

CHAPTER VIII

STEAM AND POWER CONVERSION SYSTEM

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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 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).

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**VIII Steam and Power Conversion System
A. Steam Turbine System**

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
A.1-a A.1.1 A.1.2	Piping and fittings HP turbine to MSR MSR to LP turbine	Carbon steel	Steam	Wall thinning/ Flow-accelerated corrosion	Chapter XI.M17, "Flow-Accelerated Corrosion"	No
A.1-b A.1.1 A.1.2	Piping and fittings HP turbine to MSR MSR to LP turbine	Carbon steel	Steam	Loss of material/ General, pitting, and crevice corrosion	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
A.2-a A.2.1	Valves (stop, control or governor, intermediate stop and control or combined intermediate, bypass or steam dumps, atmospheric dumps, main steam safety, or safety/relief) Body and bonnet	Carbon steel	Steam	Wall thinning (body only)/ Flow-accelerated corrosion	Chapter XI.M17, "Flow-Accelerated Corrosion" (body only)	No
A.2-b A.2.1	Valves (stop, control or governor, intermediate stop and control or combined intermediate, bypass or steam dumps, atmospheric dumps, main steam safety, or safety/relief) Body and bonnet	Carbon steel	Steam	Loss of material/ General, pitting, and crevice corrosion	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

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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).

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).

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**VIII Steam Power Conversion System
B1. Main Steam System (PWR)**

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
B1.1-a B1.1.1 B1.1.2	Piping and fittings Steam lines from steam generator to isolation valves (Group B or C) Steam lines from isolation valves to main turbine (Group D)	Carbon steel	Up to 300°C (572°F) steam	Loss of material/ Pitting and crevice corrosion	Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134	No
B1.1-b B1.1.1	Piping and fittings Steam lines from steam generator to isolation valves (Group B or C)	Carbon steel	Up to 300°C (572°F) 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
B1.1-c B1.1.1 B1.1.2 B1.1.3 B1.1.4 B1.1.5 B1.1.6	Piping and fittings Steam lines from steam generator to isolation valves (Group B or C) Steam lines from isolation valves to main turbine (Group D) Lines to FW and AFW pump turbines Lines to MSR Turbine bypass Steam drains	Carbon steel	Up to 300°C (572°F) steam	Wall thinning/ Flow-accelerated corrosion	Chapter XI.M17, "Flow-Accelerated Corrosion"	No
B1.2-a B1.2.1	Valves (check, control, hand, motor operated, safety, and containment isolation valves) Body and bonnet	Carbon steel	Up to 300°C (572°F) steam	Loss of material/ Pitting and crevice corrosion	Chapter XI.M2, "Water Chemistry," for PWR secondary water in EPRI TR-102134	No
B1.2-b B1.2.1	Valves (check, control, hand, motor operated, safety, and containment isolation valves) Body and bonnet	Carbon steel	Up to 300°C (572°F) steam	Wall thinning (body only)/ Flow-accelerated corrosion	Chapter XI.M17, "Flow-Accelerated Corrosion" (body only)	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).

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).

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**VIII Steam Power Conversion System
B2. Main Steam System (BWR)**

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
B2.1-a B2.1.1 B2.1.2	Piping and fittings Steam lines to main turbine (Group B) Steam lines to main turbine (Group D)	Carbon steel	288°C (550°F) steam	Loss of material/ Pitting and crevice corrosion	Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515)	No
B2.1-b B2.1.1 B2.1.2 B2.1.3 B2.1.4 B2.1.5 B2.1.6 B2.1.7	Piping and fittings Steam lines to main turbine (Group B) Steam lines to main turbine (Group D) Lines to FW pump turbines Turbine bypass Steam drains Steam line to HPCI turbine Steam line to RCIC turbine	Carbon steel	288°C (550°F) steam	Wall thinning/ Flow-accelerated corrosion	Chapter XI.M17, "Flow-Accelerated Corrosion"	No
B2.1-c B2.1.1 B2.1.2 B2.1.3 B2.1.4 B2.1.5 B2.1.6 B2.1.7	Piping and fittings Steam lines to main turbine (Group B) Steam lines to main turbine (Group D) Lines to FW pump turbines Turbine bypass Steam drains Steam line to HPCI turbine Steam line to RCIC turbine	Carbon steel	288°C (550°F) 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
B2.2-a B2.2.1	Valves (check, control, hand, motor operated, safety valves) Body and bonnet	Carbon steel	288°C (550°F) steam	Wall thinning (body only)/ Flow-accelerated corrosion	Chapter XI.M17, "Flow-Accelerated Corrosion" (body only)	No
B2.2-b B2.2.1	Valves (check, control, hand, motor operated, safety valves) Body and bonnet	Carbon steel	288°C (550°F) steam	Loss of material/ Pitting and crevice corrosion	Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515)	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).

