CHAPTER VII

AUXILIARY SYSTEMS

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MAJOR PLANT SECTIONS

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(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.

A1. NEW FUEL STORAGE

Systems, Structures, and Components

This section comprises those structures and components used for new fuel storage, and includes carbon steel new fuel storage racks located in the auxiliary building or the fuel handling building. The racks are exposed to the temperature and humidity in the auxiliary building. The racks are generally painted with a protective coating. 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 used for new fuel storage are governed by Group C Quality Standards.

Aging management programs for the degradation of external surfaces of components and miscellaneous bolting are included in VII.I. 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 VII.J.

System Interfaces

No other systems discussed in this report interface with those used for new fuel storage.

VII AUXILIARY SYSTEMS A1 New Fuel Storage							
Item	**Link**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
A-94	VII.A1.1-a	Structural Steel	Steel	Air – indoor uncontrolled (External)	Loss of material/ general, pitting and crevice corrosion	Chapter XI.S6, “Structures Monitoring Program”	No

A2. SPENT FUEL STORAGE

Systems, Structures, and Components

This section comprises those structures and components used for spent fuel storage and include stainless steel spent fuel storage racks and neutron absorbing materials (e.g., Boraflex, Boral, or boron-steel sheets, if used) submerged in chemically treated oxygenated (BWR) or borated (PWR) water. The intended function of a spent fuel rack is to separate spent fuel assemblies. Boraflex sheets fastened to the storage cells provide for neutron absorption and help maintain subcriticality of spent fuel assemblies in the spent fuel pool.

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 used for spent fuel storage are governed by Group C Quality Standards. In some plants, the Boraflex has been replaced by Boral or boron steel.

Aging management programs for the degradation of external surfaces of components and miscellaneous bolting are included in VII.I. 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 VII.J.

System Interfaces

No other systems discussed in this report interface with those used for spent fuel storage.

VII AUXILIARY SYSTEMS A2 Spent Fuel Storage							
Item	**Link**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
A-87	VII.A2.1-a	Spent fuel storage racks Neutron-absorbing sheets - BWR	Boraflex	Treated water	Reduction of neutron-absorbing capacity/ boraflex degradation	Chapter XI.M22, “Boraflex Monitoring”	No
A-89	VII.A2.1-b	Spent fuel storage racks Neutron-absorbing sheets - BWR	Boral, boron steel	Treated water	Reduction of neutron-absorbing capacity and loss of material/ general corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific
A-86	VII.A2.1-a	Spent fuel storage racks Neutron-absorbing sheets - PWR	Boraflex	Treated borated water	Reduction of neutron-absorbing capacity/ boraflex degradation	Chapter XI.M22, “Boraflex Monitoring”	No
A-88	VII.A2.1-b	Spent fuel storage racks Neutron-absorbing sheets - PWR	Boral, boron steel	Treated borated water	Reduction of neutron-absorbing capacity and loss of material/ general corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific
A-96	VII.A2.1-c	Spent fuel storage racks Storage racks - BWR	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	No
A-97	VII.A2.1-c	Spent fuel storage racks Storage racks - PWR	Stainless steel	Treated borated water >60°C (>140°F)	Cracking/ stress corrosion cracking	Chapter XI.M2, “Water Chemistry,” for PWR primary water in EPRI TR-105714	No

A3. SPENT FUEL POOL COOLING AND CLEANUP (PRESSURIZED WATER REACTOR)

Systems, Structures, and Components

This section comprises the PWR spent fuel pool cooling and cleanup system and consists of piping, valves, heat exchangers, filters, linings, demineralizers, and pumps. The system contains borated water. Stainless steel components are not subject to significant aging degradation in borated water and, therefore, are not included in this section. The system removes heat from the spent fuel pool, and transfers heat to the closed-cycle cooling water system, which in turn transfers heat to the open-cycle cooling water system. 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 PWR spent fuel pool cooling and cleanup system are governed by Group C Quality Standards.

With respect to filters, these items are to be addressed consistent with the NRC position on consumables, provided in the NRC letter from Christopher I. Grimes to Douglas J. Walters of NEI, dated March 10, 2000. Specifically, components that function as system filters are typically replaced based on performance or condition monitoring that identifies whether these components are at the end of their qualified lives and may be excluded, on a plant-specific basis, from an aging management review under 10 CFR 54.21(a)(1)(ii). The application is to identify the standards that are relied on for replacement as part of the methodology description, for example, NFPA standards for fire protection equipment.

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

Aging management programs for the degradation of external surfaces of components and miscellaneous bolting are included in VII.I. 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 VII.J.

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

System Interfaces

The systems that interface with the PWR spent fuel cooling and cleanup system are the PWR emergency core cooling system (V.D1), the closed-cycle cooling water system (VII.C2), and the PWR chemical and volume control system (VII.E1).

VII AUXILIARY SYSTEMS A3 Spent Fuel Pool Cooling and Cleanup (PWR)							
Item	**Link**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
A-15	VII.A3.5-c VII.A3.5-a VII.A3.3-a VII.A3.2-d VII.A3.3-d VII.A3.2-a	Elastomer lining	Elastomers	Treated borated water	Hardening and loss of strength/ elastomers degradation	A plant-specific aging management program that determines and assesses the qualified life of the linings in the environment is to be evaluated.	Yes, plant specific
A-79	VII.A3.3-c VII.A3.6-a VII.A3.1-a VII.A3.2-b VII.A3.4-b VII.A3.2-c VII.A3.5-b	External surfaces of piping, piping components, and piping elements.	Steel	Air with borated water leakage	Loss of material/ boric acid corrosion	Chapter XI.M10, “Boric Acid Corrosion”	No
A-63	VII.A3.4-a	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

VII A3	AUXILIARY SYSTEMS Spent Fuel Pool Cooling and Cleanup (PWR)						
Item	**Link**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
AP-24	AP-24	Heat exchanger shell side components including tubes	Steel	Closed cycle cooling water	Loss of material/ general, pitting and crevice corrosion	Chapter XI.M21, "Closed-Cycle Cooling Water System"	No
AP-1	AP-1	Piping, piping components, and piping elements	Aluminum	Air with borated water leakage	Loss of material/ boric acid corrosion	Chapter XI.M10, "Boric Acid Corrosion"	No
AP-12	AP-12	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
A-39	VII.A3.5-a VII.A3.2-a VII.A3.3-a	Piping, piping components, and piping elements	Steel with elastomer lining	Treated borated water	Loss of material/ pitting and crevice corrosion (only for steel after lining degradation)	Chapter XI.M2, "Water Chemistry," for PWR primary water in EPRI TR-105714 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-56	VII.A3.3-b	Piping, piping components, and piping elements	Steel with stainless steel cladding	Treated borated water >60°C (>140°F)	Cracking/ stress corrosion cracking	Chapter XI.M2, "Water Chemistry," for PWR primary water in EPRI TR-105714	No

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A4. SPENT FUEL POOL COOLING AND CLEANUP (BOILING WATER REACTOR)

Systems, Structures, and Components

This section comprises the BWR spent fuel pool cooling and cleanup system and consists of piping, valves, heat exchangers, filters, linings, demineralizers, and pumps. The system contains chemically treated oxygenated water. The system removes heat from the spent fuel pool, and transfers the heat to the closed-cycle cooling water system, which in turn transfers the heat to the open-cycle cooling water system. 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 BWR spent fuel pool cooling and cleanup system are governed by Group C Quality Standards.

With respect to filters, these items are to be addressed consistent with the NRC position on consumables, provided in the NRC letter from Christopher I. Grimes to Douglas J. Walters of NEI, dated March 10, 2000. Specifically, components that function as system filters are typically replaced based on performance or condition monitoring that identifies whether these components are at the end of their qualified lives and may be excluded, on a plant-specific basis, from an aging management review under 10 CFR 54.21(a)(1)(ii). The application is to identify the standards that are relied on for replacement as part of the methodology description, for example, NFPA standards for fire protection equipment.

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

Aging management programs for the degradation of external surfaces of components and miscellaneous bolting are included in VII.I. 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 VII.J.

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

System Interfaces

The systems that interface with the BWR spent fuel cooling and cleanup system are the closed-cycle cooling water system (VII.C2) and the condensate system (VIII.E).

VII AUXILIARY SYSTEMS A4 Spent Fuel Pool Cooling and Cleanup (BWR)							
Item	**Link**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
A-16	VII.A4.2-a VII.A4.5-a VII.A4.3-a VII.A4.2-b VII.A4.5-b VII.A4.3-b	Elastomer lining	Elastomers	Treated water	Hardening and loss of strength/ elastomers degradation	A plant-specific aging management program that determines and assesses the qualified life of the linings in the environment is to be evaluated.	Yes, plant specific
A-63	VII.A4.4-a	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
AP-24	AP-24	Heat exchanger shell side components including tubes	Steel	Closed cycle cooling water	Loss of material/ general, pitting and crevice corrosion	Chapter XI.M21, "Closed-Cycle Cooling Water System"	No
A-70	VII.A4.4-b	Heat exchanger tube side components including tubes	Stainless steel/ steel with stainless steel cladding	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

VII AUXILIARY SYSTEMS A4 Spent Fuel Pool Cooling and Cleanup (BWR)							
Item	**Link**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
AP-12	AP-12	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
AP-32	AP-32	Piping, piping components, and piping elements	Copper alloy >15% Zn	Treated water	Loss of material/ selective leaching	Chapter XI.M33, "Selective Leaching of Materials"	No
AP-31	AP-31	Piping, piping components, and piping elements	Gray cast iron	Treated water	Loss of material/ selective leaching	Chapter XI.M33, "Selective Leaching of Materials"	No
A-58	VII.A4.1-a VII.A4.6-a	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
A-40	VII.A4.5-a VII.A4.2-a VII.A4.3-a	Piping, piping components, and piping elements	Steel with elastomer lining or stainless steel cladding	Treated water	Loss of material/ pitting and crevice corrosion (only for steel after lining/cladding degradation)	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

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A5. SUPPRESSION POOL CLEANUP SYSTEM (BOILING WATER REACTOR)

Systems, Structures, and Components

This section comprises the suppression pool cleanup system, which maintains water quality in the suppression pool in boiling water reactors (BWRs). The components of this system include piping, filters, valves, and pumps. These components are fabricated of carbon, low-alloy, or austenitic stainless steel. Based on Regulatory Guide 1.26, "Quality Group Classifications and Standards for Water, Steam, and Radioactive-Waste-Containing Components of Nuclear Power Plants," the components that comprise the suppression pool cleanup system are governed by the same Group C Quality Standards Group as the corresponding components in the spent fuel pool cooling and cleanup system (VII.A4).

