

CHAPTER VIII

STEAM AND POWER CONVERSION SYSTEM

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MAJOR PLANT SECTIONS

- A. Steam Turbine System
- B1. Main Steam System (PWR)
- B2. Main Steam System (BWR)
- C. Extraction Steam System
- D1. Feedwater System (PWR)
- D2. Feedwater System (BWR)
- E. Condensate System
- F. Steam Generator Blowdown System (PWR)
- G. Auxiliary Feedwater (AFW) System (PWR)
- H. External Surfaces of Components and Miscellaneous Bolting
- I. Common Miscellaneous Material Environment Combinations

(refined outline to be added when issued for public comment)

Explanation of September 30, 2004 changes in preliminary interim draft chapter outline and aging management review (AMR) tables: Within the AMR tables, this update process increases license renewal review efficiency by:

- Consolidating components (combining similar or equivalent components with matching materials, environment and AMP into a single line-item),
- Increasing consistency between **Material/Environment/Aging effects/aging management Program (MEAP)** combinations between systems (some existing MEAPs had multiple definitions that, based on the aging effect, could be broadened to envelope these into a single MEAP),
- Correcting any inconsistencies in the 2001 edition of the GALL Report,
- Updating references to the appropriate aging management programs, and
- Incorporating line-item changes based on approved staff SER positions or interim staff guidance.

The principal effect of this change is that the tables present the MEAP combinations at a higher level, and the prior detail within a structure or component line item is no longer explicitly presented. Consequently, the identifiers for subcomponents within a line item are no longer presented in the tables. As a result, the introductory listings of these subcomponents (originally in text preceding each table) have been deleted.

The following AMR tables contain a revised "Item" column and a new column titled "Link", which was not contained in the July 2001 revision. The "Item" number is a unique identifier that is used for traceability and, as mentioned above, no longer presents the detailed subcomponent identification. The link identifies the original item in the current version of the GALL Report when applicable (items added to this list refer to bases statements not yet available).

By January 30, 2005, the NRC staff plans to issue a revised GALL Report (NUREG-1801) and SRP-LR (NUREG-1800) for public comment. NRC anticipates re-numbering the line-items to provide an improved unique identifier as part of the public comment document. Also as part of the public comment process, the NRC will issue a NUREG documenting the basis for the proposed changes to the GALL Report and the SRP-LR. This NUREG bases document will be an aid for those reviewing the revised documents to understand what was changed and the basis for the proposed changes.

A. STEAM TURBINE SYSTEM

Systems, Structures, and Components

This section comprises the piping and fittings in the steam turbine system for both pressurized water reactors (PWRs) and boiling water reactors (BWRs) and consists of the lines from the high-pressure (HP) turbine to the moisture separator/reheater (MSR) and the lines from the MSR to the low-pressure (LP) turbine. Based on Regulatory Guide 1.26, "Quality Group Classifications and Standards for Water, Steam, and Radioactive-Waste-Containing Components of Nuclear Power Plants," all components that comprise the steam turbine system are governed by Group D Quality Standards.

The steam turbine performs its intended functions with moving parts and does not require an aging management review under 10 CFR 54.21(a)(1).

Aging management programs for the degradation of external surfaces of components and miscellaneous bolting are included in VIII.H. Common miscellaneous material environment combinations where there are no aging effects which are expected to degrade the ability of the structure or component from performing its intended function for the extended period of operation are included in VIII.I.

The system piping includes all pipe sizes, including instrument piping.

System Interfaces

The systems that interface with the steam turbine system include the main steam system (VIII.B1 and VIII.B2), the extraction steam system (VIII.C), and the condensate system (VIII.E).

| VIII STEAM AND POWER CONVERSION SYSTEM | | | | | | | |
|--|--------------------------|--|----------|-------------|---|---|--|
| A Steam Turbine System | | | | | | | |
| Item | Link | Structure and/or Component | Material | Environment | Aging Effect/ Mechanism | Aging Management Program (AMP) | Further Evaluation |
| S-06 | VIII.A.2-b VIII.A.1-b | Piping, piping components, and piping elements | Steel | Steam | Loss of material/ general, pitting and crevice corrosion | Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program. | Yes, detection of aging effects is to be evaluated |
| S-04 | VIII.A.1-b VIII.A.2-b | Piping, piping components, and piping elements | Steel | Steam | Loss of material/ general, pitting and crevice corrosion | Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515) The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program. | Yes, detection of aging effects is to be evaluated |
| S-15 | VIII.A.2-a VIII.A.1-a | Piping, piping components, and piping elements | Steel | Steam | Wall thinning/ flow-accelerated corrosion | Chapter XI.M17, "Flow-Accelerated Corrosion" | No |

B1 MAIN STEAM SYSTEM (PWR)

Systems, Structures, and Components

This section comprises the main steam system for pressurized water reactors (PWRs). The section includes the main steam lines from the steam generator to the steam turbine and the turbine bypass lines from the main steam lines to the condenser. Also included are the lines to the main feedwater (FW) and auxiliary feedwater (AFW) pump turbines, steam drains, and valves, including the containment isolation valves on the main steam lines and lines to the AFW pump turbines.

Based on Regulatory Guide 1.26, "Quality Group Classifications and Standards for Water, Steam, and Radioactive-Waste-Containing Components of Nuclear Power Plants," the portion of the main steam system extending from the steam generator up to the second containment isolation valve is governed by Group B or C Quality Standards, and all other components that comprise the main steam system located downstream of the isolation valves are governed by Group D Quality Standards.

The internals of the valves perform their intended functions with moving parts or with a change in configuration, or they are subject to replacement on the basis of qualified life or specified time period. Accordingly, they are not subject to an aging management review, pursuant to 10 CFR 54.21(a)(1).

Aging management programs for the degradation of external surfaces of components and miscellaneous bolting are included in VIII.H. Common miscellaneous material environment combinations where there are no aging effects which are expected to degrade the ability of the structure or component from performing its intended function for the extended period of operation are included in VIII.I.

The system piping includes all pipe sizes, including instrument piping.

