LICENSE RENEWAL APPLICATION

CALLAWAY PLANT
UNIT 1

Facility Operating License No.
NPF-30

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CHAPTER 1

ADMINISTRATIVE INFORMATION

1.0 ADMINISTRATIVE INFORMATION

In accordance with the requirements of Part 54 of Title 10 of the Code of Federal Regulations (10 CFR Part 54), this application provides the technical and environmental information required for renewal of the Callaway Plant Unit 1 Facility Operating License No. NPF-30 for a period of 20 years beyond the expiration of the current license, which occurs at midnight on October 18, 2024. The application also applies to renewal of the source, special nuclear, and by-product materials licenses under 10 CFR Parts 30, 40, and 70 that are included in the facility operating license.

The application is based on guidance provided by the U.S. Nuclear Regulatory Commission (NRC) in NUREG-1800, *Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants*, Revision 2, December 2010; Regulatory Guide 1.188, *Standard Format and Content for Applications to Renew Nuclear Power Plant Operating Licenses*, Revision 1, September 2005; and guidance provided by the Nuclear Energy Institute in NEI 95-10, *Industry Guideline for Implementing the Requirements of 10 CFR 54 – The License Renewal Rule*, Revision 6, June 2005.

This application and supporting environmental report are intended to provide sufficient information for the NRC to complete its technical and environmental reviews and enable the NRC to make the findings required by 10 CFR 54.29 in support of the issuance of renewed operating license for Callaway Plant Unit 1.

1.1 GENERAL INFORMATION

The application meets the filing and content requirements of 10 CFR 54.17 and 10 CFR 54.19.

1.1.1 Name of Applicant

The applicant for the renewed operating license for Callaway Plant Unit 1 is Union Electric Company d/b/a Ameren Missouri.

1.1.2 Address of Applicant

Ameren Missouri's principal office and place of business is:
One Ameren Plaza
1901 Chouteau Avenue
St. Louis, MO
63103

1.1.3 Description of Business or Occupation of Applicant

Ameren Missouri is a Missouri corporation engaged in providing electric and natural gas service in portions of Missouri, operating as a public utility under the jurisdiction of the Missouri Public Service Commission. Ameren Missouri was incorporated in 1922, and was the successor to a number of companies, the oldest of which was organized in 1881.

Ameren Missouri is Missouri's largest electric utility, providing electric service to approximately 1.2 million customers across central and eastern Missouri, including the greater St. Louis area. Ameren Missouri serves 57 Missouri counties and 500 towns. More than half of Ameren Missouri's electric customers are located in the St. Louis metropolitan area. Ameren Missouri is also the largest electric provider in Missouri and the third largest natural gas provider in the state, serving approximately 127,000 natural gas customers in more than 90 Missouri communities, including towns in southeast, central, and eastern Missouri. The company owns approximately 3,100 miles of natural gas transmission and distribution mains and has approximately 4,400 employees. Ameren Missouri operates nine power plants, including three hydroelectric plants and one nuclear plant. Ameren Missouri also operates several natural gas (Combustion Turbine Generator) peaking facilities.

Ameren Missouri built and is the current license holder for Callaway Plant Unit 1, a Westinghouse four loop pressurized water reactor (PWR) of the Standardized Nuclear Unit Power Plant System (SNUPPS) design.

1.1.4 Description of Organization and Management of Applicant

Ameren Missouri is not owned, controlled or dominated by an alien, a foreign corporation, or foreign government. Ameren Missouri is a wholly owned subsidiary of Ameren Corporation. Ameren Corporation, a holding company and Parent of Ameren Missouri, was created by the December 1997 merger of CIPSCO Incorporated and Union Electric Company. In 2003, Ameren Corporation grew with the acquisition of CILCORP INC., parent of Central Illinois Light Company. In 2004, Ameren Corporation acquired Illinois Power Company from Dynegy Inc. Ameren employees, totaling approximately 9,500, provide energy services to approximately 2.4 million electric customers and nearly one million natural gas customers across 64,000 square miles in Illinois and Missouri. Ameren is a publicly traded company (AEE), and its securities are traded on the New York Stock Exchange and are widely held.

In addition to Ameren Missouri, Ameren Corporation's principle subsidiaries are:

> Ameren Illinois Company, an Illinois corporation based in Peoria, Illinois, which is a public utility under the jurisdiction of the Illinois Commerce Commission engaged in providing electric and gas service in central and southern Illinois;
>
> Ameren Services Company, a Missouri Corporation, which provides support services to Ameren Corporation and its subsidiaries; and
>
> Ameren Energy Resources Company, LLC, a Delaware LLC, which is the holding company for non-rate-regulated generation, development, marketing and fuels services companies.

Ameren Corporation exercises control and oversight of Ameren Missouri and its subsidiaries through its holding company structure, including appointing the directors and officers of its subsidiaries.

The business and affairs of Ameren Missouri are managed under the direction of a Board of Directors, currently consisting of six directors. The names and addresses of Ameren Missouri's directors and principal officers, all of whom are United States citizens, are as follows:

Ameren Missouri Board of Directors	
Name	**Address**
W. L. Baxter	Union Electric Company 1901 Chouteau Avenue St. Louis, MO 63103
D. F. Cole	Union Electric Company 1901 Chouteau Avenue St. Louis, MO 63103
A. C. Heflin	Union Electric Company 1901 Chouteau Avenue St. Louis, MO 63103
M. J. Lyons, Jr.	Union Electric Company 1901 Chouteau Avenue St. Louis, MO 63103
R. J. Mark	Union Electric Company 1901 Chouteau Avenue St. Louis, MO 63103
S. R. Sullivan	Union Electric Company 1901 Chouteau Avenue St. Louis, MO 63103

Ameren Missouri Principal Officers		
Name	**Title**	**Address**
Warner L. Baxter	Chairman, President and Chief Executive Officer	Union Electric Company P.O. Box 66149 St. Louis, Missouri 63166-6149
Daniel F. Cole	Senior Vice President	Union Electric Company P.O. Box 66149 St. Louis, Missouri 63166-6149
Martin J. Lyons	Senior Vice President and Chief Financial Officer	Union Electric Company P.O. Box 66149 St. Louis, Missouri 63166-6149
Richard J. Mark	Senior Vice President	Union Electric Company P.O. Box 66149 St. Louis, Missouri 63166-6149
Adam C. Heflin	Senior Vice President and Chief Nuclear Officer	Union Electric Company- Callaway Plant P.O. Box 620 Fulton, Missouri 65251
Steven R. Sullivan	Senior Vice President, General Counsel and Secretary	Union Electric Company P.O. Box 66149 St. Louis, Missouri 63166-6149
Jerre E. Birdsong	Vice President and Treasurer	Union Electric Company P.O. Box 66149 St. Louis, Missouri 63166-6149
Mark C. Birk	Vice President	Union Electric Company P.O. Box 66149 St. Louis, Missouri 63166-6149
Karen C. Foss	Vice President	Union Electric Company P.O. Box 66149 St. Louis, Missouri 63166-6149
Fadi Diya	Vice President	Union Electric Company- Callaway Plant P.O. Box 620 Fulton, Missouri 65251
Cleveland O. Reasoner	Vice President	Union Electric Company- Callaway Plant P.O. Box 620 Fulton, Missouri 65251
Lynn M. Barnes	Vice President and Controller	Union Electric Company P.O. Box 66149 St. Louis, Missouri 63166-6149
Gregory L. Nelson	Vice President and Tax Counsel	Union Electric Company P.O. Box 66149 St. Louis, Missouri 63166-6149
David J. Schepers	Vice President	Union Electric Company P.O. Box 66149 St. Louis, Missouri 63166-6149

Ameren Missouri Principal Officers		
Name	**Title**	**Address**
Dennis W. Weisenborn	Vice President	Union Electric Company P.O. Box 66149 St. Louis, Missouri 63166-6149
Warren T. Wood	Vice President	Union Electric Company P.O. Box 66149 St. Louis, Missouri 63166-6149

1.1.5 Class of License, Use of the Facility, and Period of Time for Which the License Is Sought

Ameren Missouri requests renewal of the Class 103 operating license for Callaway Plant Unit 1 (License No. NPF-30) for a period of 20 years beyond the expiration of the current license which is midnight on October 18, 2024.

This application also applies to renewal of those NRC source material, special nuclear material, and by-product material licenses under 10 CFR Parts 30, 40, and 70 that are subsumed or combined with the facility operating license.

1.1.6 Earliest and Latest Dates for Alterations, If Proposed

No physical plant alterations or modifications have been identified as necessary in order to implement the provisions of the application.

1.1.7 Restricted Data

With regard to the requirements of 10 CFR 54.17(f), this application does not contain any “Restricted Data,” as that term is defined in the Atomic Energy Act of 1954, as amended, or other defense information, and it is not expected that any such information will become involved in these licensed activities.

In accordance with the requirements of 10 CFR 54.17(g), Ameren Missouri will not permit any individual to have access to, or any facility to possess Restricted Data or classified national security information until the individual and/or facility has been approved for such access under the provisions of 10 CFR 25 and/or 95.

1.1.8 Regulatory Agencies

The names and addresses of regulatory agencies that have jurisdiction over the rates and services incident to the proposed activity are as follows:

Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

Missouri Public Service Commission
301 West High Street
P.O. Box 360
Jefferson City, Missouri 65102

1.1.9 Local News Publications

Local news publications that circulate in the area around Callaway Plant Unit 1 are as follows:

Advertiser-Courier
136 East 4th Street
Hermann, Missouri 65041

Boone County Journal
209 E. Johnson Avenue
Ashland, Missouri 65010

Centralia Fireside Guard
123 North Allen Street
Centralia, Missouri 65240

Columbia Missourian
221 South 8th Street
Columbia, Missouri 65211

Columbia Tribune
101 North 4th Street
Columbia, Missouri 65201

Fulton Sun
115 East 5th Street
Fulton, Missouri 65251

Jefferson City News-Tribune
210 Monroe Street
Jefferson City, Missouri 65101

Mexico Evening Ledger
300 North Washington Street
Mexico, Missouri 65265

St. Louis Post-Dispatch
900 North Tucker Boulevard
St. Louis, Missouri 63101

1.1.10 Conforming Changes to Standard Indemnity Agreement

10 CFR 54.19(b) requires that License Renewal applications include, "…conforming changes to the standard indemnity agreement, 10 CFR 140.92, Appendix B, to account for the expiration term of the proposed renewed license." The current indemnity agreement B-93 between Ameren Missouri and the NRC ("Indemnity Agreement") in Article VII states "The term of this agreement shall commence … and shall terminate at the time of expiration of that license specified in Item 3 of the Attachment to the agreement, which is the last to expire…." Item 3 of the Attachment to the Indemnity Agreement, as amended, lists license numbers SNM-1901, NPF-25, and NPF-30.

Ameren Missouri requests that conforming changes be made to the Indemnity Agreement, as amended, and/or the Attachment to said agreement, as required, to ensure that the Indemnity Agreement continues to apply during both the terms of the current licenses and the terms of the renewed licenses. Based on the current language contained in the Indemnity Agreement that is cited above, Ameren Missouri believes that no changes are necessary for this purpose if the current license number is retained.

1.2 GENERAL LICENSE INFORMATION

1.2.1 Application Updates, Renewed License, and Renewal Term Operation

In accordance with 10 CFR 54.21(b), during NRC review of this application, an annual update to the application to reflect any change to the current licensing basis that materially affects the content of the license renewal application will be provided.

In accordance with 10 CFR 54.21(d), Ameren Missouri will maintain a summary list in the Callaway Final Safety Analysis Report (FSAR) of activities that are required to manage the effects of aging for the systems, structures or components within the scope of license renewal during the period of extended operation and summaries of the time-limited aging analyses evaluations.

1.2.2 Incorporation by Reference

There are no documents incorporated by reference as part of the application. Any document references, either in text or in Section 1.6 are listed for information only.

1.2.3 Contact Information

Any notices, questions, or correspondence in connection with this filing should be directed to:

Cleveland O. Reasoner
Vice President, Engineering, Callaway Plant
Ameren Missouri - Callaway Plant
P.O. Box 620
Fulton, MO 65251

With copies to:

Ms. Sarah Kovaleski
Supervising Engineer, Plant Life Extension
Ameren Missouri - Callaway Plant
P.O. Box 620
Fulton, MO 65251

1.3 DESCRIPTION OF THE PLANT

The Callaway Plant Unit 1 is located 10 miles southeast of the city of Fulton in Callaway County, Missouri, and 80 miles west of the St. Louis metropolitan area. The nearest population center is Jefferson City, Missouri, located 25 miles west-southwest of the site. The plant site, consisting of approximately 2,767 acres of rural land, is located on a high plateau approximately 300 feet above the Missouri River, which is about five miles to the south.

The nuclear steam supply system for Callaway Plant Unit 1 is a pressurized water reactor which was designed and supplied by the Westinghouse Electric Corporation. The reactor core is designed for an output of 3,565 MWt. When the reactor coolant pump input of 14 MWt is added to the core output, the warranted nuclear steam supply system output is 3,579 MWt. The turbine generator is rated for operation at the NSSS output of 3,579 MWt. The corresponding turbine generator valve wide open capability electrical output is 1,284 MWe.

The containment is a carbon steel-lined, concrete structure. The walls and dome are post-tensioned, prestressed concrete, and the base slab is reinforced concrete.

1.4 APPLICATION STRUCTURE

This license renewal application is structured in accordance with Regulatory Guide 1.188, *Standard Format and Content for Applications to Renew Nuclear Power Plant Operating Licenses*, and NEI 95-10, *Industry Guideline for Implementing the Requirements of 10 CFR Part 54 - The License Renewal Rule*. In addition, Chapter 3, Aging Management Review and Appendix B, Aging Management Programs, are structured to address the guidance provided in NUREG-1800, *Standard Review Plan for the Review of License Renewal Applications for Nuclear Power Plants*. NUREG-1800 references NUREG-1801, *Generic Aging Lessons Learned (GALL) Report*. NUREG-1801 was used to determine the adequacy of existing aging management programs and to identify existing programs that will be augmented for license renewal. The results of the aging management review, using NUREG-1801, have been documented and are illustrated in table format in Chapter 3, *Aging Management Review*, of this application.

The application is divided into the following chapters:

Chapter 1 – Administrative Information

This chapter provides the administrative information required by 10 CFR 54.17 and 10 CFR 54.19. It describes the plant and states the purpose for this application. Included in this chapter are the names, addresses, business descriptions, organization, and management descriptions of the applicant, as well as other administrative information. This chapter also provides an overview of the structure of the application and a listing of acronyms and general references used throughout the application.

Chapter 2 – Scoping and Screening Methodology for Identifying Structures and Components Subject to Aging Management Review and Implementation Results

This chapter describes and justifies the methods used in the integrated plant assessment to identify those structures and components subject to an aging management review in accordance with the requirements of 10 CFR 54.21(a)(2). These methods consist of: (1) scoping, which identifies the systems, structures, and components (SSCs) that are within the scope of 10 CFR 54.4(a), and (2) screening under 10 CFR 54.21(a)(1), which identifies those in-scope SSCs that perform intended functions without moving parts or a change in configuration or properties, and that are not subject to replacement based on a qualified life or specified time period.

Additionally, the scoping results for systems and structures are described in this chapter. Scoping results are presented in Section 2.2, Table 2.2-1, *Callaway Plant Scoping Results*. Screening results are presented in Sections 2.3, 2.4, and 2.5.

The screening results consist of lists of component types that require aging management review. Brief descriptions of mechanical systems and structures within the scope of license renewal are provided as background information. For each in-scope system and structure, component types requiring an aging management review are identified, associated component intended functions are identified, and appropriate reference to the Chapter 3 Table reference providing the aging management review results are provided.

Selected structural and electrical component types, such as component supports and cables, were evaluated as commodities. Under the commodity approach, selected structural and electrical component types were evaluated based upon common environments and materials. For each of these commodities, the component types requiring aging management are presented in Sections 2.4 and 2.5.

Chapter 3 – Aging Management Review

10 CFR 54.21(a)(3) requires a demonstration that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the current licensing basis throughout the period of extended operation. Chapter 3 presents the results of the aging management reviews (AMRs). Chapter 3 is the link between the scoping and screening results provided in Chapter 2 and the aging management programs (AMPs) described in Appendix B.

Aging management review results are presented in tabular form, in a format in accordance with NUREG-1800, *Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants*. For mechanical systems, aging management review results are provided in Sections 3.1, 3.2, 3.3, and 3.4 for the reactor vessel, internals, and reactor coolant system, engineered safety features, auxiliary systems, and steam and power conversion system. Aging management review results for containment, structures, and component supports are provided in Section 3.5. Aging management review results for electrical and instrumentation and controls are provided in Section 3.6.

Chapter 4 – Time-Limited Aging Analyses

Time-limited aging analyses (TLAAs), as defined by 10 CFR 54.3, are listed in this chapter. Chapter 4 includes each of the TLAAs identified in NUREG-1800 and in plant-specific analyses. This chapter includes a summary of the time-dependent aspects of the analyses. A demonstration is provided to show that: (1) each of the analyses remains valid for the period of extended operation, (2) the analyses have been projected to the end of the period of extended operation, or (3) the effects of aging on the intended function(s) will be adequately managed for the period of extended operation (PEO).

Appendix A – Final Safety Analysis Report Supplement

As required by 10 CFR 54.21(d), the Callaway Plant Unit 1 FSAR supplement is found in Appendix A. It contains a summary of activities credited for managing the effects of aging for the period of extended operation. In addition, summary descriptions and dispositions of time-limited aging analysis evaluations and a summary of license renewal commitments are provided.

Appendix B – Aging Management Programs

Appendix B describes the programs and activities that are credited for managing aging effects for components or structures during the period of extended operation based upon the aging management review results provided in Chapter 3 and the time-limited aging analyses results provided in Chapter 4.

Appendix C

Appendix C is not used.

Appendix D – Technical Specification Changes

Appendix D satisfies the requirements of 10 CFR 54.22 to identify whether any Technical Specification changes or additions are necessary to manage the effects of aging during the period of extended operation. Since no Technical Specification changes are requested, this Appendix is not used.

Appendix E – Environmental Information

This Appendix satisfies the requirements of 10 CFR 54.23 to provide a supplement to the Environmental Report that complies with the requirements of subpart A of 10 CFR 51 for Callaway.

