CHAPTER VIII

STEAM AND POWER CONVERSION SYSTEM

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MAJOR PLANT SECTIONS

A. Steam Turbine System

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B2. Main Steam System (BWR)

C. Extraction Steam System

D1. Feedwater System (PWR)

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G. Auxiliary Feedwater (AFW) System (PWR)

H. External Surfaces of Components and Miscellaneous Bolting

I. Common Miscellaneous Material Environment Combinations

~~Carbon Steel Componen~~

(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 **M**aterial/**E**nvironment/**A**ging effects/aging management **P**rogram (MEAP) combinations between systems (some existing MEAPs had multiple definitions that, based on the aging effect, could be broadened to envelope these into a singe 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.

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A. STEAM TURBINE SYSTEM

A.1 Piping and Fittings

A.1.1 High Pressure (HP) Turbine to Moisture Separator/Reheater (MSR)
A.1.2 MSR to Low Pressure (LP) Turbine

A.2 Valves (Stop, Control or Governor, Intermediate Stop and Control or Combined Intermediate, Bypass or Steam Dumps, Atmospheric Dumps, Main Steam Safety, or Safety/Relief)

A.2.1 Body and Bonnet

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.
~~Aging management programs for the degradation of the external surfaces of carbon steel components are included in VIII.H.~~

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 A	STEAM AND POWER CONVERSION SYSTEM 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

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B1. MAIN STEAM SYSTEM (PWR)

B1.1 Piping and Fittings

B1.1.1 Steam Lines from Steam Generator to Isolation Valves (Group B or C)
B1.1.2 Steam Lines from Isolation Valves to Main Turbine (Group D)
B1.1.3 Lines to Feedwater (FW) and Auxiliary Feedwater (AFW) Pump Turbines
B1.1.4 Lines to Moisture Separator/Reheater (MSR)
B1.1.5 Turbine Bypass
B1.1.6 Steam Drains

B1.2 Valves (Check, Control, Hand, Motor Operated, Safety, and Containment Isolation Valves)

B1.2.1 Body and Bonnet

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).

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. ~~Aging management programs for the degradation of the external surfaces of carbon steel components are included in VIII.H.~~

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

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B2 MAIN STEAM SYSTEM (BWR)

B2.1 Piping and Fittings

B2.1.1 Steam Lines to Main Turbine (Group B)
B2.1.2 Steam Lines to Main Turbine (Group D)
B2.1.3 Lines to FW Pump Turbines
B2.1.4 Turbine Bypass
B2.1.5 Steam Drains
B2.1.6 Steam Line to HPCI Turbine
B2.1.7 Steam Line to RCIC Turbine

B2.2 Valves (Check, Control, Hand, Motor Operated, Safety Valves)

B2.2.1 Body and Bonnet

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).

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.~~Aging management programs for the degradation of the external surfaces of carbon steel components are included in VIII.H~~.

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

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C. EXTRACTION STEAM SYSTEM

C.1 Piping and Fittings

C.1.1 Lines to Feedwater Heaters
C.1.2 Steam Drains

C.2 Valves

C.2.1 Body and Bonnet

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).

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.
~~Aging management programs for the degradation of the external surfaces of carbon steel components are included in VIII.H.~~

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 C	STEAM AND POWER CONVERSION SYSTEM 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

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D1. FEEDWATER SYSTEM (PWR)

D1.1 Main Feedwater Line

D1.1.1 Pipe and Fittings (Group B, C, or D)

D1.2 Valves (Control, Check, Hand, Safety, and Containment Isolation Valves)

D1.2.1 Body and Bonnet

D1.3 Feedwater Pump (Steam Turbine and Motor Driven)

D1.3.1 Casing

D1.3.2 Suction and Discharge Lines

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 not subject to an aging management review, pursuant to 10 CFR 54.21(a)(1).

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.
~~Aging management programs for the degradation of the external surfaces of carbon steel components are included in VIII.H.~~

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 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**
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

D2. FEEDWATER SYSTEM (BWR)

D2.1 Main Feedwater Line

D2.1.1 Pipe and Fittings (Group B or D)

D2.2 Valves (Control, Check, and Hand Valves)

D2.2.1 Body and Bonnet

D2.3 Feedwater Pump (Steam Turbine and Motor Driven)

D2.3.1 Casing

D2.3.2 Suction and Discharge Lines

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).

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.
~~Aging management programs for the degradation of the external surfaces of carbon steel components are included in VIII.H.~~

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

E.1 Condensate Lines

E.1.1 Piping and Fittings

E.2 Valves

E.2.1 Body and Bonnet

E.3 Condensate Pumps (Main and Booster Pumps)

E.3.1 Casing

E.4 Condensate Coolers/Condensers

E.4.1 Tubes
E.4.2 Tubesheet
E.4.3 Channel Head
E.4.4 Shell

E.5 Condensate Storage

E.5.1 Tank

E.6 Condensate Cleanup System

E.6.1 Piping and Fittings
E.6.2 Demineralizer
E.6.3 Strainer

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).

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.
~~Aging management programs for the degradation of the external surfaces of carbon steel components are included in VIII.H.~~

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, & microbiologically 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, & microbiologically 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	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**
						program.	
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

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F. STEAM GENERATOR BLOWDOWN SYSTEM (PWR)

F.1 Blowdown Lines

F.1.1 Pipe and Fittings (Group B)
F.1.2 Pipe and Fittings (Group D)

F.2 Valves (including Containment Isolation Valves)

F.2.1 Body and Bonnet

F.3 Blowdown Pump

F.3.1 Casing

F.4 Blowdown Heat Exchanger

F.4.1 Tubes
F.4.2 Tubesheet
F.4.3 Channel Head and Access Cover
F.4.4 Shell and Access Cover

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).

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.
~~Aging management programs for the degradation of the external surfaces of carbon steel components are included in VIII.H.~~

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, & microbiologically 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, & microbiologically 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 STEAM AND POWER CONVERSION SYSTEM F 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

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~~G. AUXILIARY FEEDWATER SYSTEM (PWR)~~

~~G.1 Auxiliary Feedwater Piping~~

~~G.1.1 Piping and Fittings (Aboveground)~~
~~G.1.2 Piping and Fittings (Buried)~~

~~G.2 AFW Pumps (Steam Turbine and Motor Driven)~~

~~G.2.1 Casing~~
~~G.2.2 Suction and Discharge Lines~~

~~G.3 Valves (Control, Check, Hand, and Containment Isolation Valves)~~

~~G.3.1 Body and Bonnet~~

~~G.4 Condensate Storage (Emergency)~~

~~G.4.1 Tank~~

~~G.5 Bearing Oil Coolers (for Steam Turbine Pump)~~

~~G.5.1 Shell~~
~~G.5.2 Tubes~~
~~G.5.3 Tubesheet~~

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).

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.
~~Aging management programs for the degradation of the external surfaces of carbon steel components are included in VIII.H.~~

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 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-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 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-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

~~H. CARBON STEEL COMPONENTS~~

H. EXTERNAL SURFACES OF COMPONENTS AND MISCELLANEOUS BOLTING ~~CARBON STEEL COMPONENTS~~

Systems, Structures, and Components

This section includes the aging management programs for the degradation of external surfaces of all ~~carbon~~ 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 ~~carbon~~ 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 STEAM AND POWER CONVERSION SYSTEM H 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

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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 I	STEAM AND POWER CONVERSION SYSTEM 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 I	STEAM AND POWER CONVERSION SYSTEM 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

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