System Interfaces

The systems and structures that interface with the main steam system include PWR concrete or steel containment structures (II.A1 and II.A2), common components (II.A3), the steam generator (IV.D1 and IV.D2), the steam turbine system (VIII.A), the feedwater system (VIII.D1), the condensate system (VIII.E), and the auxiliary feedwater system (VIII.G).

| VIII B1 STEAM AND POWER CONVERSION SYSTEM Main Steam System (PWR) | | | | | | | |
|---|----------------------------|--|---------------------|-------------|--|--|--|
| Item | Link | Structure and/or Component | Material | Environment | Aging Effect/ Mechanism | Aging Management Program (AMP) | Further Evaluation |
| SP-18 | SP-18 | Piping, piping components, and piping elements | Nickel-based alloys | Steam | Loss of material/ pitting and crevice corrosion | Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 | No |
| S-36 | VIII.B1. | Piping, piping components, and piping elements | Stainless steel | Steam | Loss of material/ pitting and crevice corrosion | Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 | No |
| S-37 | VIII.B1. | Piping, piping components, and piping elements | Stainless steel | Steam | Cracking/ stress corrosion cracking | Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 | Yes, detection of aging effects is to be evaluated |
| S-08 | VIII.B1.1-b | Piping, piping components, and piping elements | Steel | Steam | Cumulative fatigue damage/ fatigue | Fatigue is a time-limited aging analysis (TLAA) to be evaluated for the period of extended operation. See the Standard Review Plan, Section 4.3, "Metal Fatigue" for acceptable methods for meeting the requirements of 10 CFR 54.21(c). | Yes, TLAA |
| S-07 | VIII.B1.2-a VIII.B1.1-a | Piping, piping components, and piping elements | Steel | Steam | Loss of material/ pitting and crevice corrosion | Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 | No |
| S-15 | VIII.B1.2-b VIII.B1.1-c | Piping, piping components, and piping elements | Steel | Steam | Wall thinning/ flow-accelerated corrosion | Chapter XI.M17, "Flow-Accelerated Corrosion" | No |

B2. MAIN STEAM SYSTEM (BWR)

Systems, Structures, and Components

This section comprises the main steam system for boiling water reactors (BWRs). The section includes the main steam lines from the outermost containment isolation valve to the steam turbines and the turbine bypass lines from the main steam lines to the condenser. Also included are steam drains, and lines to main feedwater (FW), high-pressure coolant injection (HPCI), and reactor core isolation cooling (RCIC) turbines.

Based on Regulatory Guide 1.26, "Quality Group Classifications and Standards for Water, Steam, and Radioactive-Waste-Containing Components of Nuclear Power Plants," portions of the main steam system extending from the outermost containment isolation valve up to and including the turbine stop and bypass valves, as well as connected piping up to and including the first valve that is either normally closed or capable of automatic closure during all modes of normal reactor operation, are governed by Group B Quality Standards. The remaining portions of the main steam system consist of components governed by the Group D Quality Standards. For BWRs containing a shutoff valve in addition to the two containment isolation valves in the main steam line, Group B Quality Standards are applied only to those portions of the system extending from the outermost containment isolation valves up to and including the shutoff valve. The portion of the main steam system extending from the reactor pressure vessel up to the second isolation valve and including the containment isolation valves is governed by Group A Quality Standards and is covered in IV.C1.

The valve internals perform their intended functions with moving parts or with a change in configuration, or they are subject to replacement on the basis of qualified life or specified time period. Accordingly, they are not subject to an aging management review, pursuant to 10 CFR 54.21(a)(1).

Aging management programs for the degradation of external surfaces of components and miscellaneous bolting are included in VIII.H. Common miscellaneous material environment combinations where there are no aging effects which are expected to degrade the ability of the structure or component from performing its intended function for the extended period of operation are included in VIII.I.

The system piping includes all pipe sizes, including instrument piping.

System Interfaces

The systems that interface with the main steam system include the BWR Mark 1, Mark 2, or Mark 3 containment structures (II.B1, II.B2, and II.B3, respectively) and common components (II.B4), the reactor coolant pressure boundary (IV.C1), the steam turbine system (VIII.A), the feedwater system (VIII.D2), and the condensate system (VIII.E).

| VIII B2 STEAM AND POWER CONVERSION SYSTEM Main Steam System (BWR) | | | | | | | |
|--|----------------------------|--|-----------------|-------------|---|--|--|
| Item | Link | Structure and/or Component | Material | Environment | Aging Effect/ Mechanism | Aging Management Program (AMP) | Further Evaluation |
| S-38 | VIII.B2. | Piping, piping components, and piping elements | Stainless steel | Steam | Cracking/ stress corrosion cracking | Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515). The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program. | Yes, detection of aging effects is to be evaluated |
| S-08 | VIII.B2.1-c | Piping, piping components, and piping elements | Steel | Steam | Cumulative fatigue damage/ fatigue | Fatigue is a time-limited aging analysis (TLAA) to be evaluated for the period of extended operation. See the Standard Review Plan, Section 4.3, "Metal Fatigue" for acceptable methods for meeting the requirements of 10 CFR 54.21(c). | Yes, TLAA |
| S-05 | VIII.B2.2-b VIII.B2.1-a | Piping, piping components, and piping elements | Steel | Steam | Loss of material/ pitting and crevice corrosion | Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515) | No |
| S-15 | VIII.B2.2-a VIII.B2.1-b | Piping, piping components, and piping elements | Steel | Steam | Wall thinning/ flow-accelerated corrosion | Chapter XI.M17, "Flow-Accelerated Corrosion" | No |

C. EXTRACTION STEAM SYSTEM

Systems, Structures, and Components

This section comprises the extraction steam lines for both pressurized water reactors (PWRs) and boiling water reactors (BWRs), which extend from the steam turbine to the feedwater heaters, including the drain lines. Based on Regulatory Guide 1.26, "Quality Group Classifications and Standards for Water, Steam, and Radioactive-Waste-Containing Components of Nuclear Power Plants," all components that comprise the extraction steam system are governed by Group D Quality Standards.