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 Steam Power Conversion System
C. Extraction Steam System**

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
C.1-a C.1.1 C.1.2	Piping and fittings Lines to feedwater heaters Steam drains	Carbon steel	Up to 300°C (572°F) steam	Wall thinning/ Flow-accelerated corrosion	Chapter XI.M17, "Flow-Accelerated Corrosion"	No
C.1-b C.1.1 C.1.2	Piping and fittings Lines to feedwater heaters Steam drains	Carbon steel	Up to 300°C (572°F) steam	Loss of material/ General, pitting, and crevice corrosion	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
C.2-a C.2.1	Valves Body and bonnet	Carbon steel	Up to 300°C (572°F) steam	Wall thinning (body only)/ Flow-accelerated corrosion	Chapter XI.M17, "Flow-Accelerated Corrosion" (body only)	No
C.2-b C.2.1	Valves Body and bonnet	Carbon steel	Up to 300°C (572°F) steam	Loss of material/ General, pitting, and crevice corrosion	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

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

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 Steam and Power Conversion System
D1. Feedwater System (PWR)

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
D1.1-a D1.1.1	Main feedwater line Piping and fittings (Group B, C, or D)	Carbon steel	Treated water	Wall thinning/ Flow-accelerated corrosion	Chapter XI.M17, "Flow-Accelerated Corrosion"	No
D1.1-b D1.1.1	Main feedwater line Piping and fittings (Group B or C from steam generator to isolation valves)	Carbon 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
D1.1-c D1.1.1	Main feedwater line Piping and fittings (Group B, C, or D)	Carbon 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
D1.2-a D1.2.1	Valves (control, check, hand, safety, and containment isolation valves) Body and bonnet	Carbon steel	Treated water	Wall thinning (body only)/ Flow-accelerated corrosion	Chapter XI.M17, "Flow-Accelerated Corrosion" (body only)	No
D1.2-b D1.2.1	Valves (control, check, and hand, safety, and containment isolation valves) Body and bonnet	Carbon 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

VIII Steam and Power Conversion System
D1. Feedwater System (PWR)

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
D1.3-a D1.3.1 D1.3.2	Feedwater pump (steam turbine and motor driven) Casing Suction and discharge lines	Carbon 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
D1.3-b D1.3.2	Feedwater pump (steam turbine and motor driven) Suction and discharge lines	Carbon steel	Treated water	Wall thinning/ Flow-accelerated corrosion	Chapter XI.M17, "Flow-Accelerated Corrosion"	No

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).

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).

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**VIII Steam and Power Conversion System
D2. Feedwater System (BWR)**

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
D2.1-a D2.1.1	Main feedwater line Piping and fittings (Group B or D)	Carbon steel	Treated water	Wall thinning/ Flow-accelerated corrosion	Chapter XI.M17, "Flow-Accelerated Corrosion"	No
D2.1-b D2.1.1	Main feedwater line Piping and fittings (Group B or D)	Carbon 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
D2.1-c D2.1.1	Main feedwater line Piping and fittings (Group B or D)	Carbon 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
D2.2-a D2.2.1	Valves (control, check, and hand valves) Body and bonnet	Carbon steel	Treated water	Wall thinning (body only)/ Flow-accelerated corrosion	Chapter XI.M17, "Flow-Accelerated Corrosion" (body only)	No
D2.2-b D2.2.1	Valves (control, check, and hand valves) Body and bonnet	Carbon 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
D2.3-a D2.3.2	Feedwater pump (steam turbine and motor driven) Suction and discharge lines	Carbon steel	Treated water	Wall thinning/ Flow-accelerated corrosion	Chapter XI.M17, "Flow-Accelerated Corrosion"	No

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D2. Feedwater System (BWR)

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
D2.3-b D2.3.1 D2.3.2	Feedwater pump (steam turbine and motor driven) Casing Suction and discharge lines	Carbon 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

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).