1.5 ACRONYMS

Acronym	Meaning
AC	Alternating Current
ACC	Accumulator
ACI	American Concrete Institute
AFW	Auxiliary Feedwater
AHU	Air Handling Unit
AMP	Aging Management Program
AMR	Aging Management Review
AMSAC	ATWS Mitigation System Actuation Circuit
ANS	American Nuclear Society
ANSI	American National Standards Institute
ART	Adjusted Reference Temperature
ASCR	Aluminum Conductor Steel Reinforced
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
ATWS	Anticipated Transients Without Scram
AVB	Anti-Vibration Bar
BMI	Bottom Mounted Instrumentation
BOP	Balance of Plant
BTP	Branch Technical Position
BTRS	Boron Thermal Regeneration System
BWR	Boiling Water Reactor
CASS	Cast Austenitic Stainless Steel
CBF	Cycle-Based Fatigue
CC	Cycle Counting
CCW	Component Cooling Water
CCCW	Closed-Cycle Cooling Water
CEL	Callaway Equipment List

Acronym	Meaning
CETNA	Core Exit Thermocouple Nozzle Assembly
CFR	Code of Federal Regulations
CIS	Close Interval Survey
CISI	Containment Inservice Inspection
CLB	Current Licensing Basis
CMAA	Crane Manufacturers Association of America
CMU	Concrete Masonry Unit
COMS	Cold Overpressure Mitigation System
CRDM	Control Rod Drive Mechanism
CST	Condensate Storage Tank
CSW	Canopy Seal Weld
CUF	Cumulative Usage Factor
CVCS	Chemical and Volume Control System
DBE	Design Basis Event
DC	Direct Current
DCA	Diesel Coolant Additive
EAF	Environmentally-Assisted fatigue
ECCS	Emergency Core Cooling System
EFPY	Effective Full Power Year
EOC	End-of-Cycle
EOF	Emergency Operations Facility
EOL	End of Life
EOLE	End of Life-Extended
EPRI	Electric Power Research Institute
EQ	Environmental Qualification
EQDP	Equipment Qualification Data Package
EQMS	Equipment Qualification Management System
ESF	Engineered Safety Features
ESW(S)	Essential Service Water (System)
ETA	Ethanol-Amine

Acronym	Meaning
EVT	Enhanced Visual Examination
FAC	Flow-Accelerated Corrosion
FSAR – SA	Final Safety Analysis Report – Site Addendum
FSAR – SP	Final Safety Analysis Report – Standard Plant
FWIV	Feedwater Isolation Valve
FWST	Fire Water Storage Tank
GALL	Generic Aging Lessons Learned
GDC	General Design Criteria
GSI	Generic Safety Issue
HAZ	Heat Affected Zone
HDPE	High-Density Polyethylene
HELB	High-Energy Line Break
HVAC	Heating, Ventilation, and Air Conditioning
I&C	Instrumentation and Control
IASCC	Irradiation-Assisted Stress Corrosion Cracking
ICI	In-core instrumentation
IEEE	Institute of Electrical and Electronics Engineers
ILRT	Integrated Leak Rate Test
INPO	Institute for Nuclear Power Operations
IPA	Integrated Plant Assessment
ISI	Inservice Inspection
LBB	Leak-Before-Break
LCO	Limiting Condition For Operation
LOCA	Loss Of Coolant Accident
LRA	License Renewal Application
LR-ISG	License Renewal - Interim Staff Guidance
LTOP	Low-Temperature Overpressure Protection
LTW	Long Term Weighting
MCC	Motor Control Center
MIC	Microbiologically Influenced Corrosion

Acronym	Meaning
MEB	Metal Enclosed Bus
MPA	Methoxy-Propyl-Amine
MRV	Minimum Required Value
MOP	Modified Operating Procedure
MSIV	Main Steam Isolation Valve
MSLB	Main Steam Line Break
MWe	Megawatt Electric
MWt	Megawatt Thermal
NACE	National Association of Corrosion Engineers
NDE	Nondestructive Examination
NDT	Nil-Ductility Temperature
NEI	Nuclear Energy Institute
NESC	National Electric Safety Code
NFPA	National Fire Protection Association
NPS	Nominal Pipe Size
NRC	Nuclear Regulatory Commission
NSSS	Nuclear Steam Supply System
OBE	Operating Basis Earthquake
OCCW	Open-cycle Cooling Water
OD	Outside Diameter
ODSCC	Outside Diameter Stress Corrosion Cracking
OE	Operating Experience
OQAM	Operating Quality Assurance Manual
OTI	One-Time Inspection
P&ID	Piping and Instrumentation Diagram
PAOT	Post Accident Operating Time
PEO	Period of Extended Operation
PI	Project Instruction
PLL	Predicted Lower Limit
PORV	Power Operated Relief Valve

Acronym	**Meaning**
PSV	Pressurizer Safety Valve
PrSS	Primary Sampling System
P-T	Pressure-Temperature
PTLR	Pressure Temperature Limits Report
PTS	Pressurized Thermal Shock
PVC	Polyvinyl Chloride
PWR	Pressurized Water Reactor
PWSCC	Primary Water Stress Corrosion Cracking
PZR	Pressurizer
QA	Quality Assurance
RCCA	Rod Cluster Control Assembly
RCL	Reactor Coolant Loop
RCP	Reactor Coolant Pump
RCPB	Reactor Coolant Pressure Boundary
RCS	Reactor Coolant System
RG	Regulatory Guide
RHR	Residual Heat Removal
RIS	Regulatory Issue Summary
RPS	Reactor Protection System
RPV	Reactor Pressure Vessel
RSG	Replacement Steam Generator
RT	Radiography Testing
RT	Reference Temperature
RWSS	Radwaste Sampling System
RWST	Refueling Water Storage Tank
RV	Reactor Vessel
RVI	Reactor Vessel and Internals
SAC	Stranded Aluminum Conductor
SAMA	Severe Accident Mitigation Alternatives
SBF	Stress-Based Fatigue

Acronym	Meaning
SBO	Station Blackout
SCC	Stress Corrosion Cracking
SCCM	Standard Cubic Centimeters per Minute
SE	Safety Evaluation
SER	Safety Evaluation Report
SG	Steam Generator
SI	Safety Injection
SMP	Structures Monitoring Program
SNUPPS	Standardized Nuclear Unit Power Plant System
SRP	Standard Review Plan
SSCs	Systems, Structures, and Components
SSE	Safe Shutdown Earthquake
STW	Short Term Weighting
SWOL	Structural Weld Overlays
TGSCC	Transgranular Stress Corrosion Cracking
TSC	Technical Support Center
TLAA	Time-Limited Aging Analyses
TS	Technical Specifications
TSP	Trisodium Phosphate
TW	Through-wall
UHS	Ultimate Heat Sink
USE	Upper Shelf Energy
UT	Ultrasonic Testing
VAC	Volts Alternating Current
VDC	Volts Direct Current
VT	Visual Examination
WCAP	Westinghouse Commercial Atomic Power

1.6 GENERAL REFERENCES

1. 10 CFR 54, *Requirements for Renewal of Operating Licenses for Nuclear Power Plants*.

2. NEI 95-10, *Industry Guideline for Implementing the Requirements of 10 CFR Part 54 - The License Renewal Rule*, Revision 6.

3. Regulatory Guide 1.188, *Standard Format and Content for Applications to Renew Nuclear Power Plant Operating Licenses*, Revision 1, September 2005.

4. NUREG-1800, *Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants*, United States Nuclear Regulatory Commission, Revision 2 – December 2010.

5. NUREG-1801, *Generic Aging Lessons Learned (GALL) Report*, United States Nuclear Regulatory Commission, Revision 2 – December 2010.

6. 10 CFR 50.48, *Fire Protection*.

7. 10 CFR 50.49, *Environmental Qualification of Electric Equipment Important to Safety for Nuclear Power Plants*.

8. 10 CFR 50.62, *Requirements for Reduction of Risk from Anticipated Transients Without Scram (ATWS) Events for Light-Water-Cooled Nuclear Power Plants*.

9. 10 CFR 50.61, *Fracture Toughness Requirements For Protection Against Pressurized Thermal Shock Events.*

10. 10 CFR 50.63, *Loss of All Alternating Current Power*.

11. 10 CFR 50.65, *Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants*.

12. 10 CFR 50, Appendix B, *Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants*.

13. 10 CFR 51, *Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions*.

CHAPTER 2

SCOPING AND SCREENING METHODOLOGY FOR IDENTIFYING STRUCTURES AND COMPONENTS SUBJECT TO AGING MANAGEMENT REVIEW AND IMPLEMENTATION RESULTS

2.0 SCOPING AND SCREENING METHODOLOGY FOR IDENTIFYING STRUCTURES AND COMPONENTS SUBJECT TO AGING MANAGEMENT REVIEW AND IMPLEMENTATION RESULTS

Chapter 2 provides the following information that is required by 10 CFR Part 54, *Requirements for Renewal of Operating Licenses for Nuclear Power Plants*, Regulatory Guide 1.188, *Standard Format and Content for Applications to Renew Nuclear Power Plant Operating Licenses* and NUREG-1800, *Standard Review Plan (SRP) for Review of License Renewal Applications for Nuclear Power Plants*:

- Scoping and Screening Methodology (Section 2.1)
- Plant-Level Scoping Results (Section 2.2)
- Scoping and Screening Results: Mechanical Systems (Section 2.3)
- Scoping and Screening Results: Structures (Section 2.4)
- Scoping and Screening Results: Electrical and Instrumentation and Controls Systems (Section 2.5)

2.1 SCOPING AND SCREENING METHODOLOGY

The scope of plant systems, structures and components (SSCs) subject to license renewal is defined in 10 CFR 54.4(a). For SSCs within the scope of license renewal, 10 CFR 54.21(a)(1) requires the license renewal applicant to perform an integrated plant assessment (IPA) to identify and list the structures and components subject to an aging management review (AMR). 10 CFR 54.21(a)(2) further requires that the methods used to implement the requirements of 10 CFR 54.21(a)(1) be described and justified.

This section of the application provides a description of the methodology and bases used to identify and list structures and components that are within the scope of license renewal and subject to an AMR.

2.1.1 Introduction

The first step in the Integrated Plant Assessment (IPA) process identified the plant SSCs within the scope of 10 CFR 54. This step is called scoping. For those SSCs identified to be within the scope of the license renewal rule, the second step of the IPA process then identified and listed the structures and components that are subject to an AMR. This step of the process is called screening.

The scoping and screening steps have been performed in compliance with the requirements of 10 CFR 54, and are consistent with the expectations set forth in the Statements of Consideration supporting the license renewal rule, and the guidance provided in NEI 95-10, *Industry Guideline for Implementing the Requirements of*

10 CFR Part 54 - The License Renewal Rule. Section 2.1.1.1 provides a discussion of the documentation used to perform scoping and screening.

Section 2.1.2 discusses the application of the 10 CFR 54.4(a) scoping criteria. Section 2.1.3 describes the scoping methodology. Section 2.1.4 describes the screening methodology. The NRC staff's license renewal interim staff guidance (LR-ISG) documents were considered as described in Section 2.1.5. Section 2.1.6 describes the evaluation of NRC Generic Safety Issues (GSI), and Section 2.1.7 provides conclusions.

An overview of the Scoping and Screening Process is presented in Figure 2.1-1, *Scoping and Screening Process Flow*.

2.1.1.1 Documentation Sources Used for Scoping and Screening

Various documentation sources were used during the scoping and screening process. These documentation sources are listed below and described in the following sections.

- Current licensing basis (CLB) documents
- Engineering drawings
- Topical Reports
- Callaway equipment database
- Q-List
- Site walkdown

2.1.1.1.1 Current Licensing Basis Documents

The CLB is defined in 10 CFR 54.3. A variety of CLB documents were used to confirm or to determine SSC functions and evaluate them against the criteria of 10 CFR 54.4(a). These document types include:

- Final Safety Analysis Report – Standard Plant (FSAR-SP) and FSAR Site Addendum (FSAR–SA)
- Safety Evaluation Reports (SERs)
- Callaway Technical Specifications
- Licensing correspondence reflecting Ameren Missouri commitments related to various SSCs and programs

2.1.1.1.2 Engineering Drawings

Engineering drawings that provide layout and configuration details were reviewed for systems and structures. This included electrical, mechanical, and structural drawings. Use of engineering drawings is discussed in Sections 2.1.3.1, 2.1.3.2, and 2.1.3.3.

2.1.1.1.3 Topical Reports

The CLB was reviewed and topical reports were prepared to use as guidance as part of the preparation for the license renewal application to support scoping evaluations.

The following license renewal topical reports relating to scoping and screening methodology were prepared:

- Anticipated Transients Without Scram
- Station Blackout
- Fire Protection
- Environmental Qualification
- Pressurized Thermal Shock
- Criterion (a)(2)
- Aging Effects
- Electrical/I&C Plant Spaces Approach
- Plant Systems and Aging Management Programs
- Thermal Insulation
- Design Basis Events
- Specifications and Standards

2.1.1.1.4 Callaway Equipment Database

The plant maintains a Callaway Equipment List (CEL) within eB Director. This database maintains design, configuration, and reference information for configuration-controlled plant components and equipment, which are used in or support design, maintenance, surveillance, workman's protection assurance, or work instruction activities. The plant equipment database was used to identify plant systems, structures, and components. The plant equipment database provides the design and quality classification for each component.

2.1.1.1.5 Q-List

Callaway maintains the quality classification of structures, systems and components as part of the CEL. The CEL quality classification was used to identify the design and quality class of SSCs.

2.1.1.1.6 Site Walkdown

Walkdowns were performed to confirm the configuration and material properties of plant systems, structures, and components where that information was not available from plant documentation. These walkdowns were also used as an aide in identifying areas in the plant where potential interactions exist between nonsafety-related SSCs and safety-related structural, mechanical, and electrical SSCs.

2.1.2 Scoping Criteria

SSCs that satisfy the criteria in 10 CFR 54.4(a)(1), (a)(2) or (a)(3) are within the scope of license renewal. Specifically, 10 CFR 54.4 states:

(a) Plant systems, structures, and components within the scope of this part are-

(1) Safety-related systems, structures, and components which are those relied upon to remain functional during and following design-basis events (as defined in 10 CFR 50.49(b)(1)) to ensure the following functions-

(i) The integrity of the reactor coolant pressure boundary;

(ii) The capability to shut down the reactor and maintain it in a safe shutdown condition; or

(iii) The capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures comparable to those referred to in §50.34(a)(1), §50.67(b)(2), or §100.11 of this chapter, as applicable.

(2) All nonsafety-related systems, structures, and components whose failure could prevent satisfactory accomplishment of any of the functions identified in paragraphs (a)(1) (i), (ii), or (iii) of this section.

(3) All systems, structures, and components relied on in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for fire protection (10 CFR 50.48), environmental qualification (10 CFR 50.49), pressurized thermal shock (10 CFR 50.61), anticipated transients without scram (10 CFR 50.62), and station blackout (10 CFR 50.63).

(b) The intended functions that these systems, structures, and components must be shown to fulfill in §54.21 are those functions that are the bases for including them within the scope of license renewal as specified in paragraphs (a)(1) – (3).

The application of each of these criteria to plant SSCs is discussed in Section 2.1.2.1, Section 2.1.2.2, and Section 2.1.2.3, respectively.

2.1.2.1 10 CFR 54.4(a)(1) – Safety-related

10 CFR 54.4(a)(1) requires that plant SSCs within the scope of license renewal include safety-related SSCs which are those relied upon to remain functional during and following design-basis events (as defined in 10 CFR 50.49(b)(1)) to ensure the following functions:

(i) The integrity of the reactor coolant pressure boundary;

(ii) The capability to shutdown the reactor and maintain it in a safe shutdown condition; or,

(iii) The capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposure comparable to those referred to in 50.34(a)(1), 50.67(b)(2), or 100.11 of this chapter, as applicable.

Safety-related Classifications

Callaway plant-specific definitions of safety-related are provided in the FSAR Section 1.1.7 SP and the Maintenance Rule Program. These definitions are consistent with the definition of safety-related provided in 10 CFR 54.4(a)(1).

Design Basis Events

The FSAR and procedures governing safety-related and important to safety design classifications refer to design basis events (DBEs) while 10 CFR 54.4(a)(1) is more specific referring to design basis events as defined in 10 CFR 50.49(b)(1). DBEs are defined in 10 CFR 50.49(b)(1) as conditions of normal operation, including anticipated operational occurrences, design basis accidents, external events, and natural phenomena for which the plant must be designed to ensure the functions based on 10 CFR 54.4(a)(1). As part of the scoping methodology, a topical report was prepared to confirm that all applicable design basis events were considered. The FSAR identifies the design basis events for Callaway.

Chapters 1 through 12 of the Callaway Final Safety Analysis Report – Standard Plant (FSAR-SP) and FSAR Site Addendum (FSAR–SA) were reviewed to identify DBEs as defined in 10 CFR 50.49(b)(1). The purpose of this review was to determine whether additional SSCs would be brought into scope of license renewal, beyond that necessary to respond to the FSAR Chapter 15 DBEs. The Chapter 15 DBEs were reviewed separately to identify SSCs and their associated functions as described in 10 CFR 54.4(a)(1).

The Callaway FSAR review identified the set of DBEs and confirmed that the license renewal process had evaluated the associated SSCs consistent with the criteria of the Rule.

Exposure Guidelines

In addition to the guidelines of 10 CFR 100, 10 CFR 54.4(a)(1)(iii) references the dose guidelines of 10 CFR 50.34(a)(1) and 10 CFR 50.67(b)(2). These different exposure guidelines appear in three different Code sections to address similar accident analyses performed by licensees for different reasons. The exposure guidelines of 10 CFR 50.34(a)(1) are applicable to applicants for a construction permit, a design certification or combined license pursuant to 10 CFR 52 and do not apply to Callaway

Plant Unit 1 license renewal. The exposure guidelines of 10 CFR 50.67(b) address the use of alternate source terms and are not applicable under the Callaway Plant Unit 1CLB.

Therefore, use of the Callaway safety-related design classification designators is consistent with 10 CFR 54.4(a)(1) scoping criteria.

2.1.2.2 10 CFR 54.4(a)(2) – Nonsafety-Related Affecting Safety-Related

10 CFR 54.4(a)(2) requires that plant SSCs within the scope of license renewal include all nonsafety-related SSCs whose failure could prevent satisfactory accomplishment of any of the safety-related functions identified for safety-related SSCs. The guidance provided in NEI 95-10, Appendix F was used to develop the methodology for scoping to the criterion of 10 CFR 54.4(a)(2).

The methodology includes identification of nonsafety-related SSCs that are connected to safety-related SSCs and nonsafety-related SSCs that could spatially interact with safety-related SSCs. Determination and identification of any other SSCs satisfying criterion 10 CFR 54.4(a)(2) was completed as described below based on review of applicable CLB documents, plant specific and industry operating experience, and by system and structure functional evaluations.

Nonsafety-Related SSCs Performing Safety-Related 10 CFR 54.4(a)(1) Functions

The FSAR and other current licensing basis documents were reviewed for nonsafety-related plant systems or structures, to determine whether nonsafety-related systems or structures were credited with performing a safety-related function. Callaway does not have nonsafety-related systems or structures credited in CLB documents that perform a safety-related function.

Nonsafety-Related SSCs Directly Connected to Safety-Related SSCs

Nonsafety-related SSCs that are directly connected to safety-related SSCs were included within the scope of license renewal to ensure structural integrity of the safety-related SSC up to the first seismic anchor or equivalent anchor past the safety/nonsafety interface.

Seismic anchors and equivalent anchors were identified following the guidance of NEI 95-10, Appendix F as discussed below:

- A seismic anchor that ensures that forces and moments are restrained in three orthogonal directions.
- An equivalent anchor that is defined in the CLB. (Equivalent anchors are not defined in the Callaway CLB; therefore, this criterion was not used.)

- An equivalent anchor that consists of a large piece of plant equipment or a series of supports that are part of a plant-specific piping design analysis. The large piece of equipment that serves as the anchor is in the scope of license renewal or the nonsafety-related piping up to the last orthogonal support is in the scope of license renewal.

- An equivalent anchor that is composed of a combination of restraints or supports attached to the nonsafety-related piping that encompasses at least two supports in each of the three orthogonal directions. The nonsafety-related piping up to the last orthogonal support is in the scope of license renewal.

In cases where seismic or equivalent anchors were not available to serve as the license renewal boundary, the following methods as provided for in NEI 95-10, Appendix F, were utilized to establish the license renewal boundary:

- A base-mounted component (e.g., pump, heat exchanger, tank, etc.) that is a rugged component and is designed not to impose loads on connecting piping was included in scope as it has a support function for the safety-related piping. The base-mounted equipment that serves as the equivalent anchor is in the scope of license renewal.

- A flexible connection that was considered a pipe stress analysis model end point, when the flexible connection effectively decouples the piping system (i.e., does not support loads or transfer loads across it to connected piping).

- A free end of nonsafety-related piping, such as a drain pipe that ends at an open floor drain.

- Nonsafety-related piping runs that are connected at both ends to safety-related piping. The entire run of nonsafety-related piping between the safety-related piping is in the scope of license renewal if no seismic anchors or equivalent anchors are available.

- A point where buried piping exits the ground. The buried portion of the piping is included in the scope of license renewal.

- A smaller branch line where the moment of inertia ratio of the larger piping to the smaller piping is such that the smaller branch line does not impose loads on the larger piping and does not support the larger piping.

Nonsafety-Related SSCs Not Directly Connected to Safety-Related SSCs

In accordance with NEI 95-10, Appendix F, Callaway applied the preventive option for 10 CFR 54.4(a)(2) scoping. The preventive option is based on scoping nonsafety-related SSCs not directly connected to safety-related SSCs within the scope of license renewal, which could lead to an interaction with safety-related SSCs. Mechanical nonsafety-related interactions with safety-related SSCs include high, moderate, and low energy fluid/steam spatial interaction and potential flooding of safety-related SSCs. Jet impingement, pipe whip, flood barriers, curbing, and pipe supports to prevent falling pipe are structural SSCs and are managed in the structural area.

Nonsafety-related SSCs that contain fluid or steam, and are located in the same room or area that contain safety-related SSCs are included in scope for leakage boundary (spatial) interaction under criterion 10 CFR 54.4(a)(2). The rooms and areas of concern for potential leakage boundary (spatial) interaction were identified based on a review of the CLB and design drawings and considered for potential communication with other rooms that may contain 10 CFR 54.4(a)(1) components. Plant walk downs were performed as necessary to confirm the spatial interaction boundaries.

The potential effects of flooding as a consequence of a pipe break or critical crack were reviewed to ensure that the intended function of safety-related equipment would not be impaired. Floor drains required for water removal from safety-related rooms and areas are within the scope of license renewal based on 10 CFR 54.4(a)(2).