The internals of the valves perform their intended functions with moving parts or with a change in configuration, or they are subject to replacement on the basis of qualified life or specified time period. Accordingly, they are not subject to an aging management review, pursuant to 10 CFR 54.21(a)(1).

Aging management programs for the degradation of external surfaces of components and miscellaneous bolting are included in VIII.H. Common miscellaneous material environment combinations where there are no aging effects which are expected to degrade the ability of the structure or component from performing its intended function for the extended period of operation are included in VIII.I.

The system piping includes all pipe sizes, including instrument piping.

System Interfaces

The systems that interface with the extraction steam system include the steam turbine system (VIII.A), the feedwater system (VIII.D1 and VIII.D2), and the condensate system (VIII.E).

| VIII STEAM AND POWER CONVERSION SYSTEM | | | | | | | |
|--|--------------------------|--|----------|-------------|---|---|--|
| C Extraction Steam System | | | | | | | |
| Item | Link | Structure and/or Component | Material | Environment | Aging Effect/ Mechanism | Aging Management Program (AMP) | Further Evaluation |
| S-06 | VIII.C.2-b VIII.C.1-b | Piping, piping components, and piping elements | Steel | Steam | Loss of material/ general, pitting and crevice corrosion | Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program. | Yes, detection of aging effects is to be evaluated |
| S-04 | VIII.C.1-b VIII.C.2-b | Piping, piping components, and piping elements | Steel | Steam | Loss of material/ general, pitting and crevice corrosion | Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515) The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program. | Yes, detection of aging effects is to be evaluated |
| S-15 | VIII.C.1-a VIII.C.2-a | Piping, piping components, and piping elements | Steel | Steam | Wall thinning/ flow-accelerated corrosion | Chapter XI.M17, "Flow-Accelerated Corrosion" | No |

D1. FEEDWATER SYSTEM (PWR)

Systems, Structures, and Components

This section comprises the main feedwater system for pressurized water reactors (PWRs), which extends from the condensate system to the steam generator. They consist of the main feedwater lines, feedwater pumps, and valves, including the containment isolation valves. Based on Regulatory Guide 1.26, "Quality Group Classifications and Standards for Water, Steam, and Radioactive-Waste-Containing Components of Nuclear Power Plants," the portion of the feedwater system extending from the secondary side of the steam generator up to the second containment isolation valve is governed by Group B or C Quality Standards, and all other components in the feedwater system located downstream from the isolation valves are governed by Group D Quality Standards.

Pump and valve internals perform their intended functions with moving parts or with a change in configuration, or they are subject to replacement on the basis of qualified life or specified time period. Accordingly, they are not subject to an aging management review, pursuant to 10 CFR 54.21(a)(1).

Aging management programs for the degradation of external surfaces of components and miscellaneous bolting are included in VIII.H. Common miscellaneous material environment combinations where there are no aging effects which are expected to degrade the ability of the structure or component from performing its intended function for the extended period of operation are included in VIII.I.

The system piping includes all pipe sizes, including instrument piping.

System Interfaces

The systems and structures that interface with the feedwater system include PWR concrete or steel containment structures (II.A1 and II.A2) and common components (II.A3), the steam generators (IV.D1 and IV.D2), the main steam system (VIII.B1), the extraction steam system (VIII.C), the condensate system (VIII.E), and the auxiliary feedwater system (VIII.G).

| VIII D1 STEAM AND POWER CONVERSION SYSTEM Feedwater Systems (PWR) | | | | | | | |
|---|-------------|--|-----------------|---------------|---|---|---|
| Item | Link | Structure and/or Component | Material | Environment | Aging Effect/ Mechanism | Aging Management Program (AMP) | Further Evaluation |
| SP-17 | SP-17 | Piping, piping components, and piping elements | Stainless steel | Treated water | Cracking/ stress corrosion cracking | Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134. The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program. The augmentation is still being resolved for SP-33 | Yes, detection of aging effects is to be evaluated. |
| SP-16 | SP-16 | Piping, piping components, and piping elements | Stainless steel | Treated water | Loss of material/ pitting and crevice corrosion | Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134. The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program. | Yes, detection of aging effects is to be evaluated |
| S-11 | VIII.D1.1-b | Piping, piping components, and piping elements | Steel | Treated water | Cumulative fatigue damage/ fatigue | Fatigue is a time-limited aging analysis (TLAA) to be evaluated for the period of extended operation. See the Standard Review Plan, Section 4.3, "Metal Fatigue" for acceptable methods for meeting the requirements of 10 CFR 54.21(c). | Yes, TLAA |

| VIII STEAM AND POWER CONVERSION SYSTEM | | | | | | | |
|--|---|---|----------|---------------|--|---|--|
| D1 Feedwater Systems (PWR) | | | | | | | |
| Item | Link | Structure and/or Component | Material | Environment | Aging Effect/ Mechanism | Aging Management Program (AMP) | Further Evaluation |
| S-16 | VIII.D1.2-a VIII.D1.1-a VIII.D1.3-b | Piping, piping components, and piping elements | Steel | Treated water | Wall thinning/ flow-accelerated corrosion | Chapter XI.M17, "Flow-Accelerated Corrosion" | No |
| S-10 | VIII.D1.3-a VIII.D1.2-b VIII.D1.1-c | Piping, piping components, piping elements, and tanks | Steel | Treated water | Loss of material/ general, pitting and crevice corrosion | Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program. | Yes, detection of aging effects is to be evaluated |

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D2. FEEDWATER SYSTEM (BWR)

Systems, Structures, and Components

This section comprises the main feedwater system for boiling water reactors (BWRs), which extends from the condensate and condensate booster system to the outermost feedwater isolation valve on the feedwater lines to the reactor vessel. They consist of the main feedwater lines, feedwater pumps, and valves.