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 Steam and Power Conversion System
E. Condensate System

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
E.1-a E.1.1	Condensate lines Piping and fittings	Carbon steel	Treated water (BWRs: reactor coolant; PWRs: secondary side water)	Wall thinning/ Flow-accelerated corrosion	Chapter XI.M17, "Flow-Accelerated Corrosion"	No
E.1-b E.1.1	Condensate lines Piping and fittings	Carbon steel	Treated water (BWRs: reactor coolant; PWRs: secondary side water)	Loss of material/ General, pitting, and crevice corrosion	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
E.2-a E.2.1	Valves Body and bonnet	Carbon steel	Treated water	Wall thinning (body only)/ Flow-accelerated corrosion	Chapter XI.M17, "Flow-Accelerated Corrosion" (body only)	No
E.2-b E.2.1	Valves Body and bonnet	Carbon 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) 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 Steam and Power Conversion System
E. Condensate System

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
E.3-a E.3.1	Condensate pumps (main and booster pumps) Casing	Carbon 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) 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
E.4-a E.4.1 E.4.2 E.4.3 E.4.4	Condensate coolers/ condensers (serviced by open-cycle cooling water) Tubes Tubesheet Channel head Shell	Tubes: stainless steel; tubesheet: carbon steel; channel head: carbon steel; shell: carbon steel	Treated water side (condensate side)	Loss of material/ General (carbon steel only), pitting, and crevice corrosion	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
E.4-b E.4.1 E.4.2 E.4.3 E.4.4	Condensate coolers/ condensers (serviced by open-cycle cooling water) Tubes Tubesheet Channel head Shell	Tubes: stainless steel; tubesheet: carbon steel; channel head: carbon steel; shell: carbon steel	Open-cycle cooling water (raw water) side	Loss of material/ General (carbon steel only), pitting, crevice, and microbiologically influenced corrosion, and biofouling	Chapter XI.M20, "Open-Cycle Cooling Water System"	No
E.4-c E.4.1	Condensate coolers/ condensers (serviced by open-cycle cooling water) Tubes	Tubes: stainless steel	Open-cycle cooling water (raw water) side	Buildup of deposit/ Biofouling	Chapter XI.M20, "Open-Cycle Cooling Water System"	No

**VIII Steam and Power Conversion System
E. Condensate System**

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
E.4-d E.4.1 E.4.2 E.4.3 E.4.4	Condensate coolers/ condensers (serviced by closed-cycle cooling water) Tubes Tubesheet Channel head Shell	Tubes: stainless steel; tubesheet: carbon steel; channel head: carbon steel; shell: carbon steel	Treated water side (on other side of condensate)	Loss of material/ General (carbon steel only), pitting, and crevice corrosion	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
E.4-e E.4.1 E.4.2 E.4.3 E.4.4	Condensate coolers/ condensers (serviced by closed-cycle cooling water) Tubes Tubesheet Channel head Shell	Tubes: stainless steel; tubesheet: carbon steel; channel head: carbon steel; shell: carbon steel	Closed-cycle cooling water side	Loss of material/ General (carbon steel only), pitting, and crevice corrosion	Chapter XI.M21, "Closed-Cycle Cooling Water System"	No
E.5-a E.5.1	Condensate storage Tank	Carbon steel	<90°C (<194°F) treated water	Loss of material/ General, pitting, and crevice corrosion	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 Steam and Power Conversion System
E. Condensate System

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
E.5-b E.5.1	Condensate storage Tank	Stainless steel	<90°C (<194°F) treated water	Loss of material/ Pitting and crevice corrosion	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
E.5-c E.5.1	Condensate storage Tank (aboveground, external surface)	Carbon steel	Sun, weather, humidity, and moisture	Loss of material/ General corrosion	Chapter XI.M29, "Aboveground Carbon Steel Tanks"	No
E.5-d E.5.1	Condensate storage Tank (buried, external surface)	Carbon steel	Soil and ground water	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

VIII Steam and Power Conversion System
E. Condensate System

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
E.6-a E.6.1 E.6.2 E.6.3	Condensate cleanup system Piping and fittings Demineralizer Strainer	Carbon 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) 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

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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).

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).

