	**Component Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Cable connections (metallic parts)	CE	Various metals used for electrical connections	Heat and air Moisture and air Radiation and air	Loosening of bolted connections	Non-EQ Bolted Cable Connections	VI.A-1 (LP-12)	3.6.1-13	E, 601
Electrical connections not subject to 10 CFR 50.49 EQ requirements	CE	Various metals used for electrical connections	Air with borated water leakage	Loss of circuit continuity	Boric Acid Corrosion Prevention	VI.A-5 (L-04)	3.6.1-5	A
Electrical cables and connections and fuse holders (insulation) not subject to 10 CFR 50.49 EQ requirements (includes non-EQ electrical and I&C penetration conductors and connections)	CE	Insulation material (various organic polymers)	Heat and air Moisture and air Radiation and air	Reduced insulation resistance (IR)	Non-EQ Insulated Cables And Connections	VI.A-2 (L-01) VI.A-6 (LP-03)	3.6.1-2	A

Table 3.6.2-1: Electrical Components

Component Type	Component Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Electrical cables not Subject To 10 CFR 50.49 EQ requirements used in instrumentation circuits	CE	Insulation material (various organic polymers)	Heat and air Moisture and air Radiation and air	Reduced insulation resistance (IR)	Non-EQ Instrumentation Circuits Test Review	VI.A-3 (L-02)	3.6.1-3	A
Fuse holders (insulation material)	CE	Insulation material (various organic polymers)	Heat and air Moisture and air Radiation and air	None	None	VI.A-7 (LP-02)	3.6.1-14	A
High voltage insulators for SBO recovery	IN	Porcelain, galvanized metal, cement	Outdoor weather	None	None	VI.A-10 (LP-11)	3.6.1-11	I
Inaccessible medium-voltage (2kV to 35kV) cables (e.g., installed underground in conduit or direct buried) not subject to 10 CFR 50.49 EQ requirements	CE	Insulation material (various organic polymers)	Moisture and voltage stress	Reduced insulation resistance (IR)	Non-EQ Inaccessible Medium-Voltage Cable	VI.A-4 (L-03)	3.6.1-4	A

Table 3.6.2-1: Electrical Components

Component Type	Component Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Metal enclosed bus (non-segregated for SBO recovery), bus and connections	CE	Aluminum, copper, steel	Heat and air Outdoor weather	Loosening of bolted connections	Metal-Enclosed Bus Inspection	VI.A-11 (LP-04)	3.6.1-7	A
Metal enclosed bus (non-segregated for SBO recovery), insulation / insulators	IN	Porcelain, galvanized metals	Heat and air Outdoor weather	Reduced insulation resistance (IR)	Metal-Enclosed Bus Inspection	VI.A-14 (LP-05)	3.6.1-8	A
Metal enclosed bus (non-segregated for SBO recovery) enclosure assemblies	SRE	Steel	Heat and air Outdoor weather	Loss of material	Metal-Enclosed Bus Inspection	VI.A-13 (LP-06)	3.6.1-9	E
Metal enclosed bus (non-segregated for SBO recovery) enclosure assemblies	SRE	Elastomers	Heat and air Outdoor weather	None	None	VI.A-12 (LP-10)	3.6.1-10	I
Switchyard bus and connections for SBO recovery	CE	Aluminum, copper	Outdoor weather	None	None	VI.A-15 (LP-9)	3.6.1-12	I
Transmission conductors and connections for SBO recovery	CE	Aluminum, steel, steel alloy	Outdoor weather	None	None	VI.A-16 (LP-08)	3.6.1-12	I

Table 3.6.2-1: Electrical Components								
Component Type	**Component Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
138kV direct burial insulated transmission cables (passive electrical for SBO recovery)	CE	Insulation material – various organic polymers	Outdoor weather Soil	None	None			J, 602