Based on Regulatory Guide 1.26, "Quality Group Classifications and Standards for Water, Steam, and Radioactive-Waste-Containing Components of Nuclear Power Plants," the portions of the feedwater system extending from the outermost containment isolation valves up to and including the shutoff valve or the first valve that is either normally closed or capable of closure during all modes of normal reactor operation are governed by Group B Quality Standards. The remaining portions of the feedwater system consist of components governed by Group D Quality Standards. The portion of the feedwater system extending from the reactor vessel up to the second containment isolation valve and including the isolation valves is governed by Group A Quality Standards and is covered in IV.C1.

Pump and valve internals perform their intended functions with moving parts or with a change in configuration, or they are subject to replacement on the basis of qualified life or specified time period. Accordingly, they are not subject to an aging management review, pursuant to 10 CFR 54.21(a)(1).

Aging management programs for the degradation of external surfaces of components and miscellaneous bolting are included in VIII.H. Common miscellaneous material environment combinations where there are no aging effects which are expected to degrade the ability of the structure or component from performing its intended function for the extended period of operation are included in VIII.I.

The system piping includes all pipe sizes, including instrument piping.

System Interfaces

The systems that interface with the feedwater system include the BWR Mark 1, Mark 2, or Mark 3 containment structures (II.B1, II.B2, and II.B3, respectively) and common components (II.B4), the reactor coolant pressure boundary (IV.C1), the main steam system (VIII.B2), the extraction steam system (VIII.C), and the condensate system (VIII.E).

| VIII D2 STEAM AND POWER CONVERSION SYSTEM Feedwater Systems (BWR) | | | | | | | |
|--|---|--|-----------------|---------------|---|--|--|
| Item | Link | Structure and/or Component | Material | Environment | Aging Effect/ Mechanism | Aging Management Program (AMP) | Further Evaluation |
| S-35 | VIII.D2. | Piping, piping components, and piping elements | Stainless steel | Treated water | Loss of material/ pitting and crevice corrosion | Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515). The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program. | Yes, detection of aging effects is to be evaluated |
| S-11 | VIII.D2.1-c | Piping, piping components, and piping elements | Steel | Treated water | Cumulative fatigue damage/ fatigue | Fatigue is a time-limited aging analysis (TLAA) to be evaluated for the period of extended operation. See the Standard Review Plan, Section 4.3, "Metal Fatigue" for acceptable methods for meeting the requirements of 10 CFR 54.21(c). | Yes, TLAA |
| S-09 | VIII.D2.2-b VIII.D2.3-b VIII.D2.1-b | Piping, piping components, and piping elements | Steel | Treated water | Loss of material/ general, pitting and crevice corrosion | Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515) The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program. | Yes, detection of aging effects is to be evaluated |
| S-16 | VIII.D2.3-a VIII.D2.2-a VIII.D2.1-a | Piping, piping components, and piping elements | Steel | Treated water | Wall thinning/ flow-accelerated corrosion | Chapter XI.M17, "Flow-Accelerated Corrosion" | No |

E. CONDENSATE SYSTEM

Systems, Structures, and Components

This section comprise the condensate system for both pressurized water reactors (PWRs) and boiling water reactors (BWRs), which extend from the condenser hotwells to the suction of feedwater pumps, including condensate and condensate booster pumps, condensate coolers, condensate cleanup system, and condensate storage tanks. Based on Regulatory Guide 1.26, "Quality Group Classifications and Standards for Water, Steam, and Radioactive-Waste-Containing Components of Nuclear Power Plants," all components that comprise the condensate system are governed by Group D Quality Standards.

Pump and valve internals perform their intended functions with moving parts or with a change in configuration, or they are subject to replacement on the basis of qualified life or specified time period. Accordingly, they are not subject to an aging management review, pursuant to 10 CFR 54.21(a)(1).

Aging management programs for the degradation of external surfaces of components and miscellaneous bolting are included in VIII.H. Common miscellaneous material environment combinations where there are no aging effects which are expected to degrade the ability of the structure or component from performing its intended function for the extended period of operation are included in VIII.I.

The system piping includes all pipe sizes, including instrument piping.

System Interfaces

The systems that interface with the condensate system include the steam turbine system (VIII.A), the main steam system (VIII.B1 and VIII.B2), the feedwater system (VIII.D1 and VIII.D2), the auxiliary feedwater system (VIII.G, PWR only), the reactor water cleanup system (VII.E3, BWR and PWR if used), the open or closed cycle cooling water systems (VII.C1 or VII.C2), and the condensate storage facility.

| VIII E STEAM AND POWER CONVERSION SYSTEM Condensate System | | | | | | | |
|--|--------------------------|--|---|---------------|---|---|--|
| Item | Link | Structure and/or Component | Material | Environment | Aging Effect/ Mechanism | Aging Management Program (AMP) | Further Evaluation |
| S-01 | VIII.E.5-d | Buried piping, piping components, piping elements, and tanks | Steel (with or without coating or wrapping) | Soil | Loss of material/ general, pitting, crevice and microbiologically influenced corrosion | Chapter XI.M28, "Buried Piping and Tanks Surveillance," or Chapter XI.M34, "Buried Piping and Tanks Inspection" | No Yes, detection of aging effects and operating experience are to be further evaluated |
| S-21 | VIII.E.4-a VIII.E.4-d | BWR heat exchanger shell side components | Stainless steel | Treated water | Loss of material/ pitting and crevice corrosion | Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515) The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program. | Yes, detection of aging effects is to be evaluated |
| S-18 | VIII.E.4-d VIII.E.4-a | BWR heat exchanger shell side components | Steel | Treated water | Loss of material/ general, pitting and crevice corrosion | Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515) The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program. | Yes, detection of aging effects is to be evaluated |