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VIII Steam and Power Conversion System
F. Steam Generator Blowdown System (PWR)

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
F.1-a F.1.1 F.1.2	Blowdown lines Piping and fittings (Group B) Piping and fittings (Group D)	Carbon steel	Secondary side treated water	Wall thinning/ Flow-accelerated corrosion	Chapter XI.M17, "Flow-Accelerated Corrosion"	No
F.1-b F.1.1 F.1.2	Blowdown lines Piping and fittings (Group B) Piping and fittings (Group D)	Carbon steel	Secondary side 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
F.2-a F.2.1	Valves (including containment isolation valves) Body and bonnet	Carbon steel	Secondary side treated water	Wall thinning (body only)/ Flow-accelerated corrosion	Chapter XI.M17, "Flow-Accelerated Corrosion" (body only)	No
F.2-b F.2.1	Valves (including containment isolation valves) Body and bonnet	Carbon steel	Secondary side 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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VIII Steam and Power Conversion System
F. Steam Generator Blowdown System (PWR)

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
F.3-a F.3.1	Blowdown pump Casing	Carbon steel	Secondary side 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
F.4-a F.4.1 F.4.2 F.4.3 F.4.4	Blowdown heat exchanger (serviced by open-cycle cooling water) Tubes Tubesheet Channel head and access cover Shell and access cover	Tubes: stainless steel; tubesheet: carbon steel; channel head: carbon steel	Secondary side treated water	Loss of material/ General (carbon steel only), 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.4-b F.4.1 F.4.2 F.4.3 F.4.4	Blowdown heat exchanger (serviced by open-cycle cooling water) Tubes Tubesheet Channel head and access cover Shell and access cover	Tubes: stainless steel; tubesheet: carbon steel; channel head: carbon steel	Open-cycle cooling water (raw water) side	Loss of material/ General (carbon steel only), pitting, crevice, and microbiologically influenced corrosion, and biofouling	Chapter XI.M20, "Open-Cycle Cooling Water System"	No
F.4-c F.4.1	Blowdown heat exchanger (serviced by open cycle cooling water) Tubes	Tubes: stainless steel	Open-cycle cooling water (raw water) side	Buildup of deposit/ Biofouling	Chapter XI.M20, "Open-Cycle Cooling Water System"	No

VIII Steam and Power Conversion System
F. Steam Generator Blowdown System (PWR)

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
F.4-d F.4.1 F.4.2 F.4.3 F.4.4	Blowdown heat exchanger (serviced by closed-cycle cooling water) Tubes Tubesheet Channel head and access cover Shell and access cover	Tubes: stainless steel; tubesheet: carbon steel; channel head: carbon steel	Treated water side (other side of steam generator blowdown)	Loss of material/ General (carbon steel only), 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.4-e F.4.1 F.4.2 F.4.3 F.4.4	Blowdown heat exchanger (serviced by closed-cycle cooling water) Tubes Tubesheet Channel head and access cover Shell and access cover	Tubes: stainless steel; tubesheet: carbon steel; channel head: carbon steel	Closed-cycle cooling water side	Loss of material/ General (carbon steel only), pitting, and crevice corrosion	Chapter XI.M21, "Closed-Cycle Cooling Water System"	No

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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).

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 Steam and Power Conversion System
G. Auxiliary Feedwater System (PWR)**

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
G.1-a G.1.1	Auxiliary feedwater piping Piping and fittings (aboveground) for Westinghouse steam generators with preheaters	Carbon steel	Treated water >90°C (>194°F)	Wall thinning/ Flow-accelerated corrosion	Chapter XI.M17, "Flow-Accelerated Corrosion"	No
G.1-b G.1.1	Auxiliary feedwater piping Piping and fittings (aboveground)	Carbon steel	Treated water >90°C (>194°F)	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
G.1-c G.1.1 G.1.2	Auxiliary feedwater piping Piping and fittings (aboveground) Piping and fittings (buried)	Carbon 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.1-d G.1.1 G.1.2	Auxiliary feedwater piping Piping and fittings (aboveground) Piping and fittings (buried)	Carbon steel	Untreated water from backup water supply	Loss of material/ General, pitting, crevice, and microbiologically influenced corrosion, and biofouling	A plant-specific aging management program is to be evaluated.	Yes, plant specific

VIII Steam and Power Conversion System
G. Auxiliary Feedwater System (PWR)