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

Aging management programs for the degradation of external surfaces of components and miscellaneous bolting are included in VII.I. 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 VII.J.

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

System Interfaces

The system that interfaces with the suppression pool cleanup system is the BWR containment (II.B), or BWR emergency core cooling system (V.D2).

Evaluation Summary

The suppression pool cleanup system in BWRs is similar to the spent fuel pool cooling and cleanup system (VII.A4), and the components in the two systems are identical or very similar. The reader is therefore referred to the section for the spent fuel storage pool system for a listing of aging effects, aging mechanisms, and aging management programs that are to be applied to the suppression pool cleanup system components. (The only component in VII.A4 that may not be applicable to the suppression pool cleanup system is the heat exchanger [VII.A4.4].)

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B. OVERHEAD HEAVY LOAD AND LIGHT LOAD (RELATED TO REFUELING) HANDLING SYSTEMS

Systems, Structures, and Components

Most commercial nuclear facilities have between fifty and one hundred cranes. Many of these cranes are industrial grade cranes that must meet the requirements of 29 CRF Volume XVII, Part 1910, and Section 1910.179. They do not fall within the scope of 10 CFR Part 54.4 and therefore are not required to be part of the integrated plant assessment (IPA). Normally fewer than ten cranes fall within the scope of 10 CFR Part 54.4. These cranes must all comply with the requirements provided in 10 CFR Part 50.65 and Reg. Guide 1.160 for monitoring the effectiveness of maintenance at nuclear power plants.

The Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (the Program) must demonstrate that the testing and the monitoring of the maintenance programs have been completed to ensure that the structures, systems, and components of these cranes are capable of sustaining their rated loads during the period of extended operation. The inspection is also to evaluate whether the usage of the cranes or hoists has been sufficient to warrant additional fatigue analysis. It should be noted that many of the systems and components of these cranes can be classified as moving parts or as components which change configuration, or, they may be subject to replacement based on a qualified life. In any of these cases, they will not fall within the scope of this Aging Management Review (AMR). The primary components that this program is concerned with are the structural girders and beams that make up the bridge and the trolley.

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 overhead heavy load and light load handling systems are governed by Group C Quality Standards.

Aging management programs for the degradation of external surfaces of components and miscellaneous bolting are included in VII.I. 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 VII.J.

System Interfaces

No other systems discussed in this report interface with the overhead heavy load and light load (related to refueling) handling systems. Physical interfaces exist with the supporting structure. The direct interface is at the connection to the structure.

VII B	AUXILIARY SYSTEMS Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems						
Item	**Link**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
A-05	VII.B.2-a	Cranes - rails	Steel	Air – indoor uncontrolled (External)	Loss of material/ wear	Chapter XI.M23, "Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems"	No
A-06	VII.B.1-a	Cranes - Structural girders	Steel	Air – indoor uncontrolled (External)	Cumulative fatigue damage/ fatigue	Fatigue is a time-limited aging analysis (TLAA) to be evaluated for the period of extended operation for structural girders of cranes that fall within the scope of 10 CFR 54. See the Standard Review Plan, Section 4.7, "Other Plant-Specific Time-Limited Aging Analyses," for generic guidance for meeting the requirements of 10 CFR 54.21 (c).	Yes, TLAA
A-07	VII.B.1-b	Cranes - Structural girders	Steel	Air – indoor uncontrolled (External)	Loss of material/ General corrosion	Chapter XI.M23, "Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems"	No

C1. OPEN-CYCLE COOLING WATER SYSTEM (SERVICE WATER SYSTEM)

Systems, Structures, and Components

This section comprises the open-cycle cooling water (OCCW) (or service water) system, which consists of piping, heat exchangers, pumps, flow orifices, basket strainers, and valves, including containment isolation valves. Because the characteristics of an OCCW system may be unique to each facility, the OCCW system is defined as a system or systems that transfer heat from safety-related systems, structures, and components (SSCs) to the ultimate heat sink (UHS) such as a lake, ocean, river, spray pond, or cooling tower. The AMPs described in this section apply to any such system, provided the service conditions and materials of construction are identical to those identified in the section. The system removes heat from the closed-cycle cooling water system and, in some plants, other auxiliary systems and components such as steam turbine bearing oil coolers, or miscellaneous coolers in the condensate system. The only heat exchangers addressed in this section are those removing heat from the closed-cycle cooling system. Heat exchangers for removing heat from other auxiliary systems and components are addressed in their respective systems, such as those for the steam turbine bearing oil coolers (VIII.A) and for the condensate system coolers (VIII.E).

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 open-cycle cooling water system are governed by Group C Quality Standards, with the exception of those forming part of the containment penetration boundary which are governed by Group B Quality Standards.

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

Aging management programs for the degradation of external surfaces of components and miscellaneous bolting are included in VII.I. 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 VII.J.

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

System Interfaces

The systems that may interface with the open-cycle cooling water system include the closed-cycle cooling water system (VII.C2), the ultimate heat sink (VII.C3), the emergency diesel generator system (VII.H2), the containment spray system (V.A), the PWR steam generator blowdown system (VIII.F), the condensate system (VIII.E), the auxiliary feedwater system (PWR) (VIII.G), the emergency core cooling system (PWR) (V.D1), and the emergency core cooling system (BWR) (V.D2).

VII AUXILIARY SYSTEMS C1 Open-Cycle Cooling Water System (Service Water System)							
Item	**Link**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
A-65	VII.C1.3-a	Heat exchanger tube side components including tubes	Copper alloy <15% Zn	Raw water	Loss of material/ pitting, crevice, microbiologically influenced corrosion and macrofouling/ biofouling	Chapter XI.M20, "Open-Cycle Cooling Water System"	No
A-66	VII.C1.3-a	Heat exchanger tube side components including tubes	Copper alloy >15% Zn	Raw water	Macrofouling/ biofouling and loss of material/ pitting, crevice, microbiologically influenced corrosion, and selective leaching	Chapter XI.M20, "Open-Cycle Cooling Water System" and Chapter XI.M33, "Selective Leaching of Materials"	No
A-64	VII.C1.3-a	Heat exchanger tube side components including tubes	Steel	Raw water	Loss of material/ general, pitting, crevice, microbiologically influenced corrosion and macrofouling/ biofouling	Chapter XI.M20, "Open-Cycle Cooling Water System"	No
A-72	VII.C1.3-b	Heat exchanger tubes	Copper alloy <15% Zn	Raw water	Reduction of heat transfer/ biofouling	Chapter XI.M20, "Open-Cycle Cooling Water System"	No
A-74	VII.C1.3-b	Heat exchanger tubes	Copper alloy >15% Zn	Raw water	Reduction of heat transfer/ biofouling	Chapter XI.M20, "Open-Cycle Cooling Water System"	No

VII AUXILIARY SYSTEMS C1 Open-Cycle Cooling Water System (Service Water System)							
Item	**Link**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
A-44	VII.C1.2-a VII.C1.1-a	Piping, piping components, and piping elements	Copper alloy <15% Zn	Raw water	Loss of material/ pitting, and crevice corrosion and macrofouling/ biofouling	Chapter XI.M20, "Open-Cycle Cooling Water System"	No
A-49	VII.C1.1-a VII.C1.2-a	Piping, piping components, and piping elements	Copper alloy >15% Zn	Raw water	Macrofouling/ biofouling and loss of material/ pitting and crevice corrosion, and selective leaching	Chapter XI.M20, "Open-Cycle Cooling Water System" and Chapter XI.M33, "Selective Leaching of Materials"	No
A-51	VII.C1.5-a	Piping, piping components, and piping elements	Gray cast iron	Raw water	Macrofouling/ biofouling and loss of material/ pitting, crevice, microbiologically influenced corrosion, and selective leaching	Chapter XI.M20, "Open-Cycle Cooling Water System" and Chapter XI.M33, "Selective Leaching of Materials"	No
A-02	VII.C1.1-c	Piping, piping components, and piping elements	Gray cast iron	Soil	Loss of material/ selective leaching and general corrosion	Chapter XI.M33, "Selective Leaching of Materials"	No

VII AUXILIARY SYSTEMS C1 Open-Cycle Cooling Water System (Service Water System)							
Item	**Link**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
A-54	VII.C1.4-a VII.C1.6-a VII.C1.2-a VII.C1.1-a	Piping, piping components, and piping elements	Stainless steel	Raw water	Loss of material/ pitting, and crevice corrosion and macrofouling/ biofouling	Chapter XI.M20, "Open-Cycle Cooling Water System"	No
A-32	VII.C1.5-a VII.C1.6-a VII.C1.2-a	Piping, piping components, and piping elements	Steel	Raw water	Loss of material/ general, pitting, crevice, microbiologically influenced corrosion and macrofouling/ biofouling	Chapter XI.M20, "Open-Cycle Cooling Water System"	No
A-01	VII.C1.1-b	Piping, piping components, and piping elements	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
A-38	VII.C1.1-a	Piping, piping components, and piping elements	Steel (without lining/coating or with degraded lining/coating)	Raw water	Loss of material/ general, pitting, crevice, microbiologically influenced corrosion and macrofouling/ biofouling	Chapter XI.M20, "Open-Cycle Cooling Water System"	No