| VIII E STEAM AND POWER CONVERSION SYSTEM Condensate System | | | | | | | |
|---|------------|--------------------------------------|-----------------|----------------------------|---|---|--|
| Item | Link | Structure and/or Component | Material | Environment | Aging Effect/ Mechanism | Aging Management Program (AMP) | Further Evaluation |
| S-13 | VIII.E.5-b | BWR tanks | Stainless steel | Treated water | Loss of material/ pitting and crevice corrosion | Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515) The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program. | Yes, detection of aging effects is to be evaluated |
| S-25 | VIII.E.4-e | Heat exchanger shell side components | Stainless steel | Closed cycle cooling water | Loss of material/ pitting and crevice corrosion | Chapter XI.M21, "Closed-Cycle Cooling Water System" | No |
| S-26 | VIII.E.4-b | Heat exchanger shell side components | Stainless steel | Raw water | Macrofouling and loss of material/ biofouling and pitting, crevice, & microbologically influenced corrosion | Chapter XI.M20, "Open-Cycle Cooling Water System" | No |
| S-23 | VIII.E.4-e | Heat exchanger shell side components | Steel | Closed cycle cooling water | Loss of material/ general, pitting and crevice corrosion | Chapter XI.M21, "Closed-Cycle Cooling Water System" | No |
| S-24 | VIII.E.4-b | Heat exchanger shell side components | Steel | Raw water | Macrofouling and loss of material/ biofouling and general, pitting, crevice, & microbologically influenced corrosion | Chapter XI.M20, "Open-Cycle Cooling Water System" | No |

| VIII E STEAM AND POWER CONVERSION SYSTEM Condensate System | | | | | | | |
|---|------------|--|----------------------|------------------------------|---|---|--|
| Item | Link | Structure and/or Component | Material | Environment | Aging Effect/ Mechanism | Aging Management Program (AMP) | Further Evaluation |
| S-28 | VIII.E.4-c | Heat exchanger tubes | Stainless steel | Raw water | Reduction of heat transfer/ fouling | Chapter XI.M20, "Open-Cycle Cooling Water System" | No |
| SP-8 | SP-8 | Piping, piping components, and piping elements | Copper alloy <15% Zn | Closed cycle cooling water | Loss of material/ pitting and crevice corrosion | Chapter XI.M21, "Closed-Cycle Cooling Water System" | No |
| S-35 | VIII.E. | Piping, piping components, and piping elements | Stainless steel | Treated water | Loss of material/ pitting and crevice corrosion | Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515). The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program. | Yes, detection of aging effects is to be evaluated |
| SP-19 | SP-19 | Piping, piping components, and piping elements | Stainless steel | Treated water >60°C (>140°F) | Cracking/ stress corrosion cracking | Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI-TR 103515) or PWR secondary water in EPRI TR-102134. The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program. | Yes, detection of aging effects is to be evaluated |

| VIII E STEAM AND POWER CONVERSION SYSTEM Condensate System | | | | | | | |
|---|--|---|-----------------|---------------|---|---|--|
| Item | Link | Structure and/or Component | Material | Environment | Aging Effect/ Mechanism | Aging Management Program (AMP) | Further Evaluation |
| S-09 | VIII.E.5-a VIII.E.6-a VIII.E.3-a VIII.E.2-b VIII.E.1-b | Piping, piping components, and piping elements | Steel | Treated water | Loss of material/ general, pitting and crevice corrosion | Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515) The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program. | Yes, detection of aging effects is to be evaluated |
| S-16 | VIII.E.1-a VIII.E.2-a | Piping, piping components, and piping elements | Steel | Treated water | Wall thinning/ flow-accelerated corrosion | Chapter XI.M17, "Flow-Accelerated Corrosion" | No |
| S-10 | VIII.E.6-a VIII.E.1-b VIII.E.2-b VIII.E.5-a VIII.E.3-a | Piping, piping components, piping elements, and tanks | Steel | Treated water | Loss of material/ general, pitting and crevice corrosion | Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program. | Yes, detection of aging effects is to be evaluated |
| S-22 | VIII.E.4-a VIII.E.4-d | PWR heat exchanger shell side components | Stainless steel | Treated water | Loss of material/ pitting and crevice corrosion | Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program. | Yes, detection of aging effects is to be evaluated |

| VIII E STEAM AND POWER CONVERSION SYSTEM Condensate System | | | | | | | |
|--|--------------------------|--|-----------------|--------------------------|---|---|--|
| Item | Link | Structure and/or Component | Material | Environment | Aging Effect/ Mechanism | Aging Management Program (AMP) | Further Evaluation |
| S-19 | VIII.E.4-d VIII.E.4-a | PWR heat exchanger shell side components | Steel | Treated water | Loss of material/ general, pitting and crevice corrosion | Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program. | Yes, detection of aging effects is to be evaluated |
| S-31 | VIII.E.5-c | Tank | Steel | Air – outdoor (External) | Loss of material/ general corrosion | Chapter XI.M29, "Aboveground Carbon Steel Tanks" | No |
| S-14 | VIII.E.5-b | Tanks | Stainless steel | Treated water | Loss of material/ pitting and crevice corrosion | Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program. | Yes, detection of aging effects is to be evaluated |

F. STEAM GENERATOR BLOWDOWN SYSTEM (PWR)

Systems, Structures, and Components

This section comprises the steam generator blowdown system for pressurized water reactors (PWRs), which extends from the steam generator through the blowdown condenser and include the containment isolation valves and small bore piping less than NPS 2 (including instrumentation lines).

Based on Regulatory Guide 1.26, "Quality Group Classifications and Standards for Water, Steam, and Radioactive-Waste-Containing Components of Nuclear Power Plants," the portion of the blowdown system extending from the steam generator up to the isolation valve outside the containment and including the isolation valves is governed by Group B or C Quality Standards. The remaining portions of the steam generator blowdown system consist of components governed by Group D Quality Standards.

Pump and valve internals perform their intended functions with moving parts or with a change in configuration, or they are subject to replacement on the basis of qualified life or specified time period. Accordingly, they are not subject to an aging management review, pursuant to 10 CFR 54.21(a)(1).

Aging management programs for the degradation of external surfaces of components and miscellaneous bolting are included in VIII.H. Common miscellaneous material environment combinations where there are no aging effects which are expected to degrade the ability of the structure or component from performing its intended function for the extended period of operation are included in VIII.I.

The system piping includes all pipe sizes, including instrument piping.