Piping that contains air and gas (non-liquid) is not a hazard to other plant equipment, and has been determined not to have spatial interactions with safety-related SSCs. SSCs containing air or gas cannot adversely affect safety-related SSCs due to leakage or spray, since gas systems contain no fluids that could spray or leak onto safety-related systems causing shorts or other malfunctions and is not in-scope for spatial interaction. Callaway and industry operating experience has not identified failures due to aging that have adversely affected the accomplishment of a safety function. Gas systems do not contain sufficient energy to cause pipe whip or jet impingement. The nonsafety-related piping containing air or gas that are attached to safety-related SSCs are in scope for structural integrity (attached) consistent with NEI 95-10, Appendix F guidance.

2.1.2.3 10 CFR 54.4(a)(3) – Regulated Events

10 CFR 54.4(a)(3) requires that plant SSCs within the scope of license renewal include all SSCs relied on in safety analyses or plant evaluations to perform a function that demonstrates compliance with the regulations for fire protection (10 CFR 50.48), environmental qualification (10 CFR 50.49), pressurized thermal shock (10 CFR 50.61), anticipated transients without scram (10 CFR 50.62), and station blackout (10 CFR 50.63).

Topical reports were prepared to provide input to the scoping process. The purpose of these reports was to evaluate the CLB relative to the regulated events, identify the systems and structures that are relied upon to demonstrate compliance with each of these regulations, and document the results of this review. Guidance provided by the topical reports was used during system and structure scoping to identify system and structure intended functions for Criterion (a)(3), and again during component screening as necessary to determine which components are credited in the regulated events.

SSCs credited in the regulated events have been classified as satisfying criterion 10 CFR 54.4(a)(3) and have been identified as within the scope of license renewal.

2.1.2.3.1 Fire Protection

Criterion 10 CFR 54.4(a)(3) requires that plant SSCs within the scope of license renewal include all SSCs relied on in safety analyses or plant evaluations to perform a function that demonstrates compliance with the regulations for fire protection (10 CFR 50.48). 10 CFR 50.48 requires each operating nuclear power plant to have a fire protection plan that satisfies the requirement of Criterion 3 of 10 CFR 50 Appendix A.

The CLB for fire protection for Callaway consists of General Design Criterion 3 to 10 CFR 50 Appendix A, Appendix A of BTP APCSB 9.5-1, 10 CFR 50, Appendix R, FSAR Section 9.5.1 SP and Operating License Condition 2.C(5). These documents identify features required for Callaway to demonstrate compliance with 10 CFR 50.48.

10 CFR 50.48(a) requires that operating nuclear power plants have a fire protection plan that satisfies Criterion 3 of 10 CFR 50 Appendix A. 10 CFR 50.48(a) does not provide specific criteria for the content of the required fire protection plan, however, the required contents of the fire protection plan are derived from 10 CFR 50.48(b).

10 CFR 50.48(b) states that Appendix R establishes fire protection features required to satisfy Criterion 3 of Appendix A. 10 CFR 50.48(b), however, allows the use of provisions of Appendix A to BTP APCSB 9.5-1 as an alternative to the requirements of Appendix R provided those provisions have been accepted by the NRC. In addition to the provisions of Appendix A to BTP APCSB 9.5-1, 10 CFR 50.48(b) imposes the provisions of Appendix R Sections III.G, J and O on plants licensed to operate prior to January 1, 1979.

SSCs classified as satisfying criterion 10 CFR 54.4(a)(3) related to fire protection are identified as within the scope of license renewal.

2.1.2.3.2 Environmental Qualification

Criterion 10 CFR 54.4(a)(3) requires that all SSCs relied on in safety analyses or regulations for Environmental Qualification (EQ) (10 CFR 50.49) are included within the scope of license renewal.

The FSAR Section 3.11(B) SP states that a review of equipment environmental qualification programs against NUREG-0588 positions was performed. The scope of the review included plant areas exposed to harsh environments following a loss of coolant accident, a main steam line break, or a high energy line break.

Components within the scope of the Callaway EQ program which demonstrate compliance with 10 CFR 50.49 and the systems containing those components are classified as satisfying criterion 10 CFR 54.4(a)(3) and are identified within the scope of license renewal.

EQ is a time-limited aging analysis (TLAA) as defined by 10 CFR 54.3(a) and is addressed in Section 4.4, *Environmental Qualification (EQ) of Electric Equipment*.

2.1.2.3.3 Pressurized Thermal Shock

Criterion 10 CFR 54.4(a)(3) requires that plant SSCs within the scope of license renewal include all SSCs relied on in safety analyses or plant evaluations to perform a function that demonstrates compliance with the regulations for Pressurized Thermal Shock (10 CFR 50.61).

A topical report was developed to review the licensing basis for pressurized thermal shock at Callaway. The only component within the scope of the license renewal rule for pressurized thermal shock is the reactor pressure vessel.

The calculation of nil-ductility transition reference temperature RT_{PTS} is a time-limited aging analysis (TLAA) as defined by 10 CFR 54.3(a) and is addressed in Section 4.2, *Reactor Vessel Neutron Embrittlement Analysis*.

2.1.2.3.4 Anticipated Transients Without Scram

Criterion 10 CFR 54.4(a)(3) requires that plant SSCs within the scope of license renewal include all SSCs relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the regulations for anticipated transients without scram (10 CFR 50.62). An ATWS is a postulated operational transient that generates an automatic scram signal accompanied by a failure of the reactor protection system to shutdown the reactor. The ATWS Rule required improvements in the design to reduce the probability of failure to shutdown the reactor following anticipated transients, and to mitigate the consequences of an ATWS event.

ATWS equipment required for compliance with the ATWS Rule is described in FSAR Section 7.7.1.11 SP, *ATWS Mitigation System Actuation Circuitry*. FSAR Section 15.8 SP, *Anticipated Transients Without Scram* describes compliance with the ATWS Rule.

SSCs classified as satisfying criterion 10 CFR 54.4(a)(3) related to ATWS are identified as within the scope of license renewal.

2.1.2.3.5 Station Blackout

Criterion 10 CFR 54.4(a)(3) requires that plant SSCs within the scope of license renewal include all SSCs relied on in safety analyses or plant evaluations to perform a function that demonstrates compliance with the regulations for station blackout (SBO) (10 CFR 50.63).

FSAR Appendix 8.3A SP, *Station Blackout,* discusses SBO coping duration, condensate inventory for decay heat removal, Class 1E battery capacity, compressed air requirements, effects of loss of ventilation, containment isolation, reactor coolant inventory, and quality assurance program requirements.

Callaway Plant SBO evaluation has determined Callaway is in AC Power Design Characteristic Group P1, Severe Weather Group 2, and Emergency AC Power Configuration (EAC) Group C. The required coping duration is four hours. Based on EAC Group C, Callaway has selected an emergency diesel generator target reliability of 0.95.

Two ESF transformers supply primary and backup offsite power to the Callaway plant. ESF transformer XNB02 is the primary recovery path. XNB02 is connected to the switchyard through circuit breaker PA0201 to 13.8KV startup transformer XMR01. Startup transformer XMR01 is connected via disconnects D41A, D41B, and D43A to switchyard breakers V41 or V43. ESF transformer XNB01 is the alternate recovery path and is connected to switchyard breakers 52-1 and 52-3.

The ESF transformers, startup transformer, overhead transmission lines, disconnects, overhead lines from the disconnects to and including the switchyard breakers and the switchyard breaker control cables and connections are within the scope of license renewal.

The station blackout recovery path is shown in Figure 2.1-2, *Station Blackout Recovery Path.*

A topical report was created to summarize the results of a detailed review of the SBO documentation for Callaway. The Callaway topical report identifies systems credited with coping with and recovering from a station blackout. The systems identified in the SBO position paper were used in scoping evaluations to identify systems that demonstrate compliance with 10 CFR 50.63.

All SSCs classified as satisfying criterion 10 CFR 54.4(a)(3) related to station blackout are identified as within the scope of license renewal.

2.1.3 Scoping Methodology

Scoping of SSCs was performed to the criteria of 10 CFR 54.4(a) to identify those SSCs within the scope of the license renewal rule. The following sections describe the methodology used for scoping. Separate discussions of mechanical system scoping methodology, structures scoping methodology, and electrical and instrumentation and control system scoping methodology are provided.

2.1.3.1 Mechanical System Scoping Methodology

A list of mechanical systems was developed and is documented in a topical report. These mechanical systems were evaluated to each of the criteria of 10 CFR 54.4(a). The list of mechanical systems and the results of the scoping process are provided in Section 2.2, *Plant-Level Scoping Results*.

For every mechanical system listed in Table 2.2-1, *Callaway Plant Scoping Results*, the following scoping process was applied.

- Identification of the system purpose and functions
- Comparison of system intended functions against criteria of 10 CFR 54.4(a)(1-3)
- Determination of the license renewal boundary
- Creation of license renewal boundary drawings
- Component level scoping
- Documentation of scoping results and references

Identification of the System Purpose and Functions

A description was prepared for each mechanical system that included the purpose and summarized the functions that the system was designed to perform. This summary description was prepared using information obtained from the FSAR system descriptions, CLB documents, design basis documents (including piping schematics), and system operating descriptions. The system scoping summaries included in Section 2.3, *Scoping and Screening Results: Mechanical Systems* provide the system description, system intended functions, and reference to the license renewal boundary drawings for each mechanical system within the scope of license renewal.

Comparison of System Functions Against 10 CFR 54.4(a)(1-3)

System functions were compared against the criteria of 10 CFR 54.4(a)(1), (a)(2), and (a)(3). The system functions were identified from the information sources previously described. Each of the system functions satisfying the scoping criteria in 10 CFR 54.4(a) was identified as a system intended function. Functions performed by safety-related portions of the evaluated system were identified as satisfying criterion (a)(1). Functions performed by nonsafety-related systems or parts of such systems that are required to ensure success of a safety-related function were identified as satisfying criterion (a)(2). Systems and structures that were credited in one of the regulated events were identified as satisfying criterion (a)(3).

Any system that performed one or more intended functions (i.e., satisfying criterion (a)(1), (a)(2), or (a)(3)) was classified as a system within the scope of the license renewal rule. Those systems for which no functions were identified as satisfying any of the three scoping criteria were classified as systems outside the scope of the Rule. For systems classified as outside the scope of the Rule, no further evaluation was performed, and the system description documented earlier was augmented to state that the system was determined to not be within the scope of the Rule. When a system was determined to be outside the scope of the Rule, all of the components for that system were identified as outside the scope of the Rule and were excluded from further scoping or screening evaluations.

Determination of the License Renewal Boundary

After the system functions were identified, the system boundary was determined and marked–up on P&IDs. The components needed for the system to perform its intended functions were included within the license renewal boundary. The system scoping summaries included in Section 2.3, *Scoping And Screening Results: Mechanical Systems* provide a description of the license renewal boundary for each mechanical system in the scope of the Rule.

The process to determine the system license renewal boundary required examination of interfaces with other systems. System interfaces were evaluated to ensure that all components were included in the boundary of one of the interfacing systems.

Creation of License Renewal Boundary Drawings

License renewal boundary drawings were created for mechanical systems determined to be within the scope of license renewal. The license renewal boundary drawings were created in conjunction with the component scoping. License renewal boundary drawings reflect the portion of the system determined to be within the scope of license renewal. The diagrams were created by highlighting the P&IDs associated with the mechanical system being evaluated. License renewal boundary drawings include: 1) the system boundary and interfaces; 2) the in-scope components whose function is required to ensure success of the system intended functions; and 3) the out-of-scope components whose function is not required to ensure success of the system-level intended functions. Nonsafety-related SSCs included within the scope of license renewal solely for 10 CFR 54.4(a)(2) are also shown on the license renewal boundary drawings.

P&IDs were highlighted to show the license renewal boundary. Component level scoping results from the Callaway equipment database were used together with P&IDs to confirm system boundaries/interfaces and components within the license renewal boundary.

Component Level Scoping

System components are uniquely identified by the combination of plant name, unit, system name, system identification, component descriptions, and component types. Unless otherwise noted, components are evaluated with their respective plant system.

A component was determined to be in scope if that component was needed to fulfill a system intended function meeting the safety-related criteria of 10 CFR 54.4(a)(1), the nonsafety-related affecting safety-related criterion of 10 CFR 54.4(a)(2), and/or if the component was needed to support the criteria of 10 CFR 54.4(a)(3) for regulated events. The results of the component scoping are documented.

The license renewal boundary drawing for each in-scope system was reviewed to identify those components within the system required to support the system intended functions. Each system P&ID was reviewed, and any commodity types, such as tubing, indicated on the drawing were reviewed and evaluated.

License renewal documentation includes uniquely-identified components that are not shown on the license renewal boundary drawings. Each of these components was evaluated individually to determine whether the component supports a safety-related system intended function, meets the criterion of 10 CFR 54.4(a)(2), or is credited for a regulated event per the criteria of 10 CFR 54.4(a)(3). Components meeting one of these three criteria were identified as within the scope of the Rule. Components not meeting any of these three criteria were identified as out of scope.

The component scoping methodology described above was performed for every mechanical component found within an in-scope system. Electrical and instrumentation and control components within in-scope mechanical systems were included within the scope of license renewal and evaluated as described in Section 2.1.3.3, *Electrical and Instrumentation and Control System Scoping Methodology*. Instrumentation and control components with mechanical functions such as flow elements, flow indicators, flow orifices, and sight gauges were evaluated in their respective mechanical systems.

Mechanical system components that were identified as in scope for license renewal were then screened against the criteria of 10 CFR 54.21(a)(1) to determine whether they were subject to an AMR. The screening methodology is discussed in Section 2.1.4, *Screening Methodology*.

Document Scoping Results and References

Throughout the scoping process described above, scoping results were documented for each mechanical system. The CLB and design basis documents reviewed in support of the scoping activities were also documented.

2.1.3.2 Structure Scoping Methodology

A list of structures was developed that included buildings, tank foundations, and other miscellaneous structures. These structures are listed in Table 2.2-1, *Callaway Plant Scoping Results*. The FSAR was relied upon to identify the safety classifications of structures and structural components.

The scoping methodology utilized for structures was similar to the mechanical system-level scoping described in Section 2.1.3.1, *Mechanical System Scoping Methodology*. Structure descriptions were prepared, including the structure purpose and functions. Structure evaluation boundaries were determined, including examination of structure interfaces. Structure functions were evaluated against the criteria of 10 CFR 54.4(a)(1), (a)(2) and (a)(3) and the results of this evaluation were documented. Engineers preparing mechanical and electrical license renewal documents were consulted to ensure that structures and structural components required to support in-scope SSCs were included in the structural scope.

Structural License Renewal Site Drawing

Unlike mechanical systems, individual license renewal boundary drawings were not created for structures. However, a license renewal site drawing (LR-CW-STRUC-8600X88100) was created for structures based on the site plan. The license renewal site drawing displays all of the structures in relation to one another.

Structural Component Scoping

For structures determined to be within the scope of license renewal, CLB documents and plant drawings were reviewed to identify structural elements (such as steel structures, foundations, floors, walls, ceilings, penetrations, stairways or curbs). For in-scope structures, structural components that are required to support the intended functions of the structure were identified and included within the scope of license renewal. Some individual structural components fabricated from the same material and exposed to the same environment were evaluated as a generic component, such as "structural steel" to represent all of the carbon steel beams and columns in a given building.

2.1.3.3 Electrical and Instrumentation and Control System Scoping Methodology

A list of electrical and instrumentation and control systems was developed and the systems were scoped against the criteria of 10 CFR 54.4(a). The list of electrical and instrumentation and control systems and the results of the scoping are provided in Table 2.2-1, *Callaway Plant Scoping Results.*

System Level Scoping

At the system level, the scoping methodology utilized for electrical and instrumentation and control systems was similar to the mechanical system-level scoping described in Section 2.1.3.1, *Mechanical System Scoping Methodology*. The FSAR descriptions, plant records, CLB documents and design basis documents applicable to the system were reviewed to determine the system safety classification and to identify all of the system functions. System level functions were evaluated against the criteria of 10 CFR 54.4(a)(1), (a)(2) and (a)(3). The results of the system level scoping along with a list of references supporting the evaluation of each electrical and instrumentation and control system were documented.

Electrical License Renewal Single Line Drawing

Unlike mechanical systems, individual license renewal boundary drawings were not created for each electrical and instrumentation and control system. A license renewal single line drawing (LR-CW-ELEC-E-21001) was created from the plant one-line diagram. The license renewal single line drawing schematically shows the portions of the AC electrical distribution system, including the station blackout recovery path, that are included within the scope of license renewal.

Component Level Scoping

Electrical and instrumentation and control components that perform an intended function as described in 10 CFR 54.4 for in-scope systems were included within the scope of license renewal.

The Callaway equipment database does not list electrical component types such as connections, high-voltage transmission conductor, connections and insulators, and switchyard bus and connections. During scoping the installed electrical components were identified by reviewing documents such as plant drawings and databases. Additionally, industry documents, such as NEI 95-10, provide a list of typical electrical components found in nuclear power plants. These lists were reviewed against engineering information for the plant to determine which electrical component types are installed at Callaway. The electrical component types installed at Callaway but not listed in the Callaway equipment database and cable were evaluated as generic components during component screening.

2.1.4 Screening Methodology

Screening is the process of identifying and listing the structures and components that are subject to an AMR. This section, and the accompanying subsections for mechanical systems, structures, and electrical and instrumentation and control systems, describes the process used to perform screening.

The structures and components categorized as within the scope of license renewal were screened against the criteria of 10 CFR 54.21(a)(1)(i) and (1)(ii) to determine whether they are subject to AMR.

10 CFR 54.21 states that the structures and components subject to an AMR shall encompass those structures and components within the scope of the license renewal rule if they perform an intended function, as described in 10 CFR 54.4, without moving parts or without a change in configuration or properties; and are not subject to replacement based on a qualified life or specified time period. The word “passive” is used in the screening process for all components that perform intended functions without moving parts, or a change in configuration or properties. All components that are not “passive” are known as “active”. The word “long-lived” is used in the screening process

for all components that are not subject to replacement based on qualified life or specific time period.

NEI 95-10, Appendix B, *Typical Structure, Component and Commodity Groupings and Active/Passive Determinations for the Integrated Plant Assessment*, provides industry guidance for screening structures and components. The guidance provided in NEI 95-10, Appendix B, has been incorporated into the Callaway license renewal screening process. The screening methodology applied for each category of system and for structures is described in the following paragraphs.

The list of component intended functions utilized in the screening of mechanical, structural, and electrical component types is found in Table 2.1-1, *Intended Functions Abbreviations and Definitions*. The intended function abbreviation is used in the Table 3.X.2-X tables throughout Chapter 3, *Aging Management Review*.

Table 2.1-1 Intended Functions: Abbreviations and Definitions

Intended Function Abbreviation	Function	Description
AN	Absorb Neutrons	Absorb neutrons
DF	Direct Flow	Provide spray shield, curbs, or mechanical components for directing flow (e.g., safety injection flow to containment sump)
EC	Electrical Continuity	Provide electrical connections to specified sections of an electrical circuit to deliver voltage, current or signals
ES	Expansion/ Separation	Provide for thermal expansion and/or seismic separation
FB	Fire Barrier	Provide rated fire barrier to confine or retard a fire from spreading to or from adjacent areas of the plant
FIL	Filter	Provide filtration
FLB	Flood Barrier	Provide flood protection barrier (internal and external flooding event)
GR	Gaseous Release Path	Provide path for release of filtered and unfiltered gaseous discharge
HLBS	HELB Shielding	Provide shielding against high energy line breaks
HS	Heat Sink	Provide heat sink during SBO or design basis accidents
HT	Heat Transfer	Provide heat transfer

Table 2.1-1 Intended Functions: Abbreviations and Definitions (Continued)

Intended Function Abbreviation	Function	Description
IN	Insulate (electrical)	Insulate and support an electrical conductor
INS	Insulate	Control heat loss
LBS	Leakage Boundary (Spatial)	Nonsafety-related component that maintains mechanical and structural integrity to prevent spatial interactions that could cause failure of safety-related SSCs
MB	Missile Barrier	Provide missile barrier (internally or externally generated)
MCI	Maintain Coating Integrity	Maintain coating integrity to prevent clogging of the Emergency Core Cooling Systems
PB	Pressure Boundary	Provide pressure-retaining boundary so that sufficient flow at adequate pressure is delivered, or provide fission product barrier for containment pressure boundary, or provide containment isolation for fission product retention
PR	Pressure Relief	Provide over-pressure protection
PWR	Pipe Whip Restraint	Provide pipe whip restraint
SH	Shelter, Protection	Provide shelter/protection to safety-related components
SIA	Structural Integrity (attached)	Nonsafety-related component that maintains mechanical and structural integrity to provide structural support to attached safety-related piping and components
SLD	Shielding	Provide shielding against radiation
SP	Spray	Convert fluid into spray
SPB	Structural Pressure Boundary	Provide pressure boundary or essentially leak tight barrier to protect public health and safety in the event of any postulated design basis events

Table 2.1-1 Intended Functions: Abbreviations and Definitions (Continued)

Intended Function Abbreviation	Function	Description
SS	Structural Support	Provide structural and / or functional support to safety-related and/or nonsafety-related components
TH	Throttle	Provide flow restriction

2.1.4.1 Mechanical System Component Screening Methodology

After a mechanical system component was categorized as in scope, the classification as an active or passive component was determined based on evaluation of the component description and type. The active/passive component determinations documented in NEI 95-10, *Appendix B*, provided guidance for this activity. In-scope components that were determined to be passive and long-lived were documented as subject to AMR.