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
G.1-e G.1.2	Auxiliary feedwater piping Piping and fittings (buried) external surface	Carbon steel	Soil and groundwater	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
G.2-a G.2.1 G.2.2	AFW pumps (steam turbine and motor driven) Casing Suction and discharge lines	Carbon steel	Treated water <90°C (<194°F)	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.3-a G.3.1	Valves (control, check, hand, and containment isolation valves) Body and bonnet	Carbon steel	Treated water <90°C (<194°F)	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

VIII Steam and Power Conversion System
G. Auxiliary Feedwater System (PWR)

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
G.4-a G.4.1	Condensate storage (emergency) Tank	Carbon steel	Treated water <90°C (<194°F)	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.4-b G.4.1	Condensate storage (emergency) Tank	Stainless steel	Treated water <90°C (<194°F)	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
G.4-c G.4.1	Condensate storage (emergency) Tank (aboveground, external surface)	Carbon steel	Sun, weather, humidity, and moisture	Loss of material/ General corrosion	Chapter XI.M29, "Aboveground Carbon Steel Tanks"	No
G.4-d G.4.1	Condensate storage (emergency) Tank (buried, external surface)	Carbon steel	Soil and groundwater	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

VIII Steam and Power Conversion System
G. Auxiliary Feedwater System (PWR)

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
G.5-a G.5.1 G.5.2 G.5.3	Bearing oil coolers (for steam turbine pump) serviced by open-cycle cooling water Shell Tubes Tubesheet	Stainless steel, carbon steel	Open-cycle cooling water (raw water)	Loss of material/ General (carbon steel only), pitting, crevice, and microbiologically influenced corrosion, and biofouling	Chapter XI.M20, "Open-Cycle Cooling Water System"	No
G.5-b G.5.2	Bearing oil coolers (for steam turbine pump) serviced by open-cycle cooling water Tubes	Stainless steel, carbon steel	Open-cycle cooling water (raw water)	Buildup of deposit/ Biofouling	Chapter XI.M20, "Open-Cycle Cooling Water System"	No
G.5-c G.5.1 G.5.2 G.5.3	Bearing oil coolers (for steam turbine pump) serviced by closed-cycle cooling water Shell Tubes Tubesheet	Stainless steel, carbon steel	Closed-cycle cooling water (treated water)	Loss of material/ General (carbon steel only), pitting, and crevice corrosion	Chapter XI.M21, "Closed-Cycle Cooling Water System"	No
G.5-d G.5.1 G.5.2 G.5.3	Bearing oil coolers (for steam turbine pump) Shell Tubes Tubesheet	Stainless steel, carbon steel	Lubricating oil (possibly contaminated with water)	Loss of material/ General (carbon steel only), pitting, crevice, and microbiologically influenced corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific

H. CARBON STEEL COMPONENTS

H.1 Carbon Steel Components

H.1.1 External Surfaces

H.2 Closure Bolting

H.2.1 In High-Pressure or High-Temperature Systems

H. 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 boltings 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.)

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VIII Steam and Power Conversion System
H. Carbon Steel Components

Item	Structure and/or Component	Material	Environment	Aging Effect/ Mechanism	Aging Management Program (AMP)	Further Evaluation
H.1-a H.1.1	Carbon steel components (PWRs) External Surfaces	Carbon steel, low-alloy steel	Air, leaking and dripping chemically treated borated water up to 340°C (644°F)	Loss of material/ Boric acid corrosion of external surfaces	Chapter XI.M10, "Boric Acid Corrosion"	No
H.1-b H.1.1	Carbon steel components (PWRs and BWRs) External surfaces	Carbon steel, low-alloy steel	Air, moisture, and humidity <100°C (212°F)	Loss of material/ General corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific
H.2-a H.2.1	Closure bolting In high-pressure or high-temperature systems	Carbon steel, low-alloy steel	Air, moisture, humidity, and leaking fluid	Loss of material/ General corrosion	Chapter XI.M18, "Bolting Integrity"	No
H.2-b H.2.1	Closure bolting In high-pressure or high-temperature systems	Carbon steel, low-alloy steel	Air, moisture, humidity, and leaking fluid	Crack initiation and growth/ Cyclic loading, stress corrosion cracking	Chapter XI.M18, "Bolting Integrity"	No

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