System Interfaces

The systems that interface with the blowdown system include the steam generator (IV.D1 and IV.D2) and the open- or closed-cycle cooling water systems (VII.C1 or VII.C2).

| VIII F STEAM AND POWER CONVERSION SYSTEM Steam Generator Blowdown System (PWR) | | | | | | | |
|---|------------|---|-----------------|------------------------------|---|--|---|
| Item | Link | Structure and/or Component | Material | Environment | Aging Effect/ Mechanism | Aging Management Program (AMP) | Further Evaluation |
| S-25 | VIII.F.4-e | Heat exchanger shell side components | Stainless steel | Closed cycle cooling water | Loss of material/ pitting and crevice corrosion | Chapter XI.M21, "Closed-Cycle Cooling Water System" | No |
| S-26 | VIII.F.4-b | Heat exchanger shell side components | Stainless steel | Raw water | Macrofouling and loss of material/ biofouling and pitting, crevice, & microbologically influenced corrosion | Chapter XI.M20, "Open-Cycle Cooling Water System" | No |
| S-23 | VIII.F.4-e | Heat exchanger shell side components | Steel | Closed cycle cooling water | Loss of material/ general, pitting and crevice corrosion | Chapter XI.M21, "Closed-Cycle Cooling Water System" | No |
| S-24 | VIII.F.4-b | Heat exchanger shell side components | Steel | Raw water | Macrofouling and loss of material/ biofouling and general, pitting, crevice, & microbologically influenced corrosion | Chapter XI.M20, "Open-Cycle Cooling Water System" | No |
| S-39 | VIII.F. | Heat exchanger tube side components including tubes | Stainless steel | Treated water >60°C (>140°F) | Cracking/ stress corrosion cracking | Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134. The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program. | Yes, detection of aging effects is to be evaluated. |

| VIII F STEAM AND POWER CONVERSION SYSTEM Steam Generator Blowdown System (PWR) | | | | | | | |
|---|--------------------------|--|----------------------|------------------------------|---|---|--|
| Item | Link | Structure and/or Component | Material | Environment | Aging Effect/ Mechanism | Aging Management Program (AMP) | Further Evaluation |
| S-28 | VIII.F.4-c | Heat exchanger tubes | Stainless steel | Raw water | Reduction of heat transfer/ fouling | Chapter XI.M20, "Open-Cycle Cooling Water System" | No |
| SP-8 | SP-8 | Piping, piping components, and piping elements | Copper alloy <15% Zn | Closed cycle cooling water | Loss of material/ pitting and crevice corrosion | Chapter XI.M21, "Closed-Cycle Cooling Water System" | No |
| SP-21 | SP-21 | Piping, piping components, and piping elements | Stainless steel | Treated water | Loss of material/ pitting and crevice corrosion | Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program. | Yes, detection of aging effects is to be evaluated |
| SP-20 | SP-20 | Piping, piping components, and piping elements | Stainless steel | Treated water >60°C (>140°F) | Cracking/ stress corrosion cracking | Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program. | Yes, detection of aging effects is to be evaluated |
| S-16 | VIII.F.2-a VIII.F.1-a | Piping, piping components, and piping elements | Steel | Treated water | Wall thinning/ flow-accelerated corrosion | Chapter XI.M17, "Flow-Accelerated Corrosion" | No |

| VIII F STEAM AND POWER CONVERSION SYSTEM Steam Generator Blowdown System (PWR) | | | | | | | |
|---|--|---|-----------------|---------------|---|---|--|
| Item | Link | Structure and/or Component | Material | Environment | Aging Effect/ Mechanism | Aging Management Program (AMP) | Further Evaluation |
| S-10 | VIII.F.1-b VIII.F.2-b VIII.F.3-a | Piping, piping components, piping elements, and tanks | Steel | Treated water | Loss of material/ general, pitting and crevice corrosion | Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program. | Yes, detection of aging effects is to be evaluated |
| S-22 | VIII.F.4-a VIII.F.4-d | PWR heat exchanger shell side components | Stainless steel | Treated water | Loss of material/ pitting and crevice corrosion | Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program. | Yes, detection of aging effects is to be evaluated |
| S-19 | VIII.F.4-a VIII.F.4-d | PWR heat exchanger shell side components | Steel | Treated water | Loss of material/ general, pitting and crevice corrosion | Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program. | Yes, detection of aging effects is to be evaluated |

G. AUXILIARY FEEDWATER SYSTEM (PWR)

Systems, Structures, and Components

This section comprises the auxiliary feedwater (AFW) system for pressurized water reactors (PWRs), which extends from the condensate storage or backup water supply system to the steam generator or to the main feedwater (MFW) line. They consist of AFW piping, AFW pumps, pump turbine oil coolers, and valves, including the containment isolation valves.

Based on Regulatory Guide 1.26, "Quality Group Classifications and Standards for Water, Steam, and Radioactive-Waste-Containing Components of Nuclear Power Plants," portions of the AFW system extending from the secondary side of the steam generator up to the second isolation valve and including the containment isolation valves are governed by Group B Quality Standards. In addition, portions of the AFW system that are required for their safety functions and that either do not operate during any mode of normal reactor operation or cannot be tested adequately are also governed by Group B Quality Standards, and the remainder of the structures and components covered in this section are governed by Group C Quality Standards.

Pump and valve internals perform their intended functions with moving parts or with a change in configuration, or they are subject to replacement on the basis of qualified life or specified time period. Accordingly, they are not subject to an aging management review, pursuant to 10 CFR 54.21(a)(1).

Aging management programs for the degradation of external surfaces of components and miscellaneous bolting are included in VIII.H. Common miscellaneous material environment combinations where there are no aging effects which are expected to degrade the ability of the structure or component from performing its intended function for the extended period of operation are included in VIII.I.

The system piping includes all pipe sizes, including instrument piping.