VII AUXILIARY SYSTEMS C1 Open-Cycle Cooling Water System (Service Water System)							
Item	**Link**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
AP-25	AP-25	Piping, piping components, and piping elements	Steel with internal lining or coating	Raw water	Loss of material/ lining or coating degradation	Chapter XI.M20, “Open-Cycle Cooling Water System”	No

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C2. CLOSED-CYCLE COOLING WATER SYSTEM

Systems, Structures, and Components

This section comprises the closed-cycle cooling water (CCCW) system, which consists of piping, radiation elements, temperature elements, heat exchangers, pumps, tanks, flow orifices, and valves, including containment isolation valves. The system contains chemically treated demineralized water. The closed-cycle cooling water system is designed to remove heat from various auxiliary systems and components such as the chemical and volume control system and the spent fuel cooling system to the open-cycle cooling water system (VII.C1). A CCCW system is defined as part of the service water system that does not reject heat directly to a heat sink and that has water chemistry control and is not subject to significant sources of contamination.

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 in the closed-cycle cooling water system are classified as Group C quality Standards, with the exception of those forming part of the containment penetration boundary which are Group B.

The aging management programs (AMPs) for the heat exchanger between the closed-cycle and the open-cycle cooling water systems are addressed in the open-cycle cooling water system (VII.C1). The AMPs for the heat exchangers between the closed-cycle cooling water system and the interfacing auxiliary systems are included in the evaluations of their respective systems, such as those for the PWR and BWR spent fuel pool cooling and cleanup systems (VII.A3 and VII.A4, respectively) and the chemical and volume control system (VII.E1).

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

Aging management programs for the degradation of external surfaces of components and miscellaneous bolting are included in VII.I. 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 VII.J.

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

System Interfaces

The systems that interface with the closed-cycle cooling water system include the open-cycle cooling water system (VII.C1), the PWR spent fuel pool cooling and cleanup system (VII.A3), the BWR spent fuel pool cooling and cleanup system (VII.A4), the chemical and volume control system (VII.E1), the BWR reactor water cleanup system (VII.E3), the shutdown cooling system (older BWR, VII.E5), the primary containment heating and ventilation system (VII.F3), the fire protection (VII.G), the emergency diesel generator system (VII.H2), the PWR containment spray system (V.A), the PWR and BWR emergency core cooling systems (V.D1 and V.D2), the

PWR steam generator blowdown system (VIII.F), the condensate system (VIII.E), and the PWR auxiliary feedwater system (VIII.G).

VII AUXILIARY SYSTEMS C2 Closed-Cycle Cooling Water System							
Item	**Link**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
AP-24	AP-24	Heat exchanger shell side components including tubes	Steel	Closed cycle cooling water	Loss of material/ general, pitting and crevice corrosion	Chapter XI.M21, "Closed-Cycle Cooling Water System"	No
AP-12	AP-12	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
AP-32	AP-32	Piping, piping components, and piping elements	Copper alloy >15% Zn	Treated water	Loss of material/ selective leaching	Chapter XI.M33, "Selective Leaching of Materials"	No
A-50	VII.C2.3-a	Piping, piping components, and piping elements	Gray cast iron	Closed cycle cooling water	Loss of material/ pitting and crevice corrosion, and selective leaching	Chapter XI.M21, "Closed-Cycle Cooling Water System," and Chapter XI.M33, "Selective Leaching of Materials"	No
AP-31	AP-31	Piping, piping components, and piping elements	Gray cast iron	Treated water	Loss of material/ selective leaching	Chapter XI.M33, "Selective Leaching of Materials"	No
A-52	VII.C2.2-a	Piping, piping components, and piping elements	Stainless steel	Closed cycle cooling water	Loss of material/ pitting and crevice corrosion	Chapter XI.M21, "Closed-Cycle Cooling Water System"	No

VII AUXILIARY SYSTEMS C2 Closed-Cycle Cooling Water System							
Item	**Link**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
A-25	VII.C2.3-a VII.C2.5-a VII.C2.2-a VII.C2.1-a VII.C2.4-a	Piping, piping components, piping elements, and tanks	Steel	Closed cycle cooling water	Loss of material/ general, pitting and crevice corrosion	Chapter XI.M21, “Closed-Cycle Cooling Water System”	No

C3. Ultimate Heat Sink

Systems, Structures, and Components

The ultimate heat sink (UHS) consists of a lake, ocean, river, spray pond, or cooling tower and provides sufficient cooling water for safe reactor shutdown and reactor cooldown via the residual heat removal system or other similar system. Due to the varying configurations of connections to lakes, oceans, and rivers, a plant specific aging management program (AMP) is required. Appropriate AMPs shall be provided to trend and project (1) deterioration of earthen dams and impoundments; (2) rate of silt deposition; (3) meteorological, climatological, and oceanic data since obtaining the Final Safety Analysis Report (FSAR) data; (4) water level extremes for plants located on rivers; and (5) aging degradation of all upstream and downstream dams affecting the UHS.

The systems, structures and components included in this section consist of piping, valves, and pumps. The cooling tower is addressed in this report on water-control structures (III.A6). The ultimate heat sink absorbs heat from the residual heat removal system or other similar system. Based on Regulatory Guide 1.26, “Quality Group Classifications and Standards for Water, Steam, and Radioactive-Waste-Containing Components of Nuclear Power Plants,” the piping and valves used for the ultimate heat sink 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 are subject to replacement based on qualified life or specified time period. Accordingly, they are not subject to an aging management review, pursuant to 10 CFR 54.21(a)(1).

Aging management programs for the degradation of external surfaces of components and miscellaneous bolting are included in VII.I. 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 VII.J.

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

System Interfaces

The systems that interface with the ultimate heat sink include the open-cycle cooling water system (VII.C1) and the emergency core cooling systems (V.D1 and V.D2).

VII AUXILIARY SYSTEMS C3 Ultimate Heat Sink							
Item	**Link**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
A-43	VII.C3.2-a VII.C3.1-a	Piping, piping components, and piping elements	Copper alloy <15% Zn	Raw water	Loss of material/ pitting and crevice corrosion	Chapter XI.M20, "Open-Cycle Cooling Water System"	No
A-48	VII.C3.2-a VII.C3.1-a	Piping, piping components, and piping elements	Copper alloy >15% Zn	Raw water	Loss of material/ pitting and crevice corrosion, and selective leaching	Chapter XI.M20, "Open-Cycle Cooling Water System" and Chapter XI.M33, "Selective Leaching of Materials"	No
A-53	VII.C3.2-a	Piping, piping components, and piping elements	Stainless steel	Raw water	Loss of material/ pitting and crevice corrosion	Chapter XI.M20, "Open-Cycle Cooling Water System"	No
A-31	VII.C3.2-a VII.C3.3-a VII.C3.1-a	Piping, piping components, and piping elements	Steel	Raw water	Loss of material/ general, pitting, crevice and microbiologically infuenced corrosion	Chapter XI.M20, "Open-Cycle Cooling Water System"	No
AP-25	AP-25	Piping, piping components, and piping elements	Steel with internal lining or coating	Raw water	Loss of material/ lining or coating degradation	Chapter XI.M20, "Open-Cycle Cooling Water System"	No

D. COMPRESSED AIR SYSTEM

Systems, Structures, and Components

This section comprises the compressed air system, which consists of piping, valves (including containment isolation valves), air receiver, pressure regulators, filters, and dryers. The system components and piping are located in various buildings at most nuclear power plants. 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 of the compressed air system are classified as Group D Quality Standards, with the exception of those forming part of the containment penetration boundary which are Group B. However, the cleanliness of these components and high air quality is to be maintained because the air provides the motive power for instruments and active components (some of them safety-related) that may not function properly if nonsafety Group D equipment is contaminated.

With respect to filters, these items are to be addressed consistent with the NRC position on consumables, provided in the NRC letter from Christopher I. Grimes to Douglas J. Walters of NEI, dated March 10, 2000. Specifically, components that function as system filters are typically replaced based on performance or condition monitoring that identifies whether these components are at the end of their qualified lives and may be excluded, on a plant-specific basis, from an aging management review under 10 CFR 54.21(a)(1)(ii). The application is to identify the standards that are relied on for replacement as part of the methodology description, for example, NFPA standards for fire protection equipment.

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

Aging management programs for the degradation of external surfaces of components and miscellaneous bolting are included in VII.I. 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 VII.J.

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

System Interfaces

Various other systems discussed in this report may interface with the compressed air system.