Each component that was identified as subject to an AMR was evaluated to determine its component intended function(s). The component intended function(s) was identified based on an evaluation of the component type and the way(s) in which the component supports the system intended functions. The results of the component screening were documented.

During the screening process, components that were identified as short-lived were eliminated from the AMR process and the basis for the classification as short-lived was documented. Other in-scope passive components were identified as subject to an AMR.

Thermal insulation was treated as a passive, long-lived component during the scoping and screening process. For systems where it has an intended function, insulation was considered within the scope of license renewal and subject to AMR, and is included as a component type in each appropriate in-scope system.

The evaluation process for consumables is consistent with the guidance provided in NUREG-1800, Table 2.1-3. Consumables have been divided into the following four categories for the purpose of license renewal.

- Packing, gaskets, seals, and O-rings
  Based on ANSI B31.1 and the ASME B&PV Code Section III, the subcomponents of pressure retaining components as shown above are not pressure-retaining parts. Therefore, these subcomponents are not relied on to form a pressure-retaining function and are not subject to an AMR.

- Structural sealants:
  AMRs were required for structural sealants in in-scope structures. A summary of the AMR results is presented in Section 3.5, *Aging Management Of Containments, Structures And Component Supports*.

- Oil, grease, and component filters
  These subcomponents are short-lived and are periodically replaced either by a program for periodic replacement or by a monitoring program, based on established performance criteria, when their condition begins to degrade but before there is a loss of intended function. Various plant procedures are used in the replacement of oil, grease, and filters in components that are in scope for license renewal. Therefore, these subcomponents are not subject to an AMR.

- System filters, fire extinguishers, fire hoses, and air packs
  System ventilation filters are replaced in accordance with plant procedures based on vendor manufacturers' requirements and system testing. Fire extinguishers, self-contained breathing air packs and fire hoses are within the scope of license renewal, but are not subject to aging management because they are replaced based on condition. These components are periodically inspected in accordance with Branch Technical Position CMEB 9.5-1 for fire brigade lockers, NFPA 10 for portable fire extinguishers, 29 CFR 1910.134 for self-contained breathing air packs, and NFPA 1962 for fire hoses. These require replacement of equipment based on their condition or performance during testing and inspection. The periodic inspections are implemented by controlled Callaway procedures. These components are subject to replacement based on requirements implemented by controlled procedures, and are therefore not long-lived and not subject to an aging management review.

2.1.4.2 Structural Component Screening Methodology

Structures and structural components typically perform their functions without moving parts and without a change in configuration or properties. When a structure or structural component was determined to be in scope of license renewal by the scoping process described in Section 2.1.3.2, *Structure Scoping Methodology*, the structure screening methodology classified the component as active or passive. Active components do not require aging management. This is consistent with guidance found in NEI 95-10, *Appendix B*. During the structural screening process, the intended function(s) of passive structural components were documented. In the structure screening process, an evaluation was made to determine whether in-scope structural components were subject to replacement based on a qualified life or specified time period. If an in-scope structural component was determined to be subject to replacement based on a qualified life or specified time period, the component was identified as short-lived and was excluded from an AMR. In such a case, the basis for determining that the structural component was short-lived was documented. The list of component intended functions utilized in the screening of structural components is found in Table 2.1-1, *Intended Functions Abbreviations and Definitions*.

2.1.4.3 Electrical and Instrumentation and Control Component Screening Methodology

The in-scope electrical components were categorized as “active” or “passive” based on the determinations documented in NEI 95-10, *Appendix B*. The screening of electrical and instrumentation and control components used the spaces approach which is consistent with the guidance in NEI 95-10. The spaces approach to AMR is based on areas where bounding environmental conditions are identified. The bounding environmental conditions are applied during AMR to evaluate the aging effects on passive electrical component types that are located within the bounding area. Use of the spaces approach for AMR of electrical component types eliminates the need to associate electrical and instrumentation and control components with specific systems that are within the scope of license renewal. The passive long-lived electrical and instrumentation and control components that perform an intended function without moving parts or without change in configuration or properties were grouped into component types such as insulated cable and connections, connectors, terminal blocks, high-voltage insulators, transmission conductor, transmission connections, metal enclosed bus, and switchyard bus and connections. Component-level intended function(s) were determined for each in-scope passive electrical component group and documented. The passive in-scope electrical component types were documented as subject to an AMR. A list of the passive in-scope electrical component types subject to aging management is provided in Table 2.5-1, *Electrical and I&C Component Groups Requiring Aging Management Review*.

2.1.5 Interim Staff Guidance

As lessons are learned during license renewal application reviews, the NRC staff has developed guidance documents to capture new insights or address emerging issues. To document these lessons learned, the staff has developed an interim staff guidance (ISG) process that provides guidance to future license renewal applicants until the emerging issues can be incorporated into the next revision of the license renewal guidance documents. Many of the previous issues have been closed and incorporated into license renewal guidance documents. Table 2.1-2, *NRC Interim Staff Guidance Associated with License Renewal* provides the current status of ISGs topics from the NRC website.

Table 2.1-2 NRC Interim Staff Guidance Associated with License Renewal

Issue Number	Purpose	Discussion Status
LR-ISG-2006-03	Staff Guidance for Preparing Severe Accident Mitigation Alternatives (SAMA) Analyses	The staff has issued LR-ISG-2006-03.
LR-ISG-2011-01	Aging Management of Stainless Steel Structures and Components in Treated Borated Water	This ISG has been issued in draft for public comment.
LR-ISG-2011-02	Aging Management Program for Steam Generators	The staff has issued LR-ISG-2011-02.
LR-ISG-2011-05	Ongoing Review of Operating Experience	This ISG has been issued in draft for public comment.

The following sections provide a summary discussion of each of the current NRC Interim Staff Guidance positions.

2.1.5.1 (LR-ISG-2006-03) Staff Guidance for Preparing Severe Accident Mitigation Alternatives (SAMA) Analyses

This LR-ISG was issued as final and is applicable to Callaway. The Callaway severe accident mitigation alternatives analysis, provided as a part of Appendix E of this application, is consistent with the guidance of NEI 05-01, *Severe Accident Mitigation Alternatives (SAMA) Analysis Guidance Document,* Revision A as discussed in this LR-ISG.

2.1.5.2 (LR-ISG-2011-01) Aging Management of Stainless Steel Structures and Components in Treated Borated Water

This LR-ISG was issued in draft and is applicable to Callaway. The One-Time Inspection program (B2.1.18) is used to verify the effectiveness of the Water Chemistry program (B2.1.2) to manage to manage stainless steel structures and components in a treated water environment. Results are provided in Chapter 3, *Aging Management Review.*

2.1.5.3 (LR-ISG-2011-02) Aging Management Program for Steam Generators

This LR-ISG was issued as final and is applicable to Callaway. The aging management program for the steam generators is discussed in Section B2.1.9, *Steam Generators.*

2.1.5.4 (LR-ISG-2011-05) Ongoing Review of Operating Experience

This LR-ISG was issued in draft for public comment and is applicable to Callaway. Ongoing review of operating experience is discussed in Section B1.4, *Operating Experience.*

2.1.6 Generic Safety Issues

In accordance with the guidance in NEI 95-10 and Appendix A.3 of NUREG-1800, *Standard Review Plan for the Review of License Renewal Applications for Nuclear Power Plants*, review of NRC Generic Safety Issues (GSIs) as part of the license renewal process is required to satisfy a finding per 10 CFR 54.29. GSIs that involve issues related to license renewal aging management reviews or time-limited aging analyses are to be addressed in the LRA. As a result of the review of NUREG-0933, *Resolution of Generic Safety Issues*, Supplement 33, dated August 2010, the following GSIs have been evaluated for license renewal:

1. GSI-190, Fatigue Evaluation of Metal Components for 60-year Plant Life

This GSI addresses fatigue life of metal components and was closed by the NRC. However, the NRC concluded that license renewal applicants should address the effects of reactor coolant environment on component fatigue life. Accordingly, the issue of environmental effects on component fatigue life is addressed in Section 4.3, *Metal Fatigue.*

2. GSI-191, Assessment of Debris Accumulation on PWR Sump Performance

GSI-191 addresses the potential for blockage of containment sump strainer assembly that filters debris from cooling water supplied to the safety injection and containment spray pumps following a postulated LOCA. The issue is based on containment strainer design and on the identification of new potential sources of debris that may block the sump strainers. Ameren Missouri submitted responses to NRC Generic Letter 2004-02, *Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents at Pressurized-Water Reactors* on March 7, 2005 (ML050830208) and September 1, 2005 (ML052510457). The containment recirculation strainers are evaluated in Section 2.3.2.1, *Containment Spray System* and coatings and the debris barrier and recirculation sumps are evaluated with the reactor building structure in Section 2.4.1, *Reactor Building*. The Protective Coating Monitoring and Maintenance Program is discussed in Section B2.1.33, *Protective Coating Monitoring and Maintenance Program*.

2.1.7 Conclusions

The scoping and screening methodology described in Section 2.1 was used for the Callaway integrated plant assessment to identify SSCs that are within the scope of license renewal and require an aging management review. The methods are consistent with the current NEI and NRC guidance and thereby meet the requirements of 10 CFR 54.4 and 10 CFR 54.21(a)(1).

Figure 2.1-1 Scoping and Screening Process Flow

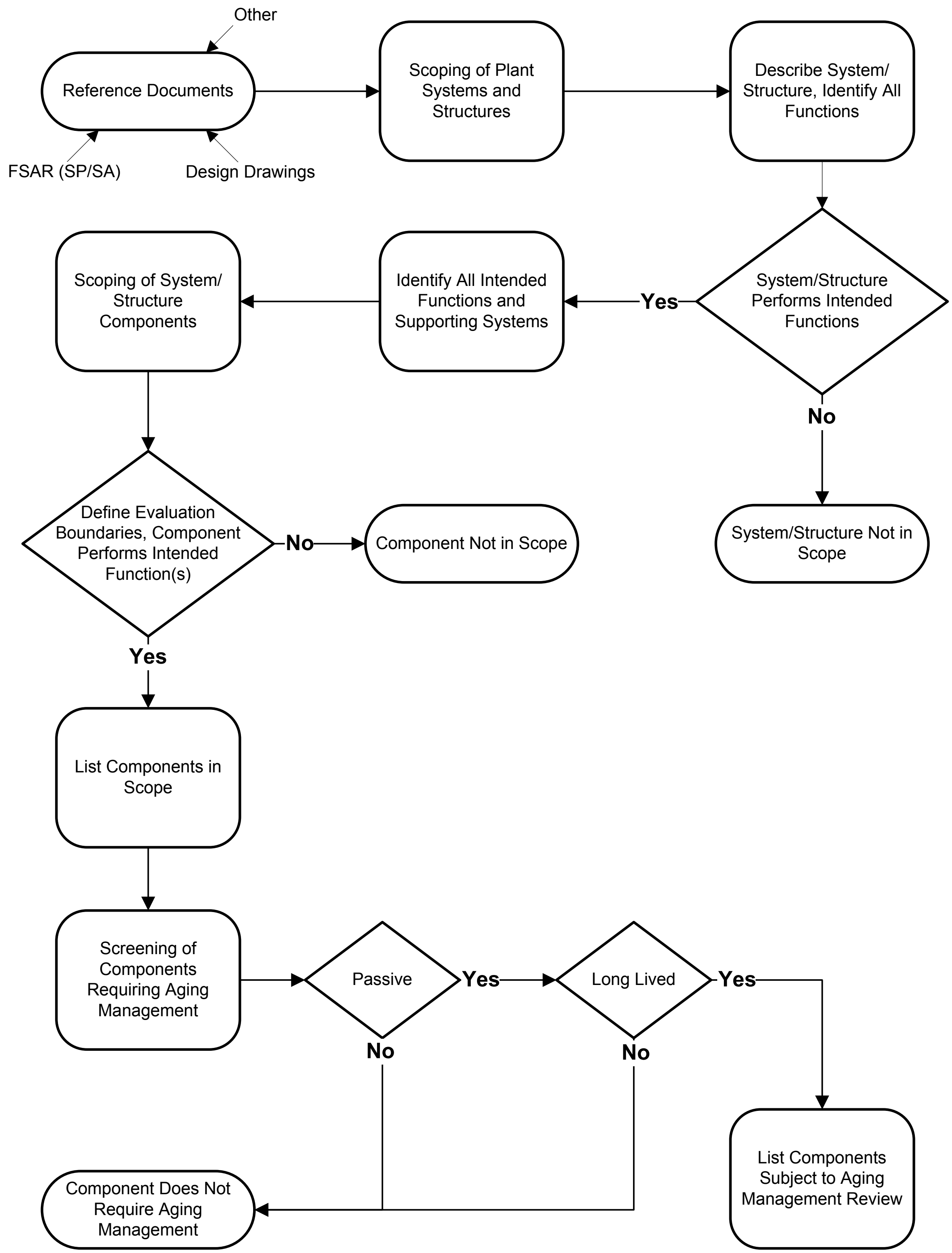
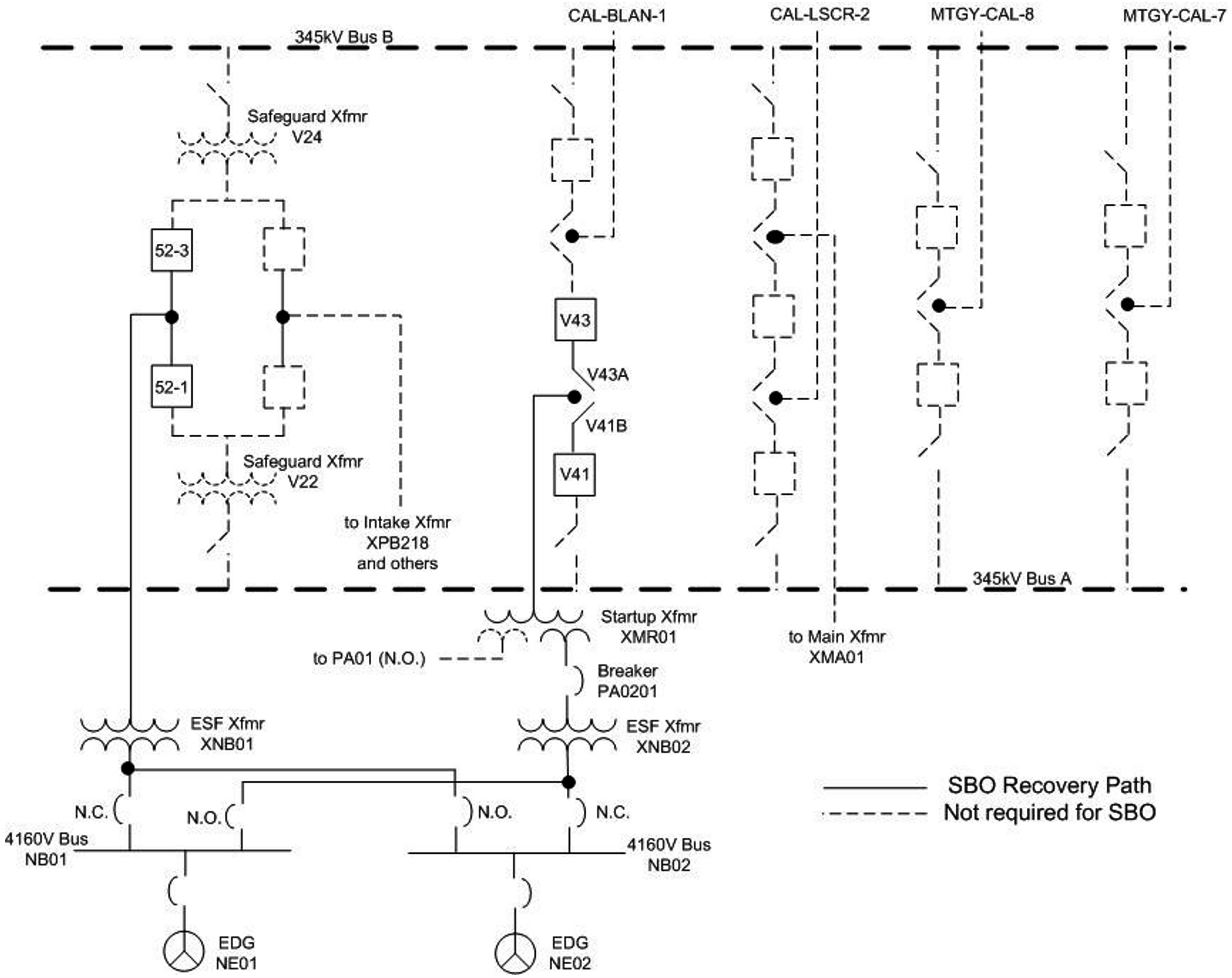


Figure 2.1-2 Station Blackout Recovery Path



2.2 PLANT-LEVEL SCOPING RESULTS

Table 2.2-1, *Callaway Plant Scoping Results* provides the results of the assessment to identify the plant systems and structures that are within the scope of license renewal. Table 2.2-1, *Callaway Plant Scoping Results* lists mechanical, electrical and instrumentation and control systems and structures. For in-scope mechanical systems and structures, a reference is given to the appropriate section that provides a description of the system or structure and the screening results (component function relationship tables) of the system or structure.

For electrical and instrumentation and control systems, no description is provided since these systems were evaluated based on the “spaces approach” as introduced in Section 2.1.4.3, *Electrical and Instrumentation and Control Component Screening Methodology* and more fully described in Section 2.5, *Scoping and Screening Results: Electrical and Instrumentation and Control Systems*.

For each mechanical system within the scope of license renewal, components subject to aging management review are highlighted on license renewal boundary drawings, as noted in Section 2.1.3, *Scoping Methodology*, indicating the evaluation boundaries of the systems.

For structures within the scope of license renewal, the structural components subject to aging management review are listed in the component function relationship tables. A license renewal site drawing, as noted in Section 2.1.3.2, *Structure Scoping Methodology*, indicates the structures within the scope of license renewal.