System Interfaces

The systems that interface with the auxiliary feedwater system include the steam generator (IV.D1 and IV.D2), the main steam system (VIII.B1), the PWR feedwater system (VIII.D1), the condensate system (VIII.E), and the open- or closed-cycle cooling water systems (VII.C1 or VII.C2).

| VIII G STEAM AND POWER CONVERSION SYSTEM Auxiliary Feedwater (AFW) System (PWR) | | | | | | | |
|---|--------------------------|--|---|----------------------------|---|--|--|
| Item | Link | Structure and/or Component | Material | Environment | Aging Effect/ Mechanism | Aging Management Program (AMP) | Further Evaluation |
| S-01 | VIII.G.1-e VIII.G.4-d | Buried piping, piping components, piping elements, and tanks | Steel (with or without coating or wrapping) | Soil | Loss of material/ general, pitting, crevice and microbiologically influenced corrosion | Chapter XI.M28, "Buried Piping and Tanks Surveillance," or Chapter XI.M34, "Buried Piping and Tanks Inspection" | No Yes, detection of aging effects and operating experience are to be further evaluated |
| S-25 | VIII.G.5-c | Heat exchanger shell side components | Stainless steel | Closed cycle cooling water | Loss of material/ pitting and crevice corrosion | Chapter XI.M21, "Closed-Cycle Cooling Water System" | No |
| S-20 | VIII.G.5-d | Heat exchanger shell side components | Stainless steel | Lubricating oil | Loss of material/ pitting, crevice, and microbiologically influenced corrosion | A plant-specific aging management program is to be evaluated. | Yes, plant specific |
| S-26 | VIII.G.5-a | Heat exchanger shell side components | Stainless steel | Raw water | Macrofouling and loss of material/ biofouling and pitting, crevice, & microbiologically influenced corrosion | Chapter XI.M20, "Open-Cycle Cooling Water System" | No |
| S-23 | VIII.G.5-c | Heat exchanger shell side components | Steel | Closed cycle cooling water | Loss of material/ general, pitting and crevice corrosion | Chapter XI.M21, "Closed-Cycle Cooling Water System" | No |

| VIII STEAM AND POWER CONVERSION SYSTEM | | | | | | | |
|--|------------|--|-----------------|------------------------------|---|---|--|
| G Auxiliary Feedwater (AFW) System (PWR) | | | | | | | |
| Item | Link | Structure and/or Component | Material | Environment | Aging Effect/ Mechanism | Aging Management Program (AMP) | Further Evaluation |
| S-17 | VIII.G.5-d | Heat exchanger shell side components | Steel | Lubricating oil | Loss of material/ general, pitting, crevice and microbiologically influenced corrosion | A plant-specific aging management program is to be evaluated. | Yes, plant specific |
| S-24 | VIII.G.5-a | Heat exchanger shell side components | Steel | Raw water | Macrofouling and loss of material/ biofouling and general, pitting, crevice, & microbiologically influenced corrosion | Chapter XI.M20, "Open-Cycle Cooling Water System" | No |
| S-28 | VIII.G.5-b | Heat exchanger tubes | Stainless steel | Raw water | Reduction of heat transfer/ fouling | Chapter XI.M20, "Open-Cycle Cooling Water System" | No |
| S-27 | VIII.G.5-b | Heat exchanger tubes | Steel | Raw water | Reduction of heat transfer/ biofouling | Chapter XI.M20, "Open-Cycle Cooling Water System" | No |
| SP-22 | SP-22 | Piping, piping components, and piping elements | Stainless steel | Treated water >60°C (>140°F) | Cracking/ stress corrosion cracking | Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program. | Yes, detection of aging effects is to be evaluated |

| VIII G STEAM AND POWER CONVERSION SYSTEM Auxiliary Feedwater (AFW) System (PWR) | | | | | | | |
|---|--|---|----------|--------------------------|---|---|--|
| Item | Link | Structure and/or Component | Material | Environment | Aging Effect/ Mechanism | Aging Management Program (AMP) | Further Evaluation |
| S-11 | VIII.G.1-b | Piping, piping components, and piping elements | Steel | Treated water | Cumulative fatigue damage/ fatigue | Fatigue is a time-limited aging analysis (TLAA) to be evaluated for the period of extended operation. See the Standard Review Plan, Section 4.3, "Metal Fatigue" for acceptable methods for meeting the requirements of 10 CFR 54.21(c). | Yes, TLAA |
| S-16 | VIII.G.1-a | Piping, piping components, and piping elements | Steel | Treated water | Wall thinning/ flow-accelerated corrosion | Chapter XI.M17, "Flow-Accelerated Corrosion" | No |
| S-12 | VIII.G.1-d | Piping, piping components, and piping elements | Steel | Untreated water | Macrofouling and loss of material/ biofouling and general, pitting, crevice, and microbiologically influenced corrosion | A plant-specific aging management program is to be evaluated. | Yes, plant specific |
| S-10 | VIII.G.4-a VIII.G.1-c VIII.G.3-a VIII.G.2-a | Piping, piping components, piping elements, and tanks | Steel | Treated water | Loss of material/ general, pitting and crevice corrosion | Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program. | Yes, detection of aging effects is to be evaluated |
| S-31 | VIII.G.4-c | Tank | Steel | Air – outdoor (External) | Loss of material/ general corrosion | Chapter XI.M29, "Aboveground Carbon Steel Tanks" | No |

| VIII STEAM AND POWER CONVERSION SYSTEM | | | | | | | |
|--|------------|----------------------------|-----------------|---------------|---|---|--|
| G Auxiliary Feedwater (AFW) System (PWR) | | | | | | | |
| Item | Link | Structure and/or Component | Material | Environment | Aging Effect/ Mechanism | Aging Management Program (AMP) | Further Evaluation |
| S-14 | VIII.G.4-b | Tanks | Stainless steel | Treated water | Loss of material/ pitting and crevice corrosion | Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134 The AMP is to be augmented by verifying the effectiveness of water chemistry control. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program. | Yes, detection of aging effects is to be evaluated |

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H. EXTERNAL SURFACES OF COMPONENTS AND MISCELLANEOUS BOLTING

Systems, Structures, and Components

This section includes the aging management programs for the degradation of external surfaces of all steel structures and components, including closure bolting in the steam and power conversion system in pressurized water reactors (PWRs) and boiling water reactors (BWRs). For the steel components in PWRs, this section addresses only boric acid corrosion of external surfaces as a result of the dripping borated water that is leaking from an adjacent PWR component.