VII D	AUXILIARY SYSTEMS Compressed Air System						
Item	**Link**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
A-103	VII.D.	Closure bolting	Steel	Saturated air	Loss of material/ general, pitting and crevice corrosion	Chapter XI.M24, “Compressed Air Monitoring”	No
A-26	VII.D.5-a VII.D.1-a VII.D.6-a VII.D.4-a VII.D.3-a VII.D.2-a	Compressed air system Piping, piping components, and piping elements	Steel	Condensation (Internal)	Loss of material/ general and pitting corrosion	Chapter XI.M24, “Compressed Air Monitoring”	No
A-80	VII.D.3-a VII.D.1-a VII.D.6-a VII.D.5-a VII.D.2-a VII.D.4-a	Piping and components external surfaces and bolting	Steel	Air – indoor uncontrolled (External)	Loss of material/ general, pitting and corrosion	A plant specific aging management program is to be evaluated	Yes, plant specific

E1. CHEMICAL AND VOLUME CONTROL SYSTEM (PRESSURIZED WATER REACTOR)

Systems, Structures, and Components

This section comprises a portion of the pressurized water reactor (PWR) chemical and volume control system (CVCS). The portion of the PWR CVCS covered in this section extends from the isolation valves associated with the reactor coolant pressure boundary (and Code change as discussed below) to the volume control tank. This portion of the PWR CVCS consists of high- and low-pressure piping and valves (including the containment isolation valves), regenerative and letdown heat exchangers, pumps, basket strainers, and the volume control tank. The system contains chemically treated borated water; the shell side of the letdown heat exchanger contains closed-cycle cooling water (treated water).
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 CVCS are governed by Group C Quality Standards. Portions of the CVCS extending from the reactor coolant system up to and including the isolation valves associated with reactor coolant pressure boundary are governed by Group A Quality Standards and covered in IV.C2.

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

Aging management programs for the degradation of external surfaces of components and miscellaneous bolting are included in VII.I. 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 VII.J.

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

System Interfaces

The systems that interface with the chemical and volume control system include the reactor coolant system (IV.C2), the emergency core cooling system (V.D1), the spent fuel pool cooling system (VII.A3), and the closed-cycle cooling water system (VII.C2).

VII AUXILIARY SYSTEMS E1 Chemical and Volume Control System (PWR)							
Item	**Link**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
A-104	VII.E1.	Closure bolting	High strength steel	Air with steam or water leakage	Cracking/ cyclic loading, stress corrosion cracking	A plant specific aging management programis to be evaluated	Yes, plant specific
A-79	VII.E1.3-b VII.E1.4-a VII.E1.5-b VII.E1.6-a VII.E1.2-a VII.E1.9-a VII.E1.10-a VII.E1.1-b VII.E1.8-d VII.E1.7-b	External surfaces of piping, piping components, and piping elements.	Steel	Air with borated water leakage	Loss of material/ boric acid corrosion	Chapter XI.M10, “Boric Acid Corrosion”	No
A-63	VII.E1.8-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

VII AUXILIARY SYSTEMS E1 Chemical and Volume Control System (PWR)							
Item	**Link**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
A-100	VII.E1.8-a	Heat exchanger shell side components including tubes	Stainless steel	Treated borated 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
AP-24	AP-24	Heat exchanger shell side components including tubes	Steel	Closed cycle cooling water	Loss of material/ general, pitting and crevice corrosion	Chapter XI.M21, "Closed-Cycle Cooling Water System"	No
A-69	VII.E1.8-b	Heat exchanger tube side components including tubes	Stainless steel	Treated borated water >60°C (>140°F)	Cracking/ stress corrosion cracking, cyclic loading	Chapter XI.M2, "Water Chemistry," for PWR primary water in EPRI TR-105714 The AMP is to be augmented by verifying the absence of cracking due to stress corrosion cracking and cyclic loading, or loss of material due to pitting and crevice corrosion. An acceptable verification program is to include temperature and radioactivity monitoring of the shell side water, and eddy current testing of tubes.	Yes, plant specific
AP-34	AP-34	Heat exchanger tubes	Copper alloy <15% Zn	Treated water	Loss of material/ pitting, crevice corrosion and galvanic corrosion	Chapter XI.M21, "Closed-Cycle Cooling Water System"	No

VII AUXILIARY SYSTEMS E1 Chemical and Volume Control System (PWR)							
Item	**Link**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
A-76	VII.E1.5-a	High-pressure pump Casing and closure bolting	Stainless steel, Steel	Treated borated water	Cracking/ cyclic loading	A plant-specific aging management program is to be evaluated.	Yes, plant specific
AP-1	AP-1	Piping, piping components, and piping elements	Aluminum	Air with borated water leakage	Loss of material/ boric acid corrosion	Chapter XI.M10, “Boric Acid Corrosion”	No
AP-12	AP-12	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
A-57	VII.E1.8-a VII.E1.1-a VII.E1.3-a VII.E1.7-a	Piping, piping components, and piping elements	Stainless steel	Treated borated 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
A-34	VII.E1.1-a VII.E1.3-a VII.E1.8-a VII.E1.7-a	Piping, piping components, and piping elements	Steel	Air – indoor uncontrolled	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

VII E1	AUXILIARY SYSTEMS Chemical and Volume Control System (PWR)						
Item	**Link**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
A-84	VII.E1.7-c	Regenerative heat exchanger tube and shell side components including tubes	Stainless steel	Treated borated water >60°C (>140°F)	Cracking/ stress corrosion cracking, cyclic loading	Chapter XI.M2, “Water Chemistry,” for PWR primary water in EPRI TR-105714 The AMP is to be augmented by verifying the absence of cracking due to stress corrosion cracking and cyclic loading, or loss of material due to pitting and crevice corrosion. An acceptable verification program is to include temperature and radioactivity monitoring of the shell side water, and eddy current testing of tubes.	Yes, plant specific

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E2. STANDBY LIQUID CONTROL SYSTEM (BOILING WATER REACTOR)

Systems, Structures, and Components

This section comprises the portion of the standby liquid control (SLC) system extending from the containment isolation valve to the solution storage tank. The system serves as a backup reactivity control system in all boiling water reactors (BWRs). The major components of this system are the piping, the solution storage tank, the solution storage tank heaters, valves, and pumps. All of the components from the storage tank to the explosive actuated discharge valve operate in contact with a sodium pentaborate ($Na_2B_{10}O_{16}{\cdot}10H_2O$) solution.

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 standby liquid control system are governed by Group B Quality Standards. The portions of the standby liquid control system extending from the reactor coolant pressure boundary up to and including the containment isolation valves are governed by Group A Quality Standards and covered in IV.C1.

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

Aging management programs for the degradation of external surfaces of components and miscellaneous bolting are included in VII.I. 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 VII.J.

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

System Interfaces

The system that interfaces with the standby liquid control system is the BWR reactor pressure vessel (IV.A1). If used, the standby liquid control system would inject sodium pentaborate solution into the pressure vessel near the bottom of the reactor core.

VII AUXILIARY SYSTEMS E2 Standby Liquid Control System (BWR)							
Item	**Link**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
A-59	VII.E2.1-a VII.E2.4-a VII.E2.2-a VII.E2.3-a	Piping, piping components, and piping elements	Stainless steel	Sodium pentaborate solution	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

E3. REACTOR WATER CLEANUP SYSTEM (BOILING WATER REACTOR)

Systems, Structures, and Components

This section comprises the reactor water cleanup (RWCU) system, which provides for cleanup and particulate removal from the recirculating reactor coolant in all boiling water reactors (BWRs). Some plants may not include the RWCU system in the scope of license renewal, while other plants may include the RWCU system because it is associated with safety-related functions.

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 RWCU system extending from the reactor coolant recirculation system up to and including the containment isolation valves forms the primary pressure boundary, and is governed by Group A Quality Standards and covered in IV.C1. The remainder of the system outboard of the isolation valves is governed by Group C Quality Standards. In this table, only aging management programs for RWCU-related piping and components outboard of the isolation valves are evaluated. The aging management program for containment isolation valves in the RWCU system is evaluated in IV.C1, which concern the reactor coolant pressure boundary in BWRs.

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

Aging management programs for the degradation of external surfaces of components and miscellaneous bolting are included in VII.I. 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 VII.J.

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

System Interfaces

The systems that interface with the BWR reactor water cleanup system include the reactor coolant pressure boundary (IV.C1), the closed-cycle cooling water system (VII.C2), and the condensate system (VIII.E).

VII AUXILIARY SYSTEMS E3 Reactor Water Cleanup System							
Item	**Link**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
A-67	VII.E3.4-b	Heat exchanger shell side components including tubes	Stainless steel/ steel with stainless steel cladding	Closed cycle cooling water	Loss of material/ microbiologically influenced corrosion	Chapter XI.M21, "Closed-Cycle Cooling Water System"	No
A-68	VII.E3.4-a	Heat exchanger shell side components including tubes	Stainless steel/ steel with stainless steel cladding	Closed cycle cooling water >60°C (>140°F)	Cracking/ stress corrosion cracking	A plant-specific aging management program is to be evaluated.	Yes, plant specific
AP-24	AP-24	Heat exchanger shell side components including tubes	Steel	Closed cycle cooling water	Loss of material/ general, pitting and crevice corrosion	Chapter XI.M21, "Closed-Cycle Cooling Water System"	No
A-71	VII.E3.4-a	Heat exchanger tube side components including tubes	Stainless steel/ steel with stainless steel cladding	Treated water >60°C (>140°F)	Cracking/ stress corrosion cracking	A plant-specific aging management program is to be evaluated.	Yes, plant specific
A-42	VII.E3.2-b	Piping, piping components, and piping elements	Cast austenitic stainless 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

VII AUXILIARY SYSTEMS E3 Reactor Water Cleanup System							
Item	**Link**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
A-41	VII.E3.2-a	Piping, piping components, and piping elements	Cast austenitic stainless steel	Treated water >60°C (>140°F)	Cracking/ stress corrosion cracking, intergranular stress corrosion cracking	Chapter XI.M25, "BWR Reactor Water Cleanup System"	No
AP-12	AP-12	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
AP-32	AP-32	Piping, piping components, and piping elements	Copper alloy >15% Zn	Treated water	Loss of material/ selective leaching	Chapter XI.M33, "Selective Leaching of Materials"	No
AP-31	AP-31	Piping, piping components, and piping elements	Gray cast iron	Treated water	Loss of material/ selective leaching	Chapter XI.M33, "Selective Leaching of Materials"	No
A-62	VII.E3.2-b VII.E3.1-b	Piping, piping components, and piping elements	Stainless 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
A-60	VII.E3.1-a	Piping, piping components, and piping elements	Stainless steel	Treated water >60°C (>140°F)	Cracking/ stress corrosion cracking, intergranular stress corrosion cracking	Chapter XI.M25, "BWR Reactor Water Cleanup System"	No

VII AUXILIARY SYSTEMS E3 Reactor Water Cleanup System							
Item	**Link**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
A-34	VII.E3.2-c	Piping, piping components, and piping elements	Steel	Air – indoor uncontrolled	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
A-85	VII.E3.3-d	Regenerative heat exchanger tube and shell side components including tubes	Stainless steel	Treated water >60°C (>140°F)	Cracking/ stress corrosion cracking	A plant-specific aging management program is to be evaluated.	Yes, plant specific

E4. SHUTDOWN COOLING SYSTEM (OLDER BWR)

Systems, Structures, and Components

This section comprises the shutdown cooling (SDC) system for older vintage boiling water reactors (BWRs) and consists of piping and fittings, the SDC system pump, the heat exchanger, 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," all components that comprise the SDC system are governed by Group B Quality Standards. Portions of the SDC system extending from the reactor coolant pressure boundary up to and including the containment isolation valves are governed by Group A Quality Standards and covered in IV.C1.