Table 2.2-1 Callaway Plant Scoping Results

System/Structure	In-Scope	Section 2 Scoping and Screening Results
Reactor Vessel, Internals, and Reactor Coolant System		
Pressurizer	Yes	2.3.1.3
Reactor Coolant System	Yes	2.3.1.2
Reactor Core	Yes	2.3.1.5
Reactor Vessel and Internals	Yes	2.3.1.1
Steam Generators	Yes	2.3.1.4
Engineered Safety Features		
Containment Hydrogen Control System	Yes	2.3.2.3
Containment Integrated Leak Rate Testing System	Yes	2.3.2.2
Containment Purge System	Yes	2.3.2.4
Containment Spray System	Yes	2.3.2.1
High Pressure Coolant Injection System includes: Accumulator Safety Injection System Borated Refueling Water Storage System	Yes	2.3.2.5
Residual Heat Removal System	Yes	2.3.2.6
Auxiliary Systems		
Auxiliary Building HVAC System	Yes	2.3.3.13
Chemical and Volume Control System	Yes	2.3.3.10
Component Cooling Water System	Yes	2.3.3.7
Compressed Air System, also includes Breathing Air System Service Gas System	Yes	2.3.3.8

Table 2.2-1 Callaway Plant Scoping Results (Continued)

System/Structure	In-Scope	Section 2 Scoping and Screening Results
Containment Cooling System	Yes	2.3.3.19
Control Building HVAC System	Yes	2.3.3.11
Cranes, Hoists, and Elevators	Yes	2.3.3.3
Decontamination System	Yes	2.3.3.25
Diesel Generator Building HVAC System	Yes	2.3.3.16
Emergency Diesel Engine Fuel Oil Storage and Transfer System	Yes	2.3.3.21
EOF and TSC Diesels, Security Building System	Yes	2.3.3.23
Essential Service Water Pumphouse HVAC System	Yes	2.3.3.12
Essential Service Water System	Yes	2.3.3.4
Fire Protection System	Yes	2.3.3.20
Floor and Equipment Drainage System	Yes	2.3.3.27
Fuel Building HVAC System	Yes	2.3.3.14
Fuel Pool Cooling and Cleanup System	Yes	2.3.3.2
Fuel Storage and Handling	Yes	2.3.3.1
Liquid Radwaste System	Yes	2.3.3.24
Miscellaneous Buildings HVAC System	Yes	2.3.3.15
Miscellaneous systems in-scope ONLY for Criterion a(2) Includes: Boron Recycle System Central Chilled Water System Chemical and Detergent Waste System	Yes	2.3.3.28

Table 2.2-1 Callaway Plant Scoping Results (Continued)

System/Structure	In-Scope	Section 2 Scoping and Screening Results
Condensate and Feedwater Chemical Addition System Condensate System Demineralized Water Makeup System Domestic Water System Gaseous Radwaste System Plant Heating System Sanitary Drainage System Secondary Liquid Waste System Solid Radwaste System Roof Drains System		
Nuclear Sampling System	Yes	2.3.3.9
Oily Waste System	Yes	2.3.3.26
Radwaste Building HVAC System	Yes	2.3.3.17
Reactor Makeup Water System	Yes	2.3.3.6
Service Water System	Yes	2.3.3.5
Standby Diesel Generator Engine System	Yes	2.3.3.22
Turbine Building HVAC System	Yes	2.3.3.18
Auxiliary Fuel Oil Storage and Handling System	No	N/A
Bulk Chemical Storage and Handling System	No	N/A
Circulating Water also includes: Cooling Water Chemical Control System Cooling Tower Makeup and Blowdown System Intake Structure and Water Treatment System	No	N/A
Closed Cooling Water System	No	N/A
Process Sampling System	No	N/A
Yard Drainage System	No	N/A

Table 2.2-1 Callaway Plant Scoping Results (Continued)

System/Structure	In-Scope	Section 2 Scoping and Screening Results
Steam and Power Conversion System		
Auxiliary Feedwater System, also includes: Auxiliary Turbines System	Yes	2.3.4.5
Condensate Storage and Transfer System	Yes	2.3.4.6
Main Feedwater System	Yes	2.3.4.3
Main Steam Supply System, also includes: Auxiliary Steam System	Yes	2.3.4.2
Main Turbine System	Yes	2.3.4.1
Steam Generator Blowdown System	Yes	2.3.4.4
Auxiliary Steam Generator System, also includes: Auxiliary Boiler Chemical Addition System	No	N/A
Condensate Demineralizer System	No	N/A
Feedwater Heater Extraction, Drains, and Vents System	No	N/A
Turbine/Generator Auxiliaries, includes: Steam Seal System Main Turbine Lube Oil System Generator Hydrogen and Carbon Dioxide System Generator Seal Oil System Stator Cooling Water System Lube Oil Storage, Transfer, and Purification System Main Condenser Air Removal System Main Turbine Control Oil System	No	N/A
Containments, Structures, and Component Supports		
Auxiliary Building	Yes	2.4.3
Control Building, also includes: Communications Corridor Structure	Yes	2.4.2
Diesel Generator Building also includes: Emergency Diesel Fuel Tank Concrete Vault Structure	Yes	2.4.5

Table 2.2-1 Callaway Plant Scoping Results (Continued)

System/Structure	In-Scope	Section 2 Scoping and Screening Results
Electrical Foundations and Structures includes: ESF Transformer Concrete Foundation Startup Transformer Concrete Foundation Main Transformer Concrete Structure Unit Auxiliary Transformer Concrete Foundation Station Service Transformer Concrete Foundation Electrical Duct Banks and Manholes	Yes	2.4.8
Essential Service Water Structures, also includes: Essential Service Water Pumphouse ESWS Supply Lines Yard Vault Ultimate Heat Sink Cooling Tower 1 Ultimate Heat Sink Retention Pond	Yes	2.4.11
Fuel Building	Yes	2.4.10
In-Scope Tank Foundations and Structures includes: Fire Water Storage Tanks Concrete Foundations Refueling Water Storage Tank Foundation and Valve House Condensate Storage Tank Foundation and Building Closure	Yes	2.4.7
Miscellaneous In-Scope Structures, includes: Circulating and Service Water Pumphouse Fire Pumphouse Switchyard Control Building Security Diesel Generator Building Security Building (Main Access Facility) Cooling Tower Basin	Yes	2.4.6
Radwaste Building	Yes	2.4.9
Reactor Building	Yes	2.4.1
Supports	Yes	2.4.12
Turbine Building	Yes	2.4.4
Miscellaneous Out-of-Scope Structures includes: Auxiliary Oil Transfer Callaway Multipurpose Building Carbon Dioxide CO2 Storage Central Processing Facility Circulating Water Cooling Tower Cooling Water Chemical Control	No	N/A

Table 2.2-1 Callaway Plant Scoping Results (Continued)

System/Structure	In-Scope	Section 2 Scoping and Screening Results
Demineralized Potable Water Building		
Demineralized Water Storage Tank Foundation		
Emergency Operations Facility		
Equalization Basin		
Fire Brigade Training Station		
Fitness for Duty Building		
Fuel Oil Storage Tank Foundation and Dike		
Gas Cylinder Storage		
Health Physics Calibration Facility		
Hydrogen Storage		
Intake Structure		
LCD Radwaste Storage Tank Foundation		
Lube Oil Storage Building		
Main Entrance		
Maintenance Shop Annex (Fab Shop)		
Maintenance Storage Facility		
Maintenance Training Annex		
Nitrogen Storage		
OCA Access Facility		
OCA Access Booth		
Oily Waste Treatment Area		
Outage Maintenance Facility		
Oxygen Storage		
Parking for Training Center		
Plant Support Facility		
Quality Control Building		
Reactor Makeup Water Storage Tank Foundation		
Remote Multiplex Unit A.B.C		
Secondary Access Facility		
Service Building		
Sewage Lift Station		
Site Cathodic Protection Anode Bed		
Site Switchgear Building		
Sludge Pump Station		
Solvent Storage		
Spare Main Transformer		
Steam Generator Storage Facility		
Stores I Building		
Stores II Building		
Switchyard Concrete Foundations		
Technical Training Facility/Callaway Learning Center		
Technical Support Center		

Table 2.2-1 Callaway Plant Scoping Results (Continued)

System/Structure	In-Scope	Section 2 Scoping and Screening Results
Training Center Vendor Liaison Building Vendor Offices Watchman Gatehouse Water Treatment Control Building Water Treatment Plant Water Treatment Plant Clearwell Well number 1 Well number 3 XMB01 Excitation Transformer		
Electrical and Instrumentation and Controls		
125 VDC Electrical System (Class 1E Power System)	Yes	N/A
125 VDC Electrical System	Yes	N/A
480 VAC Electrical System	Yes	N/A
4.16k VAC Electrical System	Yes	N/A
13.8k VAC Electrical System	Yes	N/A
ATWS Mitigation Actuation Circuitry	Yes	N/A
EHV Switchyard Bus System	Yes	N/A
Emergency Lighting System	Yes	N/A
Engineered Safety Features Actuation System	Yes	N/A
Excore Neutron Monitoring System	Yes	N/A
Freeze Protection System	Yes	N/A
Non-Vital AC Instrument System	Yes	N/A
Load Shedding and Emergency Load Sequencing System	Yes	N/A
Main Control Board System	Yes	N/A
Main Generator System	Yes	N/A
Miscellaneous Control Panels	Yes	N/A

Table 2.2-1 Callaway Plant Scoping Results (Continued)

System/Structure	In-Scope	Section 2 Scoping and Screening Results
Miscellaneous Equipment System	Yes	N/A
Process Radiation Monitoring System	Yes	N/A
Public Address System	Yes	N/A
Radioactivity Release Information System	Yes	N/A
Reactor Protection System (SSPS)	Yes	N/A
Standby Generator System	Yes	N/A
Standby Lighting System	Yes	N/A
Startup Transformer System	Yes	N/A
Vital AC Instrument Power System	Yes	N/A
250 VDC Electrical System	No	N/A
Excitation and Voltage Regulation System	No	N/A
Incore Instrumentation	No	N/A
Lighting Systems include: Normal Lighting System	No	N/A
Miscellaneous Computer Systems include: Training Center Simulator Distributed Control System Loose Parts Monitoring System	No	N/A
Miscellaneous Electrical Systems include: Miscellaneous Switchyard Grounding System Cathodic Protection System	No	N/A
Miscellaneous I&C Systems include: Meteorological Instrumentation System Closed Circuit TV System Area Radiation Monitoring System Seismic Instrumentation System Post-Accident Monitoring	No	N/A
Plant Annunciator System	No	N/A
Plant Computer System	No	N/A

Table 2.2-1 Callaway Plant Scoping Results (Continued)

System/Structure	In-Scope	Section 2 Scoping and Screening Results
Plant Security System	No	N/A
Reactor Control System (RODS)	No	N/A
Reactor Instrumentation System	No	N/A
Telephone System	No	N/A
Uninterruptible AC Power System	No	N/A

2.3 SCOPING AND SCREENING RESULTS: MECHANICAL SYSTEMS

The scoping and screening results for mechanical systems consist of lists of components and component groups that require aging management review, grouped and presented on a system basis. Brief descriptions of mechanical systems within the scope of license renewal are provided as background information. Mechanical system intended functions are provided for in-scope systems. For each in-scope system, components or component types requiring an aging management review are provided.

Specifically, this section provides the results of the scoping and screening process for mechanical systems including:

- A general description of the system and its purpose,
- System intended function(s),
- A reference to the applicable FSAR section(s),
- A reference to the applicable license renewal boundary drawing(s),
- A listing of mechanical component types subject to an aging management review with the associated component intended functions.

The mechanical scoping and screening results are provided in four subsections:

- Reactor vessel, internals, and reactor coolant system (Section 2.3.1)
- Engineered safety features (Section 2.3.2)
- Auxiliary systems (Section 2.3.3)
- Steam and power conversion systems (Section 2.3.4)

2.3.1 Reactor Vessel, Internals, and Reactor Coolant System

This section addresses scoping and screening results for the following systems:

- Reactor Vessel and Internals (Section 2.3.1.1)
- Reactor Coolant System (Section 2.3.1.2)
- Pressurizer (Section 2.3.1.3)
- Steam Generators (Section 2.3.1.4)
- Reactor Core (Section 2.3.1.5)

2.3.1.1 Reactor Vessel and Internals

System Description

The purpose of the reactor vessel is to act as a reactor coolant system (RCS) pressure boundary, acting as a barrier against the release of radioactivity generated within the reactor. The reactor internals support the core, maintain fuel alignment, limit fuel assembly movement, maintain alignment between fuel assemblies and control rod drive mechanisms (CRDMs), direct coolant flow past the fuel elements, direct coolant flow to the pressure vessel head, provide gamma and neutron shielding and provide guides for the incore instrumentation.

The reactor vessel is cylindrical and has a welded, hemispherical bottom head and a removable, flanged, hemispherical upper head. The vessel is nozzle supported. The vessel contains the core, core-supporting structures, control rods, and other parts directly associated with the core. The top head also has penetrations for the CRDMs and the head vent pipe. The O-ring leak monitoring tube penetrations are in the vessel flange. The vessel has inlet and outlet nozzles located in a horizontal plane just below the reactor vessel flange but above the top of the core. The bottom head of the vessel contains penetration nozzles for connection and entry of the nuclear incore instrumentation.

The components of the reactor internals consist of the lower core support structure (including the entire core barrel and neutron shield pad assembly), the upper core support structure, and the incore instrumentation support structure, and the alignment/interface components.

The lower core support structure includes the baffle and former plates, core barrel assembly, neutron shield panel, lower core plates with manway cover, core support forging, core support columns, secondary core support with energy absorbers, and tie plates.

The upper core support structure includes the top support plate, upper support columns, upper core plate, and control rod guide tubes. The upper core support structure is featured with head cooling spray nozzles that are holes machined in the top support plate flange.

The incore instrumentation support structure consists of an upper system to convey and support thermocouples penetrating the vessel upper head and a lower system to convey and support flux thimbles penetrating the bottom head. The flux thimble guide tubes extend from the bottom of the reactor vessel to a thimble seal table.

Alignment/interface components include the radial support keys, clevis inserts, head/vessel alignment pins, upper core plate guide pins, and hold down spring.

System Intended Functions

The reactor vessel contains the core, core support structures, control rods, and other parts directly associated with the core. In addition, the reactor vessel acts as an RCS pressure boundary, acting as a barrier against the release of radioactivity generated within the reactor. The reactor internals support the core, maintain fuel alignment, limit fuel assembly movement, maintain alignment between fuel assemblies and CRDMs, direct coolant flow past the fuel elements, direct coolant flow to the pressure vessel head, provide gamma and neutron shielding, and provide guides for incore instrumentation. Therefore, the reactor vessel and internals are within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1).

Portions of reactor vessel and internals are within the scope of license renewal to support fire protection, pressurized thermal shock, and station blackout requirements based on the criteria of 10 CFR 54.4(a)(3).

Callaway FSAR References

Additional details of the reactor vessel and internals are included in FSAR Sections 3.9(N).5 SP, 5.1 SP, and 5.3 SP.

License Renewal Boundary Drawings

There are no license renewal boundary drawings for reactor vessel and internals system.

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.3.1-1 - *Reactor Vessel and Internals*.

Table 2.3.1-1 Reactor Vessel and Internals

Component Type	Intended Function
RV BMI Guide Tube	Pressure Boundary
RV BMI Nozzle and Welds	Pressure Boundary
RV Closure Head	Pressure Boundary

Table 2.3.1-1 Reactor Vessel and Internals (Continued)

Component Type	Intended Function
RV Closure Head Bolts	Pressure Boundary
RV Control Rod Drive Head Penetration (Flange and Plug)	Pressure Boundary
RV Control Rod Drive Head Penetration (Nozzle and Welds)	Pressure Boundary
RV Control Rod Drive Housing	Pressure Boundary
RV Control Rod Drive Thermal Sleeve	Shelter, Protection
RV Core Support Lugs	Structural Support
RV Flange Leak Monitoring Tube	Pressure Boundary
RV Head Vent Nozzle, Pipe and Welds	Pressure Boundary
RV Inlet and Outlet Nozzles	Pressure Boundary
RV Nozzle Safe Ends	Pressure Boundary
RV Nozzle Safe Ends Welds	Pressure Boundary
RV Nozzle Support Pads	Structural Support
RV Shell Bottom Head	Pressure Boundary
RV Upper, Intermediate, Lower Shell and Welds	Pressure Boundary
RV Vessel Flange	Pressure Boundary
RVI Baffle-Edge Bolting	Structural Support
RVI Baffle-Former Assembly	Direct Flow Shielding Structural Support
RVI Baffle-Former Assembly Bolting	Structural Support
RVI BMI Flux Thimble	Pressure Boundary
RVI Control Rod Guide Tube Assembly	Structural Support
RVI Control Rod Guide Tube Bolting	Structural Support
RVI Control Rod Guide Tube Guide Plates	Structural Support

Table 2.3.1-1 Reactor Vessel and Internals (Continued)

Component Type	Intended Function
RVI Control Rod Guide Tube Support Pins	Structural Support
RVI Core Barrel	Direct Flow Shielding Structural Support
RVI Core Barrel Assembly-Former Bolting	Structural Support
RVI Core Barrel Flanges	Direct Flow Shielding Structural Support
RVI Core Barrel Outlet Nozzles	Direct Flow Shielding Structural Support
RVI Core Barrel Welds and Flange Welds	Direct Flow Shielding Structural Support
RVI Head/Vessel Alignment Pins	Structural Support
RVI Hold Down Spring	Structural Support
RVI ICI Support Structure Bolting	Structural Support
RVI ICI Support Structure-BMI Instr Column	Structural Support
RVI ICI Support Structures (Exit Thermocouple)	Structural Support
RVI ICI Support Structure-Upper/Lower Tie Plates	Structural Support
RVI Irradiation Specimen Basket	Structural Support
RVI Lower Core Plate	Direct Flow Structural Support
RVI Lower Core Support Column Bodies	Structural Support
RVI Lower Core Support Column Bolting	Structural Support
RVI Lower Core Support-Clevis Insert Bolting	Structural Support
RVI Lower Core Support-Core Support Forging	Structural Support
RVI Lower Core Support-Energy Absorber Assembly	Structural Support
RVI Neutron Shield Panel	Shielding
RVI Radial Support Keys and Clevis Inserts	Structural Support

Table 2.3.1-1 Reactor Vessel and Internals (Continued)

Component Type	Intended Function
RVI Upper Core Plate Guide Pins	Structural Support
RVI Upper Core Support-Top Support Plate	Structural Support
RVI Upper Core Support-Upper Core Plate	Structural Support
RVI Upper Core Support-Upper Support Column	Structural Support
RVI Upper Support Column Bolting	Structural Support
Seal Table	Pressure Boundary

The AMR results for these component types are provided in Table 3.1.2-1, *Reactor Vessel, Internals and Reactor Coolant System – Summary of Aging Management Evaluation - Reactor Vessel and Internals*.

2.3.1.2 Reactor Coolant System

System Description

The purpose of the reactor coolant system (RCS) during operation is to transfer heat generated in the core to the steam generators where the steam that drives the turbine-generator is produced. Borated pressurized water circulates in the RCS, acting as a neutron moderator and reflector, and as a neutron absorber for chemical shim control. The components of the steam generators are evaluated in Section 2.3.1.4, *Steam Generators*.

RCS pressure is controlled by the pressurizer in which water and steam are maintained in equilibrium by electrical heaters or water sprays. The components of the pressurizer are evaluated in Section 2.3.1.3, *Pressurizer*.

The portion of the RCS within the scope of license renewal consists of four similar heat transfer loops connected in parallel to the reactor pressure vessel, all of which are located inside of the containment. Each loop contains a reactor coolant pump, steam generator, and associated piping and valves. The system also includes a pressurizer, a pressurizer relief tank, interconnecting piping, and instrumentation.

System Intended Functions

The RCS pressure boundary provides a barrier to limit the release of radioactivity. The system is designed to maintain the reactor coolant pressure boundary integrity at the temperatures and pressures experienced under normal modes of operation and anticipated transients. The RCS systems provide containment isolation for penetrations where components interface with systems outside of containment. Therefore the RCS is within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1).

Portions of RCS systems are in scope as nonsafety-related affecting safety-related components based on the criterion of 10 CFR 54.4(a)(2) for spatial interaction and structural integrity.

Portions of the RCS are required to support fire protection, environmental qualification, and station blackout requirements based on the criteria of 10 CFR 54.4(a)(3).

Callaway FSAR References

Additional details of the reactor coolant system are included in
FSAR Sections 5.1 SP, 5.2 SP, 5.4 SP, and Table 6.2.4-1 SP.

License Renewal Boundary Drawings

The license renewal boundary drawings for the reactor coolant system are listed below:
LR-CW-BB-M-22BB01
LR-CW-BB-M-22BB02
LR-CW-BB-M-22BB03A
LR-CW-BB-M-22BB03B
LR-CW-BB-M-22BB03C
LR-CW-BB-M-22BB03D
LR-CW-BB-M-22BB04

Component-Function Relationship Table

The component types subject to aging management review are indicated in
Table 2.3.1-2 - *Reactor Coolant System*

Table 2.3.1-2 Reactor Coolant System

Component Type	Intended Function
Class 1 Piping < NPS 4	Pressure Boundary
Closure Bolting	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)
Flow Element	Leakage Boundary (spatial) Pressure Boundary
Heat Exchanger (RCP Bearing Oil Cooler)	Pressure Boundary
Heat Exchanger (RCP Motor Air Cooler)	Pressure Boundary
Heat Exchanger (RCP Thermal Barrier Cooler)	Heat Transfer Pressure Boundary

Table 2.3.1-2 Reactor Coolant System (Continued)

Component Type	Intended Function
Instrument Bellows	Pressure Boundary
Piping	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)
Pump	Pressure Boundary
Rupture Disc	Leakage Boundary (spatial)
Solenoid Valve	Pressure Boundary
Tank	Leakage Boundary (spatial) Structural Integrity (attached)
Tubing	Pressure Boundary
Valve	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)

The AMR results for these component types are provided in Table 3.1.2-2, *Reactor Vessel, Internals and Reactor Coolant System – Summary of Aging Management Evaluation - Reactor Coolant System*.