System Interfaces

The structures and components covered in this section belong to the Steam and Power Conversion Systems in PWRs and BWRs. (For example, see System Interfaces in VIII.A to VIII.G for details.)

| VIII H STEAM AND POWER CONVERSION SYSTEM External Surfaces of Components and Miscellaneous Bolting | | | | | | | |
|--|------------|----------------------------|---------------------|--------------------------------------|---|---|---------------------|
| Item | Link | Structure and/or Component | Material | Environment | Aging Effect/ Mechanism | Aging Management Program (AMP) | Further Evaluation |
| S-32 | VIII.H. | Bolting | Steel | Air – outdoor (External) | Loss of material/ general, pitting and crevice corrosion | Chapter XI.M18, “Bolting Integrity” | No |
| S-40 | VIII.H. | Bolting | Steel | Air with borated water leakage | Loss of material/ boric acid corrosion | Chapter XI.M10, “Boric Acid Corrosion” | No |
| S-03 | VIII.H.2-b | Closure bolting | High strength steel | Air with steam or water leakage | Cracking/ cyclic loading, stress corrosion cracking | Chapter XI.M18, “Bolting Integrity” | No |
| S-34 | VIII.H. | Closure bolting | Steel | Air – indoor uncontrolled (External) | Loss of material/ general, pitting and crevice corrosion | Chapter XI.M18, “Bolting Integrity” | No |
| S-33 | VIII.H. | Closure bolting | Steel | Air – indoor uncontrolled (External) | Loss of preload/ stress relaxation | Chapter XI.M18, “Bolting Integrity” | No |
| S-02 | VIII.H.2-a | Closure bolting | Steel | Air with steam or water leakage | Loss of material/ general, pitting and crevice corrosion | Chapter XI.M18, “Bolting Integrity” | No |
| S-29 | VIII.H.1-b | External surfaces | Steel | Air – indoor uncontrolled (External) | Loss of material/ general corrosion | A plant-specific aging management program is to be evaluated. | Yes, plant specific |
| S-41 | VIII.H.1-b | External surfaces | Steel | Air – outdoor (External) | Loss of material/ General corrosion | A plant-specific aging management program is to be evaluated. | Yes, plant specific |
| S-30 | VIII.H.1-a | External surfaces | Steel | Air with borated water leakage | Loss of material/ boric acid corrosion | Chapter XI.M10, “Boric Acid Corrosion” | No |
| S-42 | VIII.H.1-b | External surfaces | Steel | Condensation (External) | Loss of material/ General corrosion | A plant-specific aging management program is to be evaluated. | Yes, plant specific |

I. COMMON MISCELLANEOUS MATERIAL ENVIRONMENT COMBINATIONS

Systems, Structures, and Components

This section includes the aging management programs for miscellaneous material environment combinations which may be found throughout the steam and power conversion systems structures and components. For the material-environment combinations in this part, there are no aging effects which are expected to degrade the ability of the structure or component from performing its intended function for the extended period of operation, and, therefore, no resulting aging management programs for these structures and components are required.

System Interfaces

The structures and components covered in this section belong to the steam and power conversion systems in PWRs and BWRs. (For example, see System Interfaces in VIII.A to VIII.D2 for details.)

| VIII STEAM AND POWER CONVERSION SYSTEM | | | | | | | |
|--|-------|--|-----------------|--------------------------------------|----------------------------|--------------------------------|--------------------|
| I Common Miscellaneous Material Environment Combinations | | | | | | | |
| Item | Link | Structure and/or Component | Material | Environment | Aging Effect/ Mechanism | Aging Management Program (AMP) | Further Evaluation |
| SP-6 | SP-6 | Piping, piping components, and piping elements | Copper alloy | Air – indoor uncontrolled (External) | None | None | No |
| SP-5 | SP-5 | Piping, piping components, and piping elements | Copper alloy | Gas | None | None | No |
| SP-7 | SP-7 | Piping, piping components, and piping elements | Copper alloy | Lubricating oil (no water pooling) | None | None | No |
| SP-9 | SP-9 | Piping, piping components, and piping elements | Glass | Air – indoor uncontrolled (External) | None | None | No |
| SP-10 | SP-10 | Piping, piping components, and piping elements | Glass | Lubricating oil | None | None | No |
| SP-11 | SP-11 | Piping, piping components, and piping elements | Nickel alloy | Air – indoor uncontrolled (External) | None | None | No |
| SP-12 | SP-12 | Piping, piping components, and piping elements | Stainless steel | Air – indoor uncontrolled (External) | None | None | No |

| VIII STEAM AND POWER CONVERSION SYSTEM I Common Miscellaneous Material Environment Combinations | | | | | | | |
|--|-------|--|-----------------|------------------------------------|----------------------------|--------------------------------|--------------------|
| Item | Link | Structure and/or Component | Material | Environment | Aging Effect/ Mechanism | Aging Management Program (AMP) | Further Evaluation |
| SP-13 | SP-13 | Piping, piping components, and piping elements | Stainless steel | Concrete | None | None | No |
| SP-15 | SP-15 | Piping, piping components, and piping elements | Stainless steel | Gas | None | None | No |
| SP-14 | SP-14 | Piping, piping components, and piping elements | Stainless steel | Lubricating oil (no water pooling) | None | None | No |
| SP-1 | SP-1 | Piping, piping components, and piping elements | Steel | Air – indoor controlled (External) | None | None | No |
| SP-2 | SP-2 | Piping, piping components, and piping elements | Steel | Concrete | None | None | No |
| SP-4 | SP-4 | Piping, piping components, and piping elements | Steel | Gas | None | None | No |
| SP-3 | SP-3 | Piping, piping components, and piping elements | Steel | Lubricating oil (no water pooling) | None | None | No |