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

Aging management programs for the degradation of external surfaces of components and miscellaneous bolting are included in VII.I. 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 VII.J.

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

System Interfaces

The systems that interface with the SDC system include the reactor coolant pressure boundary (IV.C1) and the closed-cycle cooling water system (VII.C2).

VII AUXILIARY SYSTEMS E4 Shutdown Cooling System (Older BWR)							
Item	**Link**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
A-63	VII.E4.4-a	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
A-67	VII.E4.4-a	Heat exchanger shell side components including tubes	Stainless steel/ steel with stainless steel cladding	Closed cycle cooling water	Loss of material/ microbiologically influenced corrosion	Chapter XI.M21, "Closed-Cycle Cooling Water System"	No
AP-24	AP-24	Heat exchanger shell side components including tubes	Steel	Closed cycle cooling water	Loss of material/ general, pitting and crevice corrosion	Chapter XI.M21, "Closed-Cycle Cooling Water System"	No
A-101	VII.E4.3-a	Piping, piping components, and piping elements	Cast austenitic stainless steel	Treated water >60°C (>140°F)	Cracking/ stress corrosion cracking	Chapter XI.M7, "BWR Stress Corrosion Cracking" and Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515)	No
AP-12	AP-12	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
AP-32	AP-32	Piping, piping components, and piping elements	Copper alloy >15% Zn	Treated water	Loss of material/ selective leaching	Chapter XI.M33, "Selective Leaching of Materials"	No

VII AUXILIARY SYSTEMS E4 Shutdown Cooling System (Older BWR)							
Item	**Link**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
AP-31	AP-31	Piping, piping components, and piping elements	Gray cast iron	Treated water	Loss of material/ selective leaching	Chapter XI.M33, "Selective Leaching of Materials"	No
A-62	VII.E4.1-b	Piping, piping components, and piping elements	Stainless 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
A-58	VII.E4.1-a	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
A-61	VII.E4.3-a VII.E4.1-c	Piping, piping components, and piping elements	Stainless steel	Treated water >60°C (>140°F)	Cracking/ stress corrosion cracking	Chapter XI.M7, "BWR Stress Corrosion Cracking" and Chapter XI.M2, "Water Chemistry," for BWR water in BWRVIP-29 (EPRI TR-103515)	No

VII AUXILIARY SYSTEMS E4 Shutdown Cooling System (Older BWR)							
Item	**Link**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
A-37	VII.E4.1-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
A-35	VII.E4.1-a VII.E4.2-a	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

F1. CONTROL ROOM AREA VENTILATION SYSTEM

Systems, Structures, and Components

This section comprises the control room area ventilation system (with warm moist air as the normal environment), which contains ducts, piping and fittings, equipment frames and housings, flexible collars and seals, filters, and heating and cooling air handlers. 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 control room area ventilation system are governed by Group B Quality Standards.

With respect to filters and seals, these items are to be addressed consistent with the NRC position on consumables, provided in the NRC letter from Christopher I. Grimes to Douglas J. Walters of NEI, dated March 10, 2000. Specifically, components that function as system filters and seals are typically replaced based on performance or condition monitoring that identifies whether these components are at the end of their qualified lives and may be excluded, on a plant-specific basis, from an aging management review under 10 CFR 54.21(a)(1)(ii). The application is to identify the standards that are relied on for replacement as part of the methodology description, for example, NFPA standards for fire protection equipment.

Aging management programs for the degradation of external surfaces of components and miscellaneous bolting are included in VII.I. 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 VII.J.

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

System Interfaces

The system that interfaces with the control room area ventilation system is the auxiliary and radwaste area ventilation system (VII.F2). The cooling coils receive their cooling water from other systems, such as the hot water heating system or the chilled water cooling system.

VII AUXILIARY SYSTEMS F1 Control Room Area Ventilation System							
Item	**Link**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
A-10	VII.F1.1-a VII.F1.4-a	Ducting and components external surfaces	Steel	Air – indoor uncontrolled (External)	Loss of material/ general, pitting and crevice corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific
A-14	VII.F1.1-a	Ducting and components internal surfaces	Galvanized steel	Condensation (Internal)	Loss of material/ general, pitting, crevice corrosion, and microbiologically influenced corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific
A-08	VII.F1.1-a	Ducting and components internal surfaces	Steel	Air – indoor uncontrolled (Internal)	Loss of material/ general, pitting and crevice corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific
A-13	VII.F1.1-a	Ducting and components internal surfaces	Steel	Condensation (Internal)	Loss of material/ general, pitting, crevice corrosion, and microbiologically influenced corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific
A-105	VII.F1.	Ducting closure bolting	Steel	Air – indoor uncontrolled	Loss of material/ general pitting and crevice corrosion	A plant specific aging management program is to be evaluated	Yes, plant specific
A-09	VII.F1.4-a	Ducting, piping and components external surfaces	Stainless steel	Condensation (External)	Loss of material/ pitting and crevice corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific

VII AUXILIARY SYSTEMS F1 Control Room Area Ventilation System							
Item	**Link**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
A-12	VII.F1.4-a	Ducting, piping and components internal surfaces	Stainless steel	Condensation (Internal)	Loss of material/ pitting and crevice corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific
A-11	VII.F1.4-a	Ducting, piping and components internal surfaces	Steel	Air – indoor uncontrolled (Internal)	Loss of material/ general, pitting and crevice corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific
A-36	VII.F1.4-b VII.F1.1-b	Elastomer seals and components	Elastomers	Air – indoor uncontrolled (External)	Hardening and loss of strength/ elastomers degradation	A plant-specific aging management program is to be evaluated.	Yes, plant specific
A-73	VII.F1.1-c	Elastomer seals and components	Elastomers	Air – indoor uncontrolled (External)	Loss of material/ wear	A plant-specific aging management program is to be evaluated.	Yes, plant specific
A-18	VII.F1.1-c	Elastomer seals and components	Elastomers	Air – indoor uncontrolled (Internal)	Loss of material/ wear	A plant-specific aging management program is to be evaluated.	Yes, plant specific
A-17	VII.F1.4-b VII.F1.1-b	Elastomer seals and components	Elastomers	Air – indoor uncontrolled >35°C (>95°F) (Internal)	Hardening and loss of strength/ elastomers degradation	A plant-specific aging management program is to be evaluated.	Yes, plant specific
AP-24	AP-24	Heat exchanger shell side components including tubes	Steel	Closed cycle cooling water	Loss of material/ general, pitting and crevice corrosion	Chapter XI.M21, “Closed-Cycle Cooling Water System”	No

VII AUXILIARY SYSTEMS F1 Control Room Area Ventilation System							
Item	**Link**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
AP-34	AP-34	Heat exchanger tubes	Copper alloy <15% Zn	Treated water	Loss of material/ pitting, crevice corrosion and galvanic corrosion	Chapter XI.M21, "Closed-Cycle Cooling Water System"	No
AP-12	AP-12	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
A-46	VII.F1.2-a	Piping, piping components, and piping elements	Copper alloy >15% Zn	Condensation (External)	Loss of material/ pitting and crevice corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific
A-25	VII.F1.3-a	Piping, piping components, piping elements, and tanks	Steel	Closed cycle cooling water	Loss of material/ general, pitting and crevice corrosion	Chapter XI.M21, "Closed-Cycle Cooling Water System"	No

F2. Auxiliary and Radwaste Area Ventilation System

Systems, Structures, and Components

This section comprises the auxiliary and radwaste areas ventilation systems (with warm moist air as the normal environment) and contains ducts, piping and fittings, equipment frames and housings, flexible collars and seals, filters, and heating and cooling air handlers. 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 auxiliary and radwaste area ventilation system are governed by Group B Quality Standards.

With respect to filters and seals, these items are to be addressed consistent with the NRC position on consumables, provided in the NRC letter from Christopher I. Grimes to Douglas J. Walters of NEI, dated March 10, 2000. Specifically, components that function as system filters and seals are typically replaced based on performance or condition monitoring that identifies whether these components are at the end of their qualified lives and may be excluded, on a plant-specific basis, from an aging management review under 10 CFR 54.21(a)(1)(ii). The application is to identify the standards that are relied on for replacement as part of the methodology description, for example, NFPA standards for fire protection equipment.