2.3.1.3 Pressurizer

System Description

The purpose of the pressurizer is to provide a point in the RCS where liquid and vapor are maintained at equilibrium temperature and pressure under saturated conditions for pressure control purposes.

Valves and external piping associated with the pressurizer are evaluated with the RCS in Section 2.3.1.2, *Reactor Coolant System*.

The pressurizer consists of a vertical, cylindrical vessel with essentially hemispherical top and bottom heads. A surge line nozzle and removable electric heaters are installed in the bottom head. A thermal sleeve is provided to minimize stresses in the surge line nozzle. Spray line nozzles and relief and safety valve connections are located in the top head of the vessel. Spray flow is modulated by automatically controlled air-operated valves.

System Intended Functions

The pressurizer is part of the RCS pressure boundary. It is designed to accommodate positive and negative reactor coolant surges caused by RCS transients. The pressurizer safety valves function with the pressurizer intact to provide overpressure protection during a transient, thereby assuring continued integrity of the RCS. Therefore, the pressurizer is within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1).

The pressurizer is within scope of license renewal to support fire protection and station blackout requirements based upon the criteria of 10 CFR 54.4(a)(3).

Callaway FSAR References

Additional details of the pressurizer are included in
FSAR Sections 5.1 SP, 5.2 SP, 5.4.10 SP, and 15.5 SP.

License Renewal Boundary Drawings

There are no license renewal boundary drawings for the pressurizer.

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.3.1-3 – *Pressurizer*.

Table 2.3.1-3 Pressurizer

Component Type	Intended Function
Closure Bolting	Pressure Boundary
PZR Heater Support Plate	Structural Support
PZR Heater Well Nozzle	Pressure Boundary
PZR Instrument Penetrations	Pressure Boundary
PZR Manways and Covers	Pressure Boundary
PZR Safe Ends	Pressure Boundary
PZR Safety Nozzles	Pressure Boundary
PZR Seismic Lugs	Structural Support
PZR Shell and Head	Pressure Boundary
PZR Spray Head	Spray

Table 2.3.1-3 Pressurizer (Continued)

Component Type	Intended Function
PZR Support Skirt and Flange	Structural Support
PZR Surge and Spray Nozzles with Thermal Sleeves	Pressure Boundary Shelter, Protection

The AMR results for these component types are provided in Table 3.1.2-3, *Reactor Vessel, Internals and Reactor Coolant System – Summary of Aging Management Evaluation – Pressurizer.*

2.3.1.4 Steam Generators

System Description

The purpose of the steam generators is to provide heat removal from the reactor coolant system through the generation of steam and also to act as an assured source of steam to the steam driven auxiliary feedwater pump. Feedwater enters the steam generator and is distributed circumferentially around the steam generator by means of a feedwater ring and then flows downward through an annulus between the tube wrapper and shell. Steam is generated on the shell side and flows upward through the moisture separation to the outlet nozzle at the top of the vessel.

The steam generators consists of the primary and secondary pressure boundaries of the steam generators including all pieces and parts within the pressure boundary and all penetrations out to the safe ends of the penetration nozzles. The primary inlet and outlet nozzles are connected to the reactor coolant system hot and cold legs respectively. The reactor coolant flows through the inverted U-tubes. The secondary inlet nozzle is connected to the main feedwater system and the secondary outlet nozzle is connected to the main steam system.

System Intended Functions

The steam generators support the function of inventory and pressure control, heat removal and indirect radioactive release in post accident conditions. The primary channel head and tubes form part of the reactor coolant pressure boundary. The steam generators also provide an assured source of steam to the turbine driven auxiliary feedwater pump. Therefore the steam generators is within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1).

Portions of the steam generators are within the scope of license renewal as nonsafety-related affecting safety-related components based on the criterion of 10 CFR 54.4(a)(2).

Failure of nonsafety-related internal components may generate loose parts that prevent accomplishment of the intended function of steam generator tubes.

Portions of the steam generators are within the scope of license renewal to support fire protection and station blackout requirements based upon the criteria of 10 CFR 54.4(a)(3).

Callaway FSAR References

Additional details of the steam generators are included in FSAR Sections 5.1 SP, 5.4.2 SP, and 10.4.9 SP.

License Renewal Boundary Drawings

There are no license renewal boundary drawings for the steam generators.

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.3.1-4 - *Steam Generators*.

Table 2.3.1-4 Steam Generators

Component Type	Intended Function
SG Closure Bolting	Pressure Boundary
SG Divider Plate	Direct Flow
SG Feedwater Ring and J-Tube	Structural Support
SG Internal Structures	Structural Support
SG Moisture Separators	Structural Support
SG Primary Head	Pressure Boundary
SG Primary Manway Covers	Pressure Boundary
SG Primary Nozzles and Safe Ends	Pressure Boundary
SG Secondary Nozzles	Pressure Boundary Throttle
SG Secondary Shell	Pressure Boundary
SG Secondary Side Access Covers	Pressure Boundary
SG Support Ring	Structural Support

Table 2.3.1-4 Steam Generators (Continued)

Component Type	Intended Function
SG Tube Plugs	Pressure Boundary
SG Tube Support Plates	Structural Support
SG Tubes	Heat Transfer Pressure Boundary
SG Tubesheet	Pressure Boundary

The AMR results for these component types are provided in Table 3.1.2-4, *Reactor Vessel, Internals and Reactor Coolant System – Summary of Aging Management Evaluation - Steam Generators*.

2.3.1.5 Reactor Core

System Description

The purpose of the reactor core is to provide a heat source for the steam generators in the steam production cycle.

The reactor core consists of 193 fuel assemblies arranged in a pattern that approximates a right circular cylinder. Each fuel assembly contains a 17 x 17 rod array composed of 264 fuel rods. Each rod is held in place by spacer grids and top and bottom nozzles. The fuel rods are constructed of zirconium alloy tubing containing uranium dioxide fuel pellets. The center position in the assembly is reserved for incore instrumentation; the remaining 24 positions in the array are equipped with guide thimbles joined to the grids and the top and bottom nozzles. Depending on assembly position in the core, the guide thimbles are used as core locations for rod cluster control assemblies (RCCAs), neutron source assemblies, thimble plug assemblies, and burnable absorber rods (if used).

The bottom nozzle is a box-like structure that serves as a bottom structural element of the fuel assembly and directs the coolant flow to the assembly. The top nozzle assembly functions as the upper structural element of the fuel assembly in addition to providing a partial protective housing for the RCCA or other components. Each RCCA consists of a group of individual absorber rods fastened at the top end to a common hub or spider assembly.

System-Intended Functions

The fuel assemblies assist in directing reactor coolant through the core to achieve acceptable flow distribution and to restrict bypass flow so that the heat transfer performance requirements can be met for all modes of operation. The fuel cladding provides a radioactive fission products barrier. Reactivity control is achieved with the use of control rods. The fuel assemblies are designed to accept control rod insertions to provide reactivity control. Therefore, the reactor core system is within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1).

Portions of the reactor core system are within the scope of license renewal to support fire protection requirements based upon the criteria of 10 CFR 54.4(a)(3).

However, the fuel assemblies and the RCCAs are considered to be short-lived since they are subject to replacement at regular intervals based on the plant fuel cycle.

Thus, components of reactor core system are not subject to aging management review.

Callaway FSAR References

Additional details of the reactor core are included in FSAR Sections 4.1 SP and 4.2 SP.

License Renewal Boundary Drawings

There are no license renewal boundary drawings for the reactor core.

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.3.1-5 - *Reactor Core*.

Table 2.3.1-5 Reactor Core

Component Type	Intended Function
None	N/A

2.3.2 Engineered Safety Features

This section addresses scoping and screening results for the following systems:

- Containment Spray System (Section 2.3.2.1)
- Containment Integrated Leak Rate Testing System (Section 2.3.2.2)
- Containment Hydrogen Control System (Section 2.3.2.3)
- Containment Purge System (Section 2.3.2.4)
- High Pressure Coolant Injection System (Section 2.3.2.5)
- Residual Heat Removal System (Section 2.3.2.6)

2.3.2.1 Containment Spray System

System Description

The purpose of the containment spray system, in the event of a loss-of-coolant accident (LOCA) or a main steam line break, is to maintain the containment ambient pressure by transferring heat from the containment atmosphere to the containment sump, minimize the quantity of airborne fission product iodine in the containment atmosphere and to establish the sump pH for retention of elemental iodine.

The containment spray system consists of pumps, spray ring headers and nozzles, containment spray additive eductors, trisodium phosphate (TSP) baskets, and the associated piping and valves.

The TSP baskets contain anhydrous TSP to maintain post-LOCA fluid pH levels. The debris barrier and recirculation sumps are evaluated with the reactor building structure in Section 2.4.1, *Reactor Building*. The refueling water storage tank is evaluated in Section 2.3.2.5, *High Pressure Coolant Injection System*.

System Intended Functions

The containment spray system maintains the post-accident containment atmospheric pressure below the design limit, establishes the containment sump pH, and limits offsite radiation dose. Containment isolation valves are provided to ensure that containment integrity is maintained. Therefore, the containment spray system is within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1).

Portions of the containment spray system are within the scope of license renewal as nonsafety-related affecting safety-related components based on the criterion of 10 CFR 54.4(a)(2) for spatial interaction and structural integrity attached.

Portions of the containment spray system are within the scope of license renewal to support fire protection and environmental qualification requirements based upon the criteria of 10 CFR 54.4(a)(3).

Callaway FSAR References

Additional details of the containment spray system are included in FSAR Sections 1.2.5.1.2 SP, 6.2.2.1 SP, and 6.5.2 SP.

License Renewal Boundary Drawings

The license renewal boundary drawing for the containment spray system is listed below: LR-CW-EN-M-22EN01

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.3.2-1 - *Containment Spray System.*

Table 2.3.2-1 Containment Spray System

Component Type	Intended Function
Closure Bolting	Pressure Boundary
Containment Recirculation Strainer	Filter
Eductor	Pressure Boundary
Expansion Joint	Pressure Boundary
Flow Element	Pressure Boundary
Flow Orifice	Leakage Boundary (spatial)
Piping	Direct Flow Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)
Pump	Pressure Boundary
Spray Nozzle	Spray
Tank	Pressure Boundary
TSP Basket	Structural Support
Valve	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)

The AMR results for these component types are provided in Table 3.2.2-1, *Engineered Safety Features – Summary of Aging Management Evaluation – Containment Spray System*.

2.3.2.2 Containment Integrated Leak Rate Testing System

System Description

The purpose of the containment integrated leak rate testing system is to provide a means for periodic testing of containment leakage by pressurizing the containment building and monitoring leakage to atmosphere.

The containment integrated leak rate testing system consists of the portable air compressors, filters, dryers, instrumentation, piping and valves associated with delivering compressed air to the containment for conducting the integrated leak rate test. The containment integrated leak rate testing system containment penetrations are isolated with blank flanges during normal plant operation and form part of the containment boundary.

System Intended Functions

The containment integrated leak rate testing system provides containment isolation during normal plant operation. Therefore, the containment integrated leak rate testing system is within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1).

Portions of the containment integrated leak rate testing system are within the scope of license renewal as nonsafety-related affecting safety-related components based on the criterion of 10 CFR 54.4(a)(2) for spatial interaction.

Portions of the containment integrated leak rate testing system are within the scope of license renewal to support environmental qualification requirements based upon the criteria of 10 CFR 54.4(a)(3).

Callaway FSAR References

Additional details of the containment integrated leak rate testing system are included in FSAR Section 6.2.6.1 SP.

License Renewal Boundary Drawings

The license renewal boundary drawing for the integrated leak rate testing system is listed below:
LR-CW-GP-M-22GP01

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.3.2-2 - *Containment Integrated Leak Rate Testing System*.

Table 2.3.2-2 Containment Integrated Leak Rate Testing System

Component Type	Intended Function
Closure Bolting	Pressure Boundary
Piping	Leakage Boundary (spatial) Pressure Boundary
Valve	Pressure Boundary

The AMR results for these component types are provided in Table 3.2.2-2, *Engineered Safety Features – Summary of Aging Management Evaluation – Containment Integrated Leak Rate Testing System.*

2.3.2.3 Containment Hydrogen Control System

System Description

The purpose of the containment hydrogen control system is to control combustible gas concentrations in the containment following a LOCA.

The containment hydrogen control system consists of the electric hydrogen recombiners, the hydrogen monitoring subsystems, the hydrogen mixing subsystem, and the backup hydrogen purge subsystem. The electric recombiners are located in containment and heat the containment atmosphere within the units to the reaction temperature to cause thermal recombination of hydrogen with oxygen and to cause air flow by natural convection. The electric hydrogen recombiners were installed as a means of controlling containment atmosphere hydrogen concentration. Based upon 10 CFR 50.44, the electric hydrogen recombiners are no longer required for design basis events. The electric hydrogen recombiners perform no safety function. These electric hydrogen recombiners are still maintained as environmentally qualified equipment in the EQ program. Hydrogen monitoring is performed by hydrogen analyzers and associated sample lines with their containment isolation valves. The hydrogen purge subsystem consists of one penetration through which the containment atmosphere is purged and filtered. The hydrogen purge subsystem utilizes the fuel/auxiliary building emergency exhaust system to perform its functions. The hydrogen mixing subsystem consists of four mixing fans. Air is drawn from each steam generator compartment and is discharged toward the upper regions of the containment. The hydrogen mixing fans are evaluated in containment cooling system in Section 2.3.3.19, *Containment Cooling System*.

System Intended Functions

Portions of the containment hydrogen control system provide containment isolation and are relied upon to provide mixing of the containment atmosphere after a LOCA. Therefore, the containment hydrogen control system is within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1).

Portions of the containment hydrogen control system are within the scope of license renewal as nonsafety-related affecting safety-related components based on the criterion of 10 CFR 54.4(a)(2) for spatial interaction and structural integrity.

Portions of the containment hydrogen control system are within the scope of license renewal to support environmental qualification requirements based upon the criteria of 10 CFR 54.4(a)(3).

Callaway FSAR References

Additional details of the containment combustible gas control system are included in FSAR Section 6.2.5 SP.

License Renewal Boundary Drawings

The license renewal boundary drawing for the containment hydrogen control system is listed below:
LR-CW-GS-M-22GS01

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.3.2-3 - *Containment Hydrogen Control System*.

Table 2.3.2-3 Containment Hydrogen Control System

Component Type	Intended Function
Closure Bolting	Leakage Boundary (spatial) Pressure Boundary
Flow Orifice	Pressure Boundary Throttle
Heat Exchanger (Sample Cooler)	Pressure Boundary
Piping	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)
Pump	Pressure Boundary
Solenoid Valve	Pressure Boundary
Tank	Pressure Boundary
Tubing	Leakage Boundary (spatial) Pressure Boundary
Valve	Pressure Boundary

The AMR results for these component types are provided in Table 3.2.2-3, *Engineered Safety Features – Summary of Aging Management Evaluation – Containment Hydrogen Control System*.

2.3.2.4 Containment Purge System

System Description

The purpose of the containment purge system is to provide ventilation of the containment building for habitability when required and provide a vent path for equalization of containment pressure with the atmosphere. The containment minipurge system is typically used during power operation to reduce the concentration of noble gases within containment prior to and during personnel access to the containment or to equalize containment internal pressure with the external pressure. The containment shutdown purge system supplies outside air into the containment for ventilation and cooling or heating needed for prolonged containment access during a reactor outage. It may also be used when the reactor is in the cold shutdown mode to reduce the concentration of noble gases within the containment prior to and during personnel access.

The containment purge system consists of the common HVAC intake, common unit vent, nonessential filtering unit, supply fans, exhaust fans, containment isolation valves, radiation monitors and associated ventilation ducts.

System Intended Functions

The containment purge system provides containment isolation valves that are capable of rapid closure, following a design basis event, to limit the escape of fission products from the containment, and radiation monitors that provide radiation level input to the engineered safety feature actuation signal for the containment purge system. Therefore, the containment purge system is within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1).

Portions of the containment purge system are within the scope of license renewal as nonsafety-related affecting safety-related components based on the criterion of 10 CFR 54.4(a)(2) for spatial interaction and structural integrity.

Portions of the containment purge system are within the scope of license renewal to support environmental qualification requirements based upon the criteria of 10 CFR 54.4(a)(3).

Callaway FSAR References

Additional details of the containment purge system are included in FSAR Sections 7.3.2 SP and 9.4.6 SP.

License Renewal Boundary Drawings

The license renewal boundary drawing for the containment purge system is listed below:
LR-CW-GT-M-22GT01

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.3.2-4 - *Containment Purge System*.

Table 2.3.2-4 Containment Purge System

Component Type	Intended Function
Closure Bolting	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)
Damper	Pressure Boundary
Ductwork	Pressure Boundary
Filter	Filter, Pressure Boundary
Flex Connectors	Pressure Boundary
Flow Orifice	Structural Integrity (attached)
Heat Exchanger (Containment Purge)	Leakage Boundary (spatial)
Piping	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)
Pump	Pressure Boundary
Screen	Structural Integrity (attached)
Solenoid Valve	Pressure Boundary
Valve	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)

The AMR results for these component types are provided in Table 3.2.2-4, *Engineered Safety Features – Summary of Aging Management Evaluation – Containment Purge System*.

2.3.2.5 High Pressure Coolant Injection System

System Description

The purpose of the high pressure coolant injection system is to deliver borated water to the RCS to remove stored and fission product decay heat from the reactor core, and provide shut down capability during a LOCA, control rod drive mechanism rupture, steam or feedwater system break, and steam generator tube failure accident conditions.

The high pressure coolant injection system is part of the emergency core cooling system that also includes the accumulator safety injection system and the borated refueling water storage system. Portions of the emergency core cooling system (ECCS) are evaluated with the chemical and volume control system in Section 2.3.3.10, *Chemical and Volume Control System* and the residual heat removal system in Section 2.3.2.6, *Residual Heat Removal System*.

High Pressure Coolant Injection System

The purpose of the high pressure coolant injection system is to take suction from either the refueling water storage tank or the residual heat removal pump discharge and deliver to either the RCS cold legs or the RCS hot legs.

The portion of the high pressure coolant injection system within the scope of license renewal consists of two safety injection pumps, flow orifices, associated piping, valves and instrumentation.

Accumulator Safety Injection System

The purpose of the accumulator safety injection system is to deliver borated water from the accumulator tanks to the RCS cold legs during the post-LOCA injection phase.

The portion of the accumulator safety injection system within the scope of license renewal consists of four accumulator tanks and the associated piping, valves, and instrumentation required for operation.

Borated Refueling Water Storage System

The purpose of the borated refueling water storage system is to provide storage for borated demineralized water to supply to the refueling pool during refueling, to the chemical and volume control system during abnormal operating conditions, and to the containment spray system and the emergency core cooling systems during design basis event conditions.

The portion of the borated refueling water storage system within the scope of license renewal consists of an outdoor storage tank with connections for borated demineralized water delivery to and receipt from the fuel pool cooling and cleanup system, the chemical and volume control system, the containment spray system, and the ECCS.

System Intended Functions

Portions of the high pressure coolant injection system piping connect directly to the reactor coolant system to form part of the reactor coolant system pressure boundary and are designated as Safety Class 1 piping. The high pressure coolant injection system delivers borated water from the refueling water storage tank and accumulator tanks to the reactor coolant system to provide core cooling and safe shutdown capability during post-accident conditions. Containment isolation valves ensure that containment integrity is maintained in single failure scenarios. Therefore, the high pressure coolant injection system is within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1).

Portions of the high pressure coolant injection system are within the scope of license renewal as nonsafety-related affecting safety-related components based on the criterion of 10 CFR 54.4(a)(2) for spatial interaction and structural integrity.

Portions of the high pressure coolant injection system are within the scope of license renewal to support fire protection and environmental qualification requirements based upon the criteria of 10 CFR 54.4(a)(3).

Callaway FSAR References

Additional details of the high pressure coolant injection system are included in
FSAR Section 6.3 SP.

License Renewal Boundary Drawings

The license renewal boundary drawings for the high pressure coolant injection system are listed below:
LR-CW-EM-M-22BN01
LR-CW-EM-M-22EM01
LR-CW-EM-M-22EM02
LR-CW-EM-M-22EP01

Component-Function Relationship Table

The component types subject to aging management review are indicated in
Table 2.3.2-5 – *High Pressure Coolant Injection System*.