Aging management programs for the degradation of external surfaces of components and miscellaneous bolting are included in VII.I. 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 VII.J.

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

System Interfaces

The systems that interface with the auxiliary and radwaste area ventilation system are the control room area ventilation system (VII.F1) and the diesel generator building ventilation system (VII.F4). The cooling coils receive their cooling water from other systems, such as the hot water heating system or the chilled water cooling system.

VII AUXILIARY SYSTEMS F2 Auxiliary and Radwaste Area Ventilation System							
Item	**Link**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
A-10	VII.F2.4-a VII.F2.1-a	Ducting and components external surfaces	Steel	Air – indoor uncontrolled (External)	Loss of material/ general, pitting and crevice corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific
A-14	VII.F2.1-a	Ducting and components internal surfaces	Galvanized steel	Condensation (Internal)	Loss of material/ general, pitting, crevice corrosion, and microbiologically influenced corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific
A-08	VII.F2.1-a	Ducting and components internal surfaces	Steel	Air – indoor uncontrolled (Internal)	Loss of material/ general, pitting and crevice corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific
A-13	VII.F2.1-a	Ducting and components internal surfaces	Steel	Condensation (Internal)	Loss of material/ general, pitting, crevice corrosion, and microbiologically influenced corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific
A-09	VII.F2.4-a	Ducting, piping and components external surfaces	Stainless steel	Condensation (External)	Loss of material/ pitting and crevice corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific
A-12	VII.F2.4-a	Ducting, piping and components internal surfaces	Stainless steel	Condensation (Internal)	Loss of material/ pitting and crevice corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific

VII AUXILIARY SYSTEMS F2 Auxiliary and Radwaste Area Ventilation System							
Item	**Link**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
A-11	VII.F2.4-a	Ducting, piping and components internal surfaces	Steel	Air – indoor uncontrolled (Internal)	Loss of material/ general, pitting and crevice corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific
A-36	VII.F2.1-b VII.F2.4-b	Elastomer seals and components	Elastomers	Air – indoor uncontrolled (External)	Hardening and loss of strength/ elastomers degradation	A plant-specific aging management program is to be evaluated.	Yes, plant specific
A-73	VII.F2.1-c	Elastomer seals and components	Elastomers	Air – indoor uncontrolled (External)	Loss of material/ wear	A plant-specific aging management program is to be evaluated.	Yes, plant specific
A-18	VII.F2.1-c	Elastomer seals and components	Elastomers	Air – indoor uncontrolled (Internal)	Loss of material/ wear	A plant-specific aging management program is to be evaluated.	Yes, plant specific
A-17	VII.F2.1-b VII.F2.4-b	Elastomer seals and components	Elastomers	Air – indoor uncontrolled >35°C (>95°F) (Internal)	Hardening and loss of strength/ elastomers degradation	A plant-specific aging management program is to be evaluated.	Yes, plant specific
AP-24	AP-24	Heat exchanger shell side components including tubes	Steel	Closed cycle cooling water	Loss of material/ general, pitting and crevice corrosion	Chapter XI.M21, “Closed-Cycle Cooling Water System”	No
AP-12	AP-12	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

VII F2	AUXILIARY SYSTEMS Auxiliary and Radwaste Area Ventilation System						
Item	**Link**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
A-46	VII.F2.2-a	Piping, piping components, and piping elements	Copper alloy >15% Zn	Condensation (External)	Loss of material/ pitting and crevice corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific
A-25	VII.F2.3-a	Piping, piping components, piping elements, and tanks	Steel	Closed cycle cooling water	Loss of material/ general, pitting and crevice corrosion	Chapter XI.M21, “Closed-Cycle Cooling Water System”	No

F3. PRIMARY CONTAINMENT HEATING AND VENTILATION SYSTEM

Systems, Structures, and Components

This section comprises the primary containment heating and ventilation system (with warm moist air as the normal environment), which contains ducts, piping and fittings, equipment frames and housings, flexible collars and seals, filters, and heating and cooling air handlers. 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 primary containment heating and ventilation system are governed by Group C Quality Standards.

With respect to filters and seals, these items are to be addressed consistent with the NRC position on consumables, provided in the NRC letter from Christopher I. Grimes to Douglas J. Walters of NEI, dated March 10, 2000. Specifically, components that function as system filters and seals are typically replaced based on performance or condition monitoring that identifies whether these components are at the end of their qualified lives and may be excluded, on a plant-specific basis, from an aging management review under 10 CFR 54.21(a)(1)(ii). The application is to identify the standards that are relied on for replacement as part of the methodology description, for example, NFPA standards for fire protection equipment.

Aging management programs for the degradation of external surfaces of components and miscellaneous bolting are included in VII.I. 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 VII.J.

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

System Interfaces

The systems that interface with the primary containment heating and ventilation system are the closed-cycle cooling water system (VII.C2) and the PWR and BWR containments (II.A and II.B, respectively). The cooling coils receive their cooling water from other systems, such as the hot water heating system or the chilled water cooling system.

VII AUXILIARY SYSTEMS F3 Primary Containment Area Ventilation System							
Item	**Link**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
A-10	VII.F3.1-a VII.F3.4-a	Ducting and components external surfaces	Steel	Air – indoor uncontrolled (External)	Loss of material/ general, pitting and crevice corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific
A-14	VII.F3.1-a	Ducting and components internal surfaces	Galvanized steel	Condensation (Internal)	Loss of material/ general, pitting, crevice corrosion, and microbiologically influenced corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific
A-08	VII.F3.1-a	Ducting and components internal surfaces	Steel	Air – indoor uncontrolled (Internal)	Loss of material/ general, pitting and crevice corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific
A-13	VII.F3.1-a	Ducting and components internal surfaces	Steel	Condensation (Internal)	Loss of material/ general, pitting, crevice corrosion, and microbiologically influenced corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific
A-09	VII.F3.4-a	Ducting, piping and components external surfaces	Stainless steel	Condensation (External)	Loss of material/ pitting and crevice corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific
A-12	VII.F3.4-a	Ducting, piping and components internal surfaces	Stainless steel	Condensation (Internal)	Loss of material/ pitting and crevice corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific

VII AUXILIARY SYSTEMS F3 Primary Containment Area Ventilation System							
Item	**Link**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
A-11	VII.F3.4-a	Ducting, piping and components internal surfaces	Steel	Air – indoor uncontrolled (Internal)	Loss of material/ general, pitting and crevice corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific
A-36	VII.F3.4-b VII.F3.1-b	Elastomer seals and components	Elastomers	Air – indoor uncontrolled (External)	Hardening and loss of strength/ elastomers degradation	A plant-specific aging management program is to be evaluated.	Yes, plant specific
A-73	VII.F3.1-c	Elastomer seals and components	Elastomers	Air – indoor uncontrolled (External)	Loss of material/ wear	A plant-specific aging management program is to be evaluated.	Yes, plant specific
A-18	VII.F3.1-c	Elastomer seals and components	Elastomers	Air – indoor uncontrolled (Internal)	Loss of material/ wear	A plant-specific aging management program is to be evaluated.	Yes, plant specific
A-17	VII.F3.4-b VII.F3.1-b	Elastomer seals and components	Elastomers	Air – indoor uncontrolled >35°C (>95°F) (Internal)	Hardening and loss of strength/ elastomers degradation	A plant-specific aging management program is to be evaluated.	Yes, plant specific
AP-24	AP-24	Heat exchanger shell side components including tubes	Steel	Closed cycle cooling water	Loss of material/ general, pitting and crevice corrosion	Chapter XI.M21, “Closed-Cycle Cooling Water System”	No
AP-34	AP-34	Heat exchanger tubes	Copper alloy <15% Zn	Treated water	Loss of material/ pitting, crevice corrosion and galvanic corrosion	Chapter XI.M21, “Closed-Cycle Cooling Water System”	No

VII AUXILIARY SYSTEMS F3 Primary Containment Area Ventilation System							
Item	**Link**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
AP-12	AP-12	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
A-46	VII.F3.2-a	Piping, piping components, and piping elements	Copper alloy >15% Zn	Condensation (External)	Loss of material/ pitting and crevice corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific
A-25	VII.F3.3-a	Piping, piping components, piping elements, and tanks	Steel	Closed cycle cooling water	Loss of material/ general, pitting and crevice corrosion	Chapter XI.M21, "Closed-Cycle Cooling Water System"	No

F4. DIESEL GENERATOR BUILDING VENTILATION SYSTEM

Systems, Structures, and Components

This section comprises the diesel generator building ventilation system (with warm moist air as the normal environment), which contains ducts, piping and fittings, equipment frames and housings, flexible collars and seals, and heating and cooling air handlers. 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 diesel generator building ventilation system are governed by Group C Quality Standards.

With respect to seals, these items are to be addressed consistent with the NRC position on consumables, provided in the NRC letter from Christopher I. Grimes to Douglas J. Walters of NEI, dated March 10, 2000. Specifically, components that function as system seals are typically replaced based on performance or condition monitoring that identifies whether these components are at the end of their qualified lives and may be excluded, on a plant-specific basis, from an aging management review under 10 CFR 54.21(a)(1)(ii). The application is to identify the standards that are relied on for replacement as part of the methodology description, for example, NFPA standards for fire protection equipment.

Aging management programs for the degradation of external surfaces of components and miscellaneous bolting are included in VII.I. 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 VII.J.

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

System Interfaces

The system that interfaces with the diesel generator building system is the auxiliary and radwaste area ventilation system (VII.F2). The cooling coils receive their cooling water from other systems, such as the hot water heating system or the chilled water cooling system.