Table 2.3.2-5 High Pressure Coolant Injection System

Component Type	Intended Function
Class 1 Piping < NPS 4	Pressure Boundary
Closure Bolting	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)

Table 2.3.2-5 High Pressure Coolant Injection System (Continued)

Component Type	Intended Function
Filter	Filter Pressure Boundary
Flow Element	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)
Flow Orifice	Pressure Boundary Throttle
Heat Exchanger (Refueling Water Storage Tank)	Leakage Boundary (spatial)
Heat Exchanger (SI Pump Lube Oil)	Heat Transfer Pressure Boundary
Piping	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)
Pump	Pressure Boundary
Solenoid Valve	Pressure Boundary
Strainer	Filter Pressure Boundary
Tank	Pressure Boundary
Tubing	Leakage Boundary (spatial) Pressure Boundary
Valve	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)

The AMR results for these component types are provided in Table 3.2.2-5, *Engineered Safety Features – Summary of Aging Management Evaluation – High Pressure Coolant Injection System.*

2.3.2.6 Residual Heat Removal System

System Description

The purpose of the residual heat removal (RHR) system is to transfer heat from the reactor coolant system (RCS) in normal shutdown and post accident conditions. During RHR system operation, reactor coolant flows from the RCS to the RHR pumps, through the tube side of the RHR heat exchangers, and back to the RCS. The heat is transferred to the component cooling water circulating through the shell side of the heat exchangers.

Portions of the RHR also function as part of the emergency core cooling system during the injection and recirculation phase of the LOCA.

The RHR system is also used to transfer refueling water between the refueling water storage tank (RWST) and the refueling cavity.

The residual heat removal system consists of two heat exchangers, two pumps, and the associated piping, valves, and instrumentation necessary for operational control. The inlet lines to the RHR are connected to two of the reactor coolant system's hot legs, while the return lines are connected to the safety injection system's cold leg injection lines.

The containment recirculation strainers are evaluated with the containment spray system in Section 2.3.2.1, *Containment Spray System*.

System Intended Functions

The residual heat removal system supports the functions of containment isolation, decay heat removal and prevention of radioactive release in post accident conditions. Portions of the RHR system serve as part of the ECCS during the injection and recirculation phases of a LOCA. Therefore, the residual heat removal system is within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1).

Portions of the residual heat removal system are within the scope of license renewal as nonsafety-related affecting safety-related components based on the criterion of 10 CFR 54.4(a)(2) for spatial interaction and structural integrity.

Portions of the residual heat removal system are within the scope of license renewal to support fire protection and environmental qualification requirements based upon the criteria of 10 CFR 54.4(a)(3).

Callaway FSAR References

Additional details of the residual heat removal system are included in FSAR Sections 5.4.7 SP and 6.3 SP.

License Renewal Boundary Drawings

The license renewal boundary drawing for the residual heat removal system is listed below:
LR-CW-EJ-M-22EJ01

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.3.2-6 - *Residual Heat Removal System*.

Table 2.3.2-6 Residual Heat Removal System

Component Type	Intended Function
Closure Bolting	Leakage Boundary (spatial) Pressure Boundary
Expansion Joint	Expansion/Separation Pressure Boundary
Flexible Hoses	Leakage Boundary (spatial)
Flow Element	Pressure Boundary
Flow Orifice	Pressure Boundary Throttle
Heat Exchanger (Residual Heat Removal)	Heat Transfer Pressure Boundary
Heat Exchanger (RHR Pump Seal Water Cooler)	Heat Transfer Pressure Boundary
Insulation	Insulate (Mechanical)
Piping	Direct Flow Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)
Pump	Pressure Boundary
Solenoid Valve	Pressure Boundary
Strainer	Pressure Boundary
Tank	Pressure Boundary
Tubing	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)
Valve	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)

The AMR results for these component types are provided in Table 3.2.2-6, *Engineered Safety Features – Summary of Aging Management Evaluation – Residual Heat Removal System.*

2.3.3 Auxiliary Systems

This section addresses scoping and screening results for the following systems:

- Fuel Storage and Handling System (Section 2.3.3.1)
- Fuel Pool Cooling and Cleanup System (Section 2.3.3.2)
- Cranes, Hoists, and Elevators (Section 2.3.3.3)
- Essential Service Water System (Section 2.3.3.4)
- Service Water System (Section 2.3.3.5)
- Reactor Makeup Water System (Section 2.3.3.6)
- Component Cooling Water System (Section 2.3.3.7)
- Compressed Air System (Section 2.3.3.8)
- Nuclear Sampling System (Section 2.3.3.9)
- Chemical and Volume Control System (Section 2.3.3.10)
- Control Building HVAC System (Section 2.3.3.11)
- Essential Service Water Pumphouse HVAC System (Section 2.3.3.12)
- Auxiliary Building HVAC System (Section 2.3.3.13)
- Fuel Building HVAC System (Section 2.3.3.14)
- Miscellaneous Buildings HVAC System (Section 2.3.3.15)
- Diesel Generator Building HVAC System (Section 2.3.3.16)
- Radwaste Building HVAC System (Section 2.3.3.17)
- Turbine Building HVAC System (Section 2.3.3.18)
- Containment Cooling System (Section 2.3.3.19)
- Fire Protection System (Section 2.3.3.20)
- Emergency Diesel Engine Fuel Oil Storage and Transfer System (Section 2.3.3.21)
- Standby Diesel Generator Engine System (Section 2.3.3.22)
- EOF and TSC Diesels, Security Building System (Section 2.3.3.23)
- Liquid Radwaste System (Section 2.3.3.24)
- Decontamination System (Section 2.3.3.25)
- Oily Waste System (Section 2.3.3.26)

- Floor and Equipment Drainage System (Section 2.3.3.27)
- Miscellaneous systems in-scope ONLY for Criterion (a)(2) (Section 2.3.3.28)
  Includes:
  Boron Recycle System
  Central Chilled Water System
  Chemical and Detergent Waste System
  Condensate and Feedwater Chemical Addition System
  Condensate System
  Demineralized Water Makeup System
  Domestic Water System
  Gaseous Radwaste
  Plant Heating System
  Sanitary Drainage System
  Secondary Liquid Waste System
  Solid Radwaste System
  Roof Drains System

2.3.3.1 Fuel Storage and Handling System

System Description

The purpose of the fuel storage and handling system is to provide on-site storage of new and spent fuel assemblies, provide manipulation of fuel assemblies and rod control clusters, and provide for the servicing of the reactor vessel closure head and internals. The system is designed to minimize the possibility of mishandling or improper operation which could cause fuel assembly damage and/or potential fission product release.

The fuel storage and handling system consists of fuel handling and storage equipment including cranes, elevators, fuel storage racks, lift rigs, and transfer systems. Fuel cranes and fuel elevators are evaluated in this system.

System-Intended Functions

The fuel storage and handling system provides for onsite storage of new and spent fuel assemblies such that a sub-critical arrangement is always maintained under normal and postulated design basis events. Therefore, the fuel storage and handling system is within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1).

The fuel storage and handling system contains nonsafety-related handling systems which carry heavy loads over safety-related components, or over irradiated fuel in the reactor vessel or spent fuel pool. Therefore, the fuel storage and handling system is within the scope of license renewal based on the criterion of 10 CFR 54.4(a)(2).

Callaway FSAR References

Additional details of the fuel storage and handling system are included in FSAR Section 9.1.1 SP, 9.1.2 SP, 9.1.4 SP, 15.7.4 SP, and Appendix 9.1A SP.

License Renewal Boundary Drawings

There are no license renewal boundary drawings for the fuel storage and handling system

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.3.3-1 – *Fuel Storage and Handling System*.

Table 2.3.3-1 Fuel Storage and Handling System

Component Type	Intended Function
Bolting (Structural)	Structural Support
Crane	Structural Support
Cranes - Rails	Structural Support
Fuel Handling Equipment	Structural Support
Fuel Storage Racks	Absorb Neutrons Structural Support

The AMR results for these component types are provided in Table 3.3.2-1, *Auxiliary Systems – Summary of Aging Management Evaluation – Fuel Storage and Handling System*.

2.3.3.2 Fuel Pool Cooling and Cleanup System

System Description

The purpose of the fuel pool cooling and cleanup system is to maintain the spent fuel pool water temperature below prescribed limits by removing decay heat generated by stored spent fuel assemblies and to remove impurities from the refueling pool water, the spent fuel pool water, the transfer canal water, and the water in the cask loading pool in order to ensure optical clarity and to limit the concentration of specific activity in the water.

The fuel pool cooling and cleanup system consists of three subsystems: fuel pool cooling system, fuel pool cleanup system and fuel pool surface skimmer system.

The fuel pool cooling system consists of two 100-percent capacity cooling trains. Each train consists of a pump, a shell and U-tube heat exchanger, and the associated strainers, piping and valves. The fuel pool cooling heat exchangers are serviced by the component cooling water system on the shell side. The fuel pool cleanup system consists of two pumps and two filters in parallel, a mixed bed demineralizer, and the associated strainers, piping and valves. The fuel pool surface skimmer system consists of float-type strainers positioned just below the water surface, a pump, a filter and the associated piping and valves.

System Intended Functions

The fuel pool cooling and cleanup system provides water inventory over the spent fuel assemblies to mitigate the radiological consequences following a design bases fuel handling accident. The system maintains the fuel storage pool water temperature below prescribed limits by removing decay heat generated by stored spent fuel assemblies. The fuel pool cooling and cleanup system also contains piping which penetrates containment and contains the necessary containment isolation valves, thereby providing containment integrity. Therefore, the fuel pool cooling and cleanup system is within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1).

Portions of the fuel pool cooling and cleanup system are within the scope of license renewal as nonsafety-related affecting safety-related components based on the criterion of 10 CFR 54.4(a)(2) for spatial interaction and structural integrity.

Callaway FSAR References

Additional details of the fuel pool cooling and cleanup system are included in FSAR Sections 6.2.4 SP, 9.1.3 SP, and 15.7.4 SP.

License Renewal Boundary Drawings

The license renewal boundary drawings for the fuel pool cooling and cleanup system are listed below:
LR-CW-EC-M-22EC01
LR-CW-EC-M-22EC02

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.3.3-2 – *Fuel Pool Cooling and Cleanup System*.

Table 2.3.3-2 Fuel Pool Cooling and Cleanup System

Component Type	Intended Function
Closure Bolting	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)

Table 2.3.3-2 Fuel Pool Cooling and Cleanup System (Continued)

Component Type	Intended Function
Expansion Joint	Expansion/Separation
Flow Element	Leakage Boundary (spatial) Pressure Boundary
Fuel Transfer Tube	Pressure Boundary
Heat Exchanger (Fuel Pool Cooling)	Heat Transfer Pressure Boundary
Piping	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)
Pump	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)
Strainer	Pressure Boundary Structural Integrity (attached)
Thermowell	Pressure Boundary
Tubing	Leakage Boundary (spatial) Pressure Boundary
Valve	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)

The AMR results for these component types are provided in Table 3.3.2-2, *Auxiliary Systems – Summary of Aging Management Evaluation – Fuel Pool Cooling and Cleanup System.*

2.3.3.3 Cranes, Hoists, and Elevators

System Description

The purpose of the cranes, hoists and elevators system is to provide lifting and maneuvering capacity in Category I structures and various nonsafety-related buildings about the site. The cranes, hoists and elevators system is nonsafety and performs no safety-related functions.

The cranes, hoists and elevators system consists of multiple cranes, doors, elevators, hoists and trolleys. The following cranes, hoists and monorails are within the scope of license renewal:

- Containment jib cranes
- Containment pressurizer enclosure wall jib crane

- Hoist and trolley for the south head on component cooling water heat exchanger
- Diesel generator under-hung monorails and bridge crane
- Fuel pool cooling pumps monorails and hoists
- Auxiliary building filter room monorail and hoist
- Auxiliary feedwater pump monorails and hoists
- Component cooling water pump monorails and hoists
- Component cooling water surge tank area monorails and hoists
- Centrifugal charging pump monorails and hoists
- Safety injection pump monorails and hoists
- RHR pump monorails and hoists
- Containment spray pump monorails and hoist
- Normal charging pump monorail and hoists
- Auxiliary building HVAC monorail and hoist
- Main steam relief and isolation valve monorails and hoists
- Resin charging tank area monorail and hoist
- Reactor building elevator auxiliary monorail and hoist
- Boric acid batch tank monorail and hoist
- Containment equipment hatch radiation and missile shield hand trolley
- Feed regulating valve rigging trolley
- Trolley beams for miscellaneous equipment

Crane rail supports are evaluated with their appropriate structure in Section 2.4, *Scoping and Screening Results: Structures*.

System Intended Functions

The cranes, hoists and elevators system contains nonsafety-related handling systems which carry heavy loads over safety-related components required for plant shutdown or decay heat removal. Portions of the cranes, hoists and elevators system are within the scope of license renewal as nonsafety-related affecting safety-related components based on the criterion of 10 CFR 54.4(a)(2).

Callaway FSAR References

Additional details of the cranes, hoists, and elevators system are not included in the FSAR.

License Renewal Boundary Drawings

There are no license renewal boundary drawings for the cranes, hoists, and elevators system.

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.3.3-3 – *Cranes, Hoists, and Elevators*.

Table 2.3.3-3 Cranes, Hoists, and Elevators

Component Type	Intended Function
Bolting (Structural)	Structural Support
Crane	Structural Support
Cranes - Rails	Structural Support
Hoist	Structural Support
Trolley	Structural Support

The AMR results for these component types are provided in Table 3.3.2-3, *Auxiliary Systems – Summary of Aging Management Evaluation – Cranes, Hoists, and Elevators*.

2.3.3.4 Essential Service Water System

System Description

The purpose of the essential service water system (ESWS) is to provide cooling water to plant components which require cooling for safe shutdown of the reactor following an accident and/or loss of offsite power and convey the heat to the ultimate heat sink (UHS) cooling tower. The components cooled by the ESWS are the component cooling water heat exchangers, containment air coolers, diesel generator coolers, safety injection pump room coolers, RHR pump room coolers, containment spray pump room coolers, centrifugal charging pump room coolers, component cooling water pump room coolers, auxiliary feedwater pump room coolers, control room air conditioning condensers, Class 1E switchgear air-conditioning condensers, and penetration room coolers.

In addition, ESWS provides cooling water to the spent fuel pool cooling pump room coolers and to nonsafety-related air compressors and associated after-coolers. During normal operating and shutdown conditions, the nonsafety-related service water system provides cooling water to the components cooled by the ESWS through service water interconnections to the ESWS. The ESWS pumps are normally in standby; they are placed in service during normal shutdown conditions when the service water system is not available and during abnormal conditions such as during a loss of offsite power or a loss of coolant accident condition. The ESWS provides emergency makeup to the spent fuel pool and component cooling water systems, and is the backup water supply to the auxiliary feedwater system in the event condensate storage tank water is unavailable.

The ESWS consists of two redundant safety-related cooling water trains. The UHS, which includes a retention pond and cooling tower, is part of the ESWS.

System Intended Functions

The ESWS supports the functions of containment isolation, decay heat removal, and inventory and pressure control. Therefore, the ESWS is within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1).

Portions of the ESWS are within the scope of license renewal as nonsafety-related affecting safety-related components based on the criterion of 10 CFR 54.4(a)(2) for spatial interaction and structural integrity.

Portions of the ESWS are within the scope of license renewal to support fire protection and environmental qualification requirements based on the criteria of 10 CFR 54.4(a)(3).

Callaway FSAR References

Additional details of the essential service water system are included in FSAR Sections 1.2.9.4.2 SP, 9.2.1.2 SA, and 9.2.1.2 SP.

License Renewal Boundary Drawings

The license renewal boundary drawings for the essential service water system are listed below:
LR-CW-EF-M-22EF01
LR-CW-EF-M-22EF02
LR-CW-EF-M-U2EF01

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.3.3-4 - *Essential Service Water System*.

Table 2.3.3-4 Essential Service Water System

Component Type	Intended Function
Closure Bolting	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)
Filter	Filter
Flow Element	Pressure Boundary
Flow Orifice	Pressure Boundary Throttle
Piping	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)
Pump	Leakage Boundary (spatial) Pressure Boundary
Screen	Filter
Splash Panel	Heat Sink
Spray Nozzle	Spray
Strainer	Filter Pressure Boundary
Tank	Pressure Boundary
Thermowell	Pressure Boundary
Tubing	Leakage Boundary (spatial) Pressure Boundary
Valve	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)

The AMR results for these component types are provided in Table 3.3.2-4, *Auxiliary Systems – Summary of Aging Management Evaluation – Essential Service Water System*.

2.3.3.5 Service Water System

System Description

The purpose of the service water system is to supply cooling water to the non-essential plant auxiliary equipment and components served by the essential service water system (ESWS) during normal plant operation and normal plant shutdown. The service water system also normally supplies fire water to two hose stations within the ESW pumphouse via ESWS piping. The service water system takes suction from the cooling tower basin, and the heated return water is discharged into the circulating water system. The service water system is nonsafety-related and performs no safety-related functions.

The service water system consists of three pumps, piping, valves, strainers, heat exchangers, and chillers.

System Intended Functions

Portions of the service water system are within the scope of license renewal as nonsafety-related affecting safety-related components based on the criterion of 10 CFR 54.4(a)(2) for spatial interaction and structural integrity.

Portions of the service water system are within the scope of license renewal to support fire protection requirements based upon the criteria of 10 CFR 54.4(a)(3).

Callaway FSAR References

Additional details of the service water system are included in FSAR Sections 9.2.1.1 SA, 9.2.1.1 SP, 9.5.1.2.2 SA and 9.5.1.2.2.SP and Appendix 9.5B SA.

License Renewal Boundary Drawings

The license renewal boundary drawings for the service water system are listed below:
LR-CW-EA-M-22EA01
LR-CW-EA-M-22EA02
LR-CW-EA-X-89610
LR-CW-EA-X-89611
LR-CW-EA-X-89612
LR-CW-EA-X-89613
LR-CW-EA-X-89614
LR-CW-EA-X-89615

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.3.3-5 - *Service Water System*.

Table 2.3.3-5 Service Water System

Component Type	Intended Function
Closure Bolting	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)
Piping	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)
Pump	Pressure Boundary
Strainer	Pressure Boundary
Thermowell	Pressure Boundary
Tubing	Pressure Boundary
Valve	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)

The AMR results for these component types are provided in Table 3.3.2-5, *Auxiliary Systems – Summary of Aging Management Evaluation – Service Water System.*

2.3.3.6 Reactor Makeup Water System

System Description

The purpose of the reactor makeup water system is to store deaerated water to be used upon demand for primary makeup within the plant. The reactor makeup water system receives filtered, deaerated, demineralized water from the demineralized water storage and transfer system.

The portion of the reactor makeup water system within the scope of license renewal consists of safety-related piping associated with a containment penetration, nonsafety-related piping located in safety-related areas, and nonsafety-related piping attached to safety-related piping.

System Intended Functions

The reactor makeup water system provides containment isolation for a containment penetration. Therefore, the reactor makeup water system is within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1).

Portions of the reactor makeup water system are within the scope of license renewal as nonsafety-related affecting safety-related components based on the criterion of 10 CFR 54.4(a)(2) for spatial interaction and structural integrity.

Portions of the reactor makeup water system are within the scope of license renewal to support environmental qualification requirements based upon the criteria of 10 CFR 54.4(a)(3).

Callaway FSAR References

Additional details of the reactor makeup water system are included in FSAR Sections 6.2.4 SP and 9.2.7 SP.

License Renewal Boundary Drawings

The license renewal boundary drawing for the reactor makeup water system is listed below:
LR-CW-BL-M-22BL01

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.3.3-6 – *Reactor Makeup Water System*.

Table 2.3.3-6 Reactor Makeup Water System

Component Type	Intended Function
Closure Bolting	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)
Flow Orifice	Leakage Boundary (spatial)
Piping	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)
Pump	Leakage Boundary (spatial)
Tubing	Leakage Boundary (spatial) Pressure Boundary
Valve	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)

The AMR results for these component types are provided in Table 3.3.2-6, *Auxiliary Systems – Summary of Aging Management Evaluation – Reactor Makeup Water System*.