VII AUXILIARY SYSTEMS F4 Diesel Generator Building Ventilation System							
Item	**Link**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
A-10	VII.F4.1-a	Ducting and components external surfaces	Steel	Air – indoor uncontrolled (External)	Loss of material/ general, pitting and crevice corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific
A-14	VII.F4.1-a	Ducting and components internal surfaces	Galvanized steel	Condensation (Internal)	Loss of material/ general, pitting, crevice corrosion, and microbiologically influenced corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific
A-08	VII.F4.1-a	Ducting and components internal surfaces	Steel	Air – indoor uncontrolled (Internal)	Loss of material/ general, pitting and crevice corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific
A-13	VII.F4.1-a	Ducting and components internal surfaces	Steel	Condensation (Internal)	Loss of material/ general, pitting, crevice corrosion, and microbiologically influenced corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific
A-36	VII.F4.1-b	Elastomer seals and components	Elastomers	Air – indoor uncontrolled (External)	Hardening and loss of strength/ elastomers degradation	A plant-specific aging management program is to be evaluated.	Yes, plant specific
A-73	VII.F4.1-c	Elastomer seals and components	Elastomers	Air – indoor uncontrolled (External)	Loss of material/ wear	A plant-specific aging management program is to be evaluated.	Yes, plant specific
A-18	VII.F4.1-c	Elastomer seals and components	Elastomers	Air – indoor uncontrolled (Internal)	Loss of material/ wear	A plant-specific aging management program is to be evaluated.	Yes, plant specific

VII AUXILIARY SYSTEMS F4 Diesel Generator Building Ventilation System							
Item	**Link**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
A-17	VII.F4.1-b	Elastomer seals and components	Elastomers	Air – indoor uncontrolled >35°C (>95°F) (Internal)	Hardening and loss of strength/ elastomers degradation	A plant-specific aging management program is to be evaluated.	Yes, plant specific
AP-24	AP-24	Heat exchanger shell side components including tubes	Steel	Closed cycle cooling water	Loss of material/ general, pitting and crevice corrosion	Chapter XI.M21, “Closed-Cycle Cooling Water System”	No
AP-12	AP-12	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
A-46	VII.F4.2-a	Piping, piping components, and piping elements	Copper alloy >15% Zn	Condensation (External)	Loss of material/ pitting and crevice corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific
A-25	VII.F4.3-a	Piping, piping components, piping elements, and tanks	Steel	Closed cycle cooling water	Loss of material/ general, pitting and crevice corrosion	Chapter XI.M21, “Closed-Cycle Cooling Water System”	No

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G. FIRE PROTECTION

Systems, Structures, and Components

This section comprises the fire protection systems for both boiling water reactors (BWRs) and pressurized water reactors (PWRs), which consist of several Class 1 structures, mechanical systems, and electrical components. The Class 1 structures include the intake structure, the turbine building, the auxiliary building, the diesel generator building, and the primary containment. Structural components include fire barrier walls, ceilings, floors, fire doors, and penetration seals. Mechanical systems include the high pressure service water system, the reactor coolant pump oil collect system, and the diesel fire system. Mechanical components include piping and fittings, filters, fire hydrants, mulsifiers, pumps, sprinklers, strainers, and valves (including 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," all of the mechanical components are governed by Group C Quality Standards.

With respect to filters, seals, portable fire extinguishers, and fire hoses, these items are to be addressed consistent with the NRC position on consumables, provided in the NRC letter from Christopher I. Grimes to Douglas J. Walters of NEI, dated March 10, 2000. Specifically, components that function as system filters, seals, portable fire extinguishers, and fire hoses are typically replaced based on performance or condition monitoring that identifies whether these components are at the end of their qualified lives and may be excluded, on a plant-specific basis, from an aging management review under 10 CFR 54.21(a)(1)(ii). The application is to identify the standards that are relied on for replacement as part of the methodology description, for example, NFPA standards for fire protection equipment.

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

Aging management programs for the degradation of external surfaces of components and miscellaneous bolting are included in VII.I. 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 VII.J.

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

System Interfaces

The systems and structures that interface with the fire protection system include various Class 1 structures and component supports (III.A and III.B), the electrical components (VI.A and VI.B), the closed-cycle cooling water system (VII.C2), and the diesel fuel oil system (VII.H1).

VII G	AUXILIARY SYSTEMS Fire Protection						
Item	**Link**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
A-19	VII.G.4-a VII.G.1-a VII.G.3-a VII.G.2-a	Fire barrier penetration seals	Elastomers	Air – indoor uncontrolled	Increased hardness, shrinkage and loss of strength/ weathering	Chapter XI.M26, “Fire Protection”	No
A-20	VII.G.4-a VII.G.3-a VII.G.1-a VII.G.2-a	Fire barrier penetration seals	Elastomers	Air – outdoor	Increased hardness, shrinkage and loss of strength/ weathering	Chapter XI.M26, “Fire Protection”	No
A-21	VII.G.1-d VII.G.3-d VII.G.5-c VII.G.2-d VII.G.4-d	Fire rated doors	Steel	Air – indoor uncontrolled	Loss of material/ wear	Chapter XI.M26, “Fire Protection”	No
A-22	VII.G.1-d VII.G.2-d VII.G.3-d VII.G.4-d	Fire rated doors	Steel	Air – outdoor	Loss of material/ wear	Chapter XI.M26, “Fire Protection”	No
A-45	VII.G.6-b	Piping, piping components, and piping elements	Copper alloy <15% Zn	Raw water	Loss of material/ pitting, crevice, microbiologically influenced corrosion and macrofouling/ biofouling	Chapter XI.M27, “Fire Water System”	No
A-47	VII.G.6-b	Piping, piping components, and piping elements	Copper alloy >15% Zn	Raw water	Macrofouling/ biofouling and loss of material/ pitting and crevice corrosion, and selective leaching	Chapter XI.M27, “Fire Water System” and Chapter XI.M33, “Selective Leaching of Materials”.	No

VII G	AUXILIARY SYSTEMS Fire Protection						
Item	**Link**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
AP-29	AP-29	Piping, piping components, and piping elements	Gray cast iron	Raw water	Loss of material/ selective leaching	Chapter XI.M33, "Selective Leaching of Materials".	No
A-55	VII.G.6-b VII.G.6-a	Piping, piping components, and piping elements	Stainless steel	Raw water	Loss of material/ pitting, crevice, microbiologically influenced corrosion and macrofouling/ biofouling	Chapter XI.M27, "Fire Water System"	No
A-28	VII.G.8-a	Piping, piping components, and piping elements	Steel	Fuel oil	Loss of material/ general, pitting and crevice corrosion	Chapter XI.M26, "Fire Protection," and Chapter XI.M30, "Fuel Oil Chemistry"	No
A-33	VII.G.6-b VII.G.6-a	Piping, piping components, and piping elements	Steel	Raw water	Loss of material/ general, pitting, crevice, microbiologically influenced corrosion and macrofouling/ biofouling	Chapter XI.M27, "Fire Water System"	No
A-83	VII.G.7-b	Reactor coolant pump oil collection system Piping, tubing, valve bodies	Steel, copper alloy	Lubricating oil	Loss of material/ general, galvanic, pitting and crevice corrosion	A plant specific aging management program that monitors the degradation of the components is to be evaluated. See Chapter XI.M32, "One-Time Inspection," for an acceptable verification program.	Yes, detection of aging effects is to be evaluated

VII G	AUXILIARY SYSTEMS Fire Protection						
Item	**Link**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
A-82	VII.G.7-a	Reactor coolant pump oil collection system Tank	Steel	Lubricating oil	Loss of material/ general, pitting and crevice corrosion	A plant specific aging management program that determines the thickness of the lower portion of the tank is to be evaluated. See Chapter XI.M32, “One-Time Inspection,” for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
A-90	VII.G.2-b VII.G.3-b VII.G.4-b VII.G.1-b VII.G.5-a	Structural fire barriers – walls, ceilings and floors	Reinforced concrete	Air – indoor uncontrolled	Concrete cracking and spalling/ freeze-thaw, aggressive chemical attack, and reaction with aggregates	Chapter XI.M26, “Fire Protection” and Chapter XI.S6, “Structures Monitoring Program”	No
A-91	VII.G.5-b VII.G.4-c VII.G.3-c VII.G.1-c VII.G.2-c	Structural fire barriers – walls, ceilings and floors	Reinforced concrete	Air – indoor uncontrolled	Loss of material/ corrosion of embedded steel	Chapter XI.M26, “Fire Protection” and Chapter XI.S6, “Structures Monitoring Program”	No
A-92	VII.G.2-b VII.G.4-b VII.G.1-b VII.G.3-b	Structural fire barriers – walls, ceilings and floors	Reinforced concrete	Air – outdoor	Concrete cracking and spalling/ freeze-thaw, aggressive chemical attack, and reaction with aggregates	Chapter XI.M26, “Fire Protection” and Chapter XI.S6, “Structures Monitoring Program”	No
A-93	VII.G.4-c VII.G.3-c VII.G.2-c VII.G.1-c	Structural fire barriers – walls, ceilings and floors	Reinforced concrete	Air – outdoor	Loss of material/ corrosion of embedded steel	Chapter XI.M26, “Fire Protection” and Chapter XI.S6, “Structures Monitoring Program”	No

H1. DIESEL FUEL OIL SYSTEM

Systems, Structures, and Components

This section comprise the diesel fuel oil system, which consists of aboveground and underground piping, valves, pumps, and 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 diesel fuel oil system are governed by Group C Quality Standards.

Aging management programs for the degradation of external surfaces of components and miscellaneous bolting are included in VII.I. 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 VII.J.

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

System Interfaces

The systems that interface with the diesel fuel oil system are the fire protection (VII.G) and emergency diesel generator systems (VII.H2).

VII AUXILIARY SYSTEMS H1 Diesel Fuel Oil System							
Item	**Link**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
A-24	VII.H1.2-a VII.H1.1-a VII.H1.3-a	Piping, piping components, and piping elements	Steel	Air – outdoor (External)	Loss of material/ general, pitting and crevice corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific
A-30	VII.H1.4-a	Piping, piping components, and piping elements	Steel	Fuel oil	Loss of material/ general, pitting, crevice, microbiologically influenced corrosion and macrofouling/ biofouling	Chapter XI.M30, “Fuel Oil Chemistry” The AMP is to be augmented by verifying the effectiveness of fuel oil chemistry control. See Chapter XI.M32, “One-Time Inspection,” for an acceptable verification program.	Yes, detection of aging effects is to be evaluated
A-01	VII.H1.1-b	Piping, piping components, and piping elements	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
A-95	VII.H1.4-b	Tank	Steel	Air – outdoor (External)	Loss of material/ general, pitting and crevice corrosion	Chapter XI.M29, “Aboveground Steel Tanks”	No

H2. EMERGENCY DIESEL GENERATOR SYSTEM

Systems, Structures, and Components

This section comprises the emergency diesel generator system, which contains piping, valves, filters, mufflers, strainers, and 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 emergency diesel generator system are governed by Group C Quality Standards.

With respect to filters, these items are to be addressed consistent with the NRC position on consumables, provided in the NRC letter from Christopher I. Grimes to Douglas J. Walters of NEI, dated March 10, 2000. Specifically, components that function as system filters are typically replaced based on performance or condition monitoring that identifies whether these components are at the end of their qualified lives and may be excluded, on a plant-specific basis, from an aging management review under 10 CFR 54.21(a)(1)(ii). The application is to identify the standards that are relied on for replacement as part of the methodology description, for example, NFPA standards for fire protection equipment.

Aging management programs for the degradation of external surfaces of components and miscellaneous bolting are included in VII.I. 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 VII.J.

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

System Interfaces

The systems that interface with the emergency diesel generator system include the diesel fuel oil system (VII.H1), the closed-cycle cooling water system (VII.C2) and, for some plants, the open-cycle cooling water system (VII.C1).

VII AUXILIARY SYSTEMS H2 Emergency Diesel Generator System							
Item	**Link**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
AP-33	AP-33	Diesel engine exhaust Piping, piping components, and piping elements	Stainless steel	Diesel exhaust	Cracking/stress corrosion cracking	A plant-specific aging management program is to be evaluated	Yes, plant specific
A-27	VII.H2.4-a	Diesel engine exhaust Piping, piping components, and piping elements	Steel; stainless steel	Diesel Exhaust	Loss of material/ general (steel only), pitting and crevice corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific
AP-30	AP-30	Diesel engine lubricating oil subsystem Piping, piping components and piping elements	Steel	Lubricating oil	Loss of material/ general, pitting and crevice corrosion	A plant-specific aging management program is to be evaluated	Yes, plant specific
A-30	VII.H2.5-a	Piping, piping components, and piping elements	Steel	Fuel oil	Loss of material/ general, pitting, crevice, microbiologically influenced corrosion and macrofouling/ biofouling	Chapter XI.M30, “Fuel Oil Chemistry” The AMP is to be augmented by verifying the effectiveness of fuel oil chemistry control. See Chapter XI.M32, “One-Time Inspection,” for an acceptable verification program.	Yes, detection of aging effects is to be evaluated

VII AUXILIARY SYSTEMS H2 Emergency Diesel Generator System							
Item	**Link**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
A-23	VII.H2.3-a VII.H2.2-a	Piping, piping components, and piping elements	Steel	Moist air	Loss of material/ general, pitting and crevice corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant specific
A-32	VII.H2.1-b	Piping, piping components, and piping elements	Steel	Raw water	Loss of material/ general, pitting, crevice, microbiologically influenced corrosion and macrofouling/ biofouling	Chapter XI.M20, “Open-Cycle Cooling Water System”	No
AP-25	AP-25	Piping, piping components, and piping elements	Steel with internal lining or coating	Raw water	Loss of material/ lining or coating degradation	Chapter XI.M20, “Open-Cycle Cooling Water System”	No
A-25	VII.H2.1-a	Piping, piping components, piping elements, and tanks	Steel	Closed cycle cooling water	Loss of material/ general, pitting and crevice corrosion	Chapter XI.M21, “Closed-Cycle Cooling Water System”	No

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I. EXTERNAL SURFACES OF COMPONENTS AND MISCELLANEOUS BOLTING

Systems, Structures, and Components

This section includes the aging management programs for the external surfaces of all carbon steel structures and components including closure boltings in the Auxiliary Systems 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 surface as a result of the dripping borated water that is leaking from an adjacent PWR component. Boric acid corrosion can also occur for carbon steel components containing borated water due to leakage; such components and the related aging management program are covered in the appropriate major plant sections in VII.

System Interfaces

The structures and components covered in this section belong to the Auxiliary Systems in PWRs and BWRs. (For example, see System Interfaces in VII.A1 to VII.H2 for details.)

VII I	AUXILIARY SYSTEMS External Surfaces of Components and Miscellaneous Bolting						
Item	**Link**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
AP-28	AP-28	Bolting	Steel	Air – outdoor (External)	Loss of material/ general, pitting and crevice corrosion	Chapter XI.M18, “Bolting Integrity”	No
A-102	VII.I.	Bolting	Steel	Air with borated water leakage	Loss of material/ boric acid corrosion	Chapter XI.M10, “Boric Acid Corrosion”	No
A-04	VII.I.	Closure bolting	High strength steel	Air with steam or water leakage	Cracking/ cyclic loading, stress corrosion cracking	Chapter XI.M18, “Bolting Integrity”	No
AP-26	AP-26	Closure bolting	Steel	Air – high temperature	Loss of preload/ stress relaxation	Chapter XI.M18, “Bolting Integrity”	No
AP-27	AP-27	Closure bolting	Steel	Air – indoor uncontrolled (External)	Loss of material/ general, pitting and crevice corrosion	Chapter XI.M18, “Bolting Integrity”	No
A-03	VII.I.	Closure bolting	Steel	Air with steam or water leakage	Loss of material/ general corrosion	Chapter XI.M18, “Bolting Integrity”	No
A-77	VII.I.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
A-78	VII.I.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
A-79	VII.I.1-a	External surfaces	Steel	Air with borated water leakage	Loss of material/ boric acid corrosion	Chapter XI.M10, “Boric Acid Corrosion”	No
A-81	VII.I.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

J. 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 auxiliary system's 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 auxiliary systems in PWRs and BWRs. (For example, see System Interfaces in VII.A to VII.I for details.)

VII AUXILIARY SYSTEMS J Common Miscellaneous Material Environment Combinations							
Item	**Link**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
AP-7	AP-7	Piping, piping components, and piping elements	Cast austenitic stainless steel	Air – indoor uncontrolled (External)	None	None	No
AP-8	AP-8	Piping, piping components, and piping elements	Copper alloy	Dried Air	None	None	No
AP-9	AP-9	Piping, piping components, and piping elements	Copper alloy	Gas	None	None	No
AP-10	AP-10	Piping, piping components, and piping elements	Copper alloy	Lubricating oil (no water pooling)	None	None	No
AP-11	AP-11	Piping, piping components, and piping elements	Copper alloy <15% Zn	Air with borated water leakage	None	None	No
AP-13	AP-13	Piping, piping components, and piping elements	Galvanized steel	Air – indoor uncontrolled	None	None	No
AP-14	AP-14	Piping, piping components, and piping elements	Glass	Air – indoor uncontrolled (External)	None	None	No

VII J	AUXILIARY SYSTEMS Common Miscellaneous Material Environment Combinations						
Item	**Link**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
AP-15	AP-15	Piping, piping components, and piping elements	Glass	Lubricating oil	None	None	No
AP-16	AP-16	Piping, piping components, and piping elements	Nickel alloy	Air – indoor uncontrolled (External)	None	None	No
AP-17	AP-17	Piping, piping components, and piping elements	Stainless steel	Air – indoor uncontrolled (External)	None	None	No
AP-18	AP-18	Piping, piping components, and piping elements	Stainless steel	Air with borated water leakage	None	None	No
AP-19	AP-19	Piping, piping components, and piping elements	Stainless steel	Concrete	None	None	No
AP-20	AP-20	Piping, piping components, and piping elements	Stainless steel	Dried Air	None	None	No
AP-22	AP-22	Piping, piping components, and piping elements	Stainless steel	Gas	None	None	No

VII AUXILIARY SYSTEMS J Common Miscellaneous Material Environment Combinations							
Item	**Link**	**Structure and/or Component**	**Material**	**Environment**	**Aging Effect/ Mechanism**	**Aging Management Program (AMP)**	**Further Evaluation**
AP-21	AP-21	Piping, piping components, and piping elements	Stainless steel	Lubricating oil (no water pooling)	None	None	No
AP-23	AP-23	Piping, piping components, and piping elements	Stainless steel	Treated borated water	None	None	No
AP-2	AP-2	Piping, piping components, and piping elements	Steel	Air – indoor controlled (External)	None	None	No
AP-3	AP-3	Piping, piping components, and piping elements	Steel	Concrete	None	None	No
AP-4	AP-4	Piping, piping components, and piping elements	Steel	Dried Air	None	None	No
AP-6	AP-6	Piping, piping components, and piping elements	Steel	Gas	None	None	No
AP-5	AP-5	Piping, piping components, and piping elements	Steel	Lubricating oil (no water pooling)	None	None	No

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