2.3.3.7 Component Cooling Water System

System Description

The purpose of the component cooling water system is to remove heat from heat exchangers required for the safe shutdown of the reactor. The system also acts as an intermediate heat transfer system between potentially radioactive systems and the service water system or the essential service water system to eliminate the possibility of an uncontrolled release of radioactivity. The heat exchangers served by the component cooling water system that are essential for the safe shutdown of the reactor include: the RHR heat exchangers, RHR pump seal coolers, centrifugal charging pump bearing oil coolers, safety injection pump bearing oil coolers, fuel pool cooling heat exchangers, excess letdown heat exchanger, reactor coolant pump (RCP) motor air coolers, RCP upper and lower bearing coolers, and RCP thermal barrier cooling coils. Nonessential heat exchangers served by the component cooling water system include: the reactor coolant drain tank heat exchanger, letdown heat exchanger, seal water heat exchanger, waste gas compressor heat exchangers and other nonessential heat exchangers. Process heat is rejected to the service water system or the essential service water system through the component cooling water heat exchangers.

The component cooling water system consists of two trains each having two 100-percent capacity pumps, a surge tank, a component cooling water heat exchanger and associated piping, valves and instrumentation.

System Intended Functions

The component cooling water system supports maintenance of vital auxiliaries, heat removal, and containment integrity. Therefore, the component cooling water system is within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1).

Portions of the component cooling water system are within the scope of license renewal as nonsafety-related affecting safety-related components based on the criterion of 10 CFR 54.4(a)(2) for spatial interaction and structural integrity.

Portions of the component cooling water system are within the scope of license renewal to support fire protection and environmental qualification requirements based on the criteria of 10 CFR 54.4(a)(3).

Callaway FSAR References

Additional details of the component cooling water system are included in FSAR Sections 1.2.9.5 SP and 9.2.2 SP.

License Renewal Boundary Drawings

The license renewal drawings for the component cooling water system are listed below:
LR-CW-EG-M-22EG01
LR-CW-EG-M-22EG02
LR-CW-EG-M-22EG03

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.3.3-7 – *Component Cooling Water System*.

Table 2.3.3-7 Component Cooling Water System

Component Type	Intended Function
Closure Bolting	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)
Corrosion Coupon Rack	Pressure Boundary
Flow Element	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)
Flow Orifice	Pressure Boundary Throttle
Heat Exchanger (CCW Heat Exchanger)	Heat Transfer Pressure Boundary
Piping	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)
Pump	Pressure Boundary
Sight Gauge	Leakage Boundary (spatial) Structural Integrity (attached)
Tank	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)
Tubing	Leakage Boundary (spatial) Pressure Boundary
Valve	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)

The AMR results for these component types are provided in Table 3.3.2-7, *Auxiliary Systems – Summary of Aging Management Evaluation – Component Cooling Water System*.

2.3.3.8 Compressed Air System

System Description

The purpose of the compressed air system is to provide compressed air to the instrument air, service air, breathing air, and containment systems.

The compressed air system consists of the compressed air system, service gas system, and breathing air system.

<u>Compressed air system</u>

The purpose of the compressed air system is to provide a continuous supply of filtered, dry, and oil-free air for instrument and control operations. The system also provides station air at service outlets throughout the plant for operation of pneumatic tools and other service requirements. The compressed air system provides a reliable backup supply of nitrogen gas for the main feedwater control valves. The compressed air system also provides a safety-related backup supply of nitrogen gas for the auxiliary feedwater control valves and the main steam atmospheric relief valves.

The portion of the compressed air system within the scope of license renewal consists of accumulators for the main feedwater control valves, auxiliary feedwater control valves, and the main steam atmospheric relief valves to store nitrogen gas for use in the event there is a loss of operation of instrument air. The in-scope portion of the compressed air system also consists of instrument air and service gas containment penetration piping and associated isolation valves, components associated with air seals for the containment personnel airlock, and nonsafety piping and valves attached to safety-related components.

<u>Service gas system</u>

The purpose of the service gas system is to provide nitrogen, hydrogen, carbon dioxide, oxygen, and laboratory gases to plant systems, as required.

The portion of the service gas system within the scope of license renewal consists of nonsafety-related piping and valves attached to safety-related components.

<u>Breathing air system</u>

The purpose of the breathing air system is to provide a dedicated source of respiratory air for use during maintenance operations within, and during abnormal entry into, areas having high or potentially high concentrations of airborne radioactive contaminants.

The portion of the breathing air system within the scope of license renewal consists of piping, containment isolation valves and the attached nonsafety-related piping and valves located in the reactor building and the auxiliary building.

The safety-related portions of the compressed air systems include the containment penetrations and their isolation valves, components associated with air seals for the containment personnel airlock, and components associated with the backup nitrogen gas supply for the auxiliary feedwater control valves and the main steam atmospheric relief valves.

System Intended Functions

Portions of the compressed air systems provide containment isolation for instrument air, service air, and breathing air penetrations. Portions of the compressed air systems provide air for the seals for the containment personnel airlock doors to support containment integrity. Portions of the compressed air system provide a backup supply of nitrogen gas for operation of the auxiliary feedwater control valves and the main steam atmospheric relief valves to provide capability to shutdown the reactor and maintain it in a safe shutdown condition. Therefore, the compressed air systems are within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1).

Portions of the compressed air systems are within the scope of license renewal as nonsafety-related affecting safety-related components based on the criterion of 10 CFR 54.4(a)(2) for spatial interaction and structural integrity.

Portions of the compressed air systems are within the scope of license renewal to support environmental qualification and station blackout requirements based upon the criteria of 10 CFR 54.4 (a)(3).

Callaway FSAR References

Additional details of the compressed air system are included in FSAR Sections 9.3.1 SP, 9.3.5 SP, and 9.5.10 SP.

License Renewal Boundary Drawings

The license renewal boundary drawings for the compressed air system are listed below:
LR-CW-KA-M-22KA01
LR-CW-KA-M-22KA02
LR-CW-KA-M-22KA04
LR-CW-KA-M-22KA05
LR-CW-KB-M-22KB01
LR-CW-KH-M-22KH01

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.3.3-8 - *Compressed Air System*.

Table 2.3.3-8 Compressed Air System

Component Type	Intended Function
Closure Bolting	Pressure Boundary Structural Integrity (attached)
Flow Orifice	Structural Integrity (attached)
Piping	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)
Tank	Pressure Boundary
Tubing	Pressure Boundary
Valve	Pressure Boundary Structural Integrity (attached)

The AMR results for these component types are provided in Table 3.3.2-8, *Auxiliary Systems – Summary of Aging Management Evaluation – Compressed Air System.*

2.3.3.9 Nuclear Sampling System

System Description

The purpose of the nuclear sampling system is to collect samples from the reactor coolant, auxiliary, and radwaste systems and brings them to a common location for analysis. The nuclear sampling system contains safety-related components.

The nuclear sampling system consists of the primary sampling system (PrSS) located in the auxiliary building and the radwaste sampling system (RWSS) located in the radwaste building.

The PrSS collects samples from the reactor coolant system and auxiliary systems and brings them to a common location in a sample room in the auxiliary building. The PrSS consists of a primary sampling rack and a sampling panel. The PrSS rack contains sample coolers which reduce the temperature of the samples and are cooled by the component cooling water system. Relief valves protect the system from overpressurization. The PrSS samples are routed to a manual sample facility within an exhaust-ventilated, hooded enclosure to confine any leakage or spillage of radioactive fluids. Within the vented sampling hood are grab sample points for each stream and the sample pressure vessels. Any liquid leakage is collected in the sink and drained to the floor drain tank or holdup tank for processing through the liquid radwaste system.

The RWSS collects samples from the radwaste systems and brings them to the sample room in the radwaste building. The RWSS is manually operated on an intermittent basis to provide samples for laboratory analysis. The samples are routed to a manual sample facility with an exhaust-ventilated, hooded enclosure.

The nuclear sampling system consists of tanks, pumps, piping, tubing, and valves.

System Intended Functions

The nuclear sampling system provides part of the reactor coolant boundary and also provides containment isolation for nuclear sampling system containment penetrations. Therefore, the nuclear sampling system is within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1).

Portions of the nuclear sampling system are within the scope of license renewal as nonsafety-related affecting safety-related components based on the criterion of 10 CFR 54.4(a)(2) for spatial interaction and structural integrity.

Portions of the nuclear sampling system are within the scope of license renewal to support environmental qualification requirements based upon the criteria of 10 CFR 54.4(a)(3).

Callaway FSAR References

Additional details of the nuclear sampling system are included in FSAR Section 9.3.2 SP.

License Renewal Boundary Drawings

The license renewal boundary drawings for the nuclear sampling system are listed below:
LR-CW-SJ-M-22SJ01
LR-CW-SJ-M-22SJ03
LR-CW-SJ-M-22SJ04

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.3.3-9 - *Nuclear Sampling System*.

Table 2.3.3-9 Nuclear Sampling System

Component Type	Intended Function
Closure Bolting	Leakage Boundary (spatial) Pressure Boundary
Piping	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)
Pump	Leakage Boundary (spatial)
Solenoid Valve	Pressure Boundary
Tank	Leakage Boundary (spatial)

Table 2.3.3-9 Nuclear Sampling System (Continued)

Component Type	Intended Function
Tubing	Leakage Boundary (spatial) Pressure Boundary
Valve	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)

The AMR results for these component types are provided in Table 3.3.2-9, *Auxiliary Systems – Summary of Aging Management Evaluation – Nuclear Sampling System.*

2.3.3.10 Chemical and Volume Control System

System Description

The purpose of the chemical and volume control system (CVCS) is to maintain the required water inventory within the RCS, vary the boron concentration of the RCS, maintain required RCS water chemistry and reduce the radioactivity levels. Portions of the CVCS provide an injection flow to the RCS to support ECCS functions.

The CVCS consists of the following subsystems:

The charging, letdown and seal water subsystem maintains a programmed water level in the pressurizer, thus maintaining a proper reactor coolant inventory during all phases of plant operation. This is achieved by means of a continuous feed-and-bleed process during which the feed rate is automatically controlled, based on the pressurizer water level. Charging pumps are provided to take suction from the volume control tank and return the purified reactor coolant to the RCS. A portion of the charging flow is directed to the reactor coolant pumps seal water injection.

The reactor coolant purification and chemistry control subsystem maintains desired reactor coolant system water chemistry conditions for radioactivity control. The pH control chemical employed is lithium hydroxide introduced into the RCS via the charging flow. Dissolved hydrogen is employed to control and scavenge oxygen produced due to radiolysis of water in the core region. A sufficient partial pressure of hydrogen is maintained in the volume control tank so that the specified concentration of hydrogen is maintained in the reactor coolant. Mixed bed demineralizers are provided in the letdown line to cleanup the letdown flow of ionic corrosion products and certain fission products.

The reactor makeup control subsystem provides makeup water to the RCS to maintain proper reactor coolant inventory and soluble neutron absorber (boric acid) concentration. In addition, for emergency boration and makeup, the redundant capability exists to supply borated water directly from the boric acid tank to the suction of the charging pumps. Automatic makeup compensates for minor leakage of reactor coolant without causing significant changes in the reactor coolant boron concentration.

The boron thermal regeneration subsystem (BTRS) adjusts boron concentration when needed. Downstream of the mixed bed demineralizers, the letdown flow can be diverted to the BTRS when boron concentration changes are desired for load follow. Although the BTRS is primarily designed to compensate for xenon transients occurring during load follow, it can also be used to handle boron changes during other modes of plant operation.

The chemical and volume control system contains pumps, heat exchangers, tanks, demineralizers, filters, orifices, chillers, and associated piping, valves and instrumentation.

System Intended Functions

The chemical and volume control system maintains RCS pressure boundary, provides boration and makeup into the RCS, supplies seal water injection flow to the RCP seals and provides for containment isolation. Therefore, the CVCS is within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1).

Portions of the CVCS are within the scope of license renewal as nonsafety-related affecting safety-related components based on the criterion of 10 CFR 54.4(a)(2) for spatial interaction and structural integrity.

Portions of the CVCS are within the scope of license renewal to support fire protection, environmental qualification, and station blackout requirements based upon the criteria of 10 CFR 54.4(a)(3).

Callaway FSAR References

Additional details of the chemical and volume control system are included in FSAR Sections 7.4 SP and 9.3.4 SP.

License Renewal Boundary Drawings

The license renewal boundary drawings for the chemical and volume control system are listed below:
LR-CW-BG-M-22BG01
LR-CW-BG-M-22BG02
LR-CW-BG-M-22BG03
LR-CW-BG-M-22BG04
LR-CW-BG-M-22BG05

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.3.3-10 - *Chemical and Volume Control System*.

Table 2.3.3-10 Chemical and Volume Control System

Component Type	Intended Function
Bellows	Leakage Boundary (spatial) Pressure Boundary
Chiller	Leakage Boundary (spatial)
Class 1 Piping < NPS 4	Pressure Boundary
Closure Bolting	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)
Condenser	Structural Integrity (attached)
Demineralizer	Leakage Boundary (spatial) Structural Integrity (attached)
Filter	Filter Leakage Boundary (spatial) Pressure Boundary
Flow Element	Leakage Boundary (spatial) Pressure Boundary
Flow Orifice	Leakage Boundary (spatial) Pressure Boundary Throttle
Heat Exchanger (CVCS BTRS Letdown Chiller)	Leakage Boundary (spatial)
Heat Exchanger (CVCS BTRS Letdown Reheat - Shell)	Leakage Boundary (spatial) Structural Integrity (attached)
Heat Exchanger (CVCS BTRS Letdown Reheat - Tube)	Pressure Boundary
Heat Exchanger (CVCS BTRS Moderating)	Leakage Boundary (spatial)
Heat Exchanger (CVCS Excess Letdown)	Pressure Boundary
Heat Exchanger (CVCS Letdown)	Pressure Boundary
Heat Exchanger (CVCS Regenerative)	Pressure Boundary
Heat Exchanger (CVCS Seal Water Return)	Heat Transfer Pressure Boundary
Heat Exchanger (Lube Oil Cooler)	Heat Transfer Leakage Boundary (spatial) Pressure Boundary

Table 2.3.3-10 Chemical and Volume Control System (Continued)

Component Type	Intended Function
Insulation	Insulate (Mechanical)
Piping	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)
Pump	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)
Solenoid Valve	Leakage Boundary (spatial) Pressure Boundary
Strainer	Leakage Boundary (spatial)
Tank	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)
Tubing	Leakage Boundary (spatial) Pressure Boundary
Valve	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)

The AMR results for these component types are provided in Table 3.3.2-10, *Auxiliary Systems – Summary of Aging Management Evaluation – Chemical and Volume Control System.*

2.3.3.11 Control Building HVAC System

System Description

The purpose of the control building HVAC system is to provide conditioned outside air for the ventilation and cooling to each level of the control building. The control building HVAC system includes the control room filtration system and the control room pressurization system and provides a suitable environment for personnel and for Class 1E electrical equipment. The normal portion of the system also provides a means of purging smoke following a postulated fire. Actuation of the control room ventilation isolation signal shuts down the normal portion of the system, isolates the nonessential portion of the control building HVAC system, starts the safety-related control room pressurization system and processes the ventilation air through safety-related filter absorber units to maintain control room habitability.

The control building HVAC system consists of the nonsafety-related normal system which includes air handlers, exhaust fans, cooling coils, heating coils and a nonsafety-related ventilation filter absorber unit, dampers and ductwork and the safety-related emergency system which includes redundant air handlers for the Class 1E equipment rooms, redundant air handlers for the control room, redundant control room pressurization fans, redundant safety-related filter absorber units, radiation monitors, dampers and ductwork. Supply to nonsafety- related cooling and heating components is provided by nonsafety-related central chilled water system and nonsafety-related plant heating system, respectively. Supply to safety-related cooling is provided by safety-related essential service water system. The control building HVAC system has no safety-related HVAC heating components.

The radiation monitors shown in the boundary drawing for the control building HVAC system are evaluated in process radiation monitoring system. The ventilation air supply and exhaust louvers shown in the boundary drawing for the control building HVAC system are evaluated as structural components in the control building in Section 2.4.2, *Control Building*.

System Intended Functions

The control building HVAC system provides a suitable environment for Class 1E electrical equipment under normal conditions and design basis events. It isolates all nonsafety-related HVAC penetrations on a control room ventilation isolation signal and processes the ventilation air through safety-related filter absorber units so that habitability of the control room is maintained. Therefore, the control building HVAC system is within the scope of license renewal based on the criteria 10 CFR 54.4(a)(1).

Portions of the control building HVAC system are within the scope of license renewal as nonsafety-related affecting safety-related components based on the criterion of 10 CFR 54.4(a)(2) for spatial interaction and structural integrity.

Portions of the control building HVAC system are within the scope of license renewal to support fire protection and environmental qualification requirements based on the criteria of 10 CFR 54.4(a)(3).

Callaway FSAR References

Additional details of the control building HVAC system are included in FSAR Sections 3.11 (B) SP, 6.4.4 SP and 9.4.1 SP.

License Renewal Boundary Drawings

The license renewal boundary drawings for the control building HVAC system are listed below:
LR-CW-GK-M-22GK01
LR-CW-GK-M-22GK02
LR-CW-GK-M-22GK03
LR-CW-GK-M-22GK04

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.3.3-11 – *Control Building HVAC System*.

Table 2.3.3-11 Control Building HVAC System

Component Type	Intended Function
Air Conditioner	Pressure Boundary
Closure Bolting	Leakage Boundary (spatial) Pressure Boundary
Compressor	Pressure Boundary
Condenser	Heat Transfer Pressure Boundary
Damper	Fire Barrier Pressure Boundary
Ductwork	Pressure Boundary Throttle
Fan	Pressure Boundary
Filter	Direct Flow Pressure Boundary
Flex Connectors	Pressure Boundary
Flow Indicator	Pressure Boundary
Heat Exchanger (Control Building HVAC)	Heat Transfer Leakage Boundary (spatial) Pressure Boundary
Piping	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)
Pump	Pressure Boundary
Solenoid Valve	Pressure Boundary
Tubing	Leakage Boundary (spatial) Pressure Boundary
Valve	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)

The AMR results for these component types are provided in Table 3.3.2-11, *Auxiliary Systems – Summary of Aging Management Evaluation – Control Building HVAC System*.

2.3.3.12 Essential Service Water Pumphouse HVAC System

System Description

The purpose of the essential service water pumphouse HVAC system is to provide a suitable environment for operation of the safety-related essential service water pump motors and associated electrical equipment.

A ventilation subsystem, physically independent from the essential service water pumphouse ventilation system, is provided for the ultimate heat sink (UHS) electrical equipment rooms. The purpose of this subsystem is to provide a suitable environment for operation of the safety-related electrical equipment associated with the UHS cooling tower fans.

The essential service water pumphouse HVAC system and the UHS electrical equipment rooms ventilation subsystem consist of supply fans, dampers, and ductwork.

System Intended Functions

The essential service water pumphouse HVAC system provides a suitable environment for operation of the essential service water pumps and the electrical equipment associated with the UHS cooling tower fans. Therefore, the ESW pumphouse HVAC system is within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1).

Portions of the essential service water pumphouse HVAC system are within the scope of license renewal as nonsafety-related affecting safety-related components based on the criterion of 10 CFR 54.4(a)(2) for spatial interaction and structural integrity.

Portions of the essential service water pumphouse HVAC system are within the scope of license renewal to support fire protection requirements based on the criteria of 10 CFR 54.4(a)(3).

Callaway FSAR References

Additional details of the essential service water pumphouse HVAC system are included in FSAR Sections 9.2.1.2 SP and 9.4.8 SP.

License Renewal Boundary Drawings

The license renewal boundary drawing for the essential service water pumphouse HVAC system is listed below:
LR-CW-GD- M-U2GD01

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.3.3-12 - *Essential Service Water Pumphouse HVAC System*.

Table 2.3.3-12 Essential Service Water Pumphouse HVAC System

Component Type	Intended Function
Closure Bolting	Pressure Boundary
Damper	Pressure Boundary
Ductwork	Filter Pressure Boundary Throttle
Fan	Pressure Boundary
Flex Connectors	Pressure Boundary
Piping	Leakage Boundary (spatial) Structural Integrity (attached)

The AMR results for these component types are provided in Table 3.3.2-12, *Auxiliary Systems – Summary of Aging Management Evaluation – Essential Service Water Pumphouse HVAC System*.

2.3.3.13 Auxiliary Building HVAC System

System Description

The purpose of the auxiliary building HVAC system is to maintain a suitable environment for safety-related equipment under both normal conditions and design basis events. Portions of the auxiliary building HVAC system serve to collect and process airborne particulates in the auxiliary building and exhaust the air purged from the containment via the containment hydrogen control system.

The auxiliary building ventilation system consists of dampers, ductwork, fan housing, filters, heat exchangers, piping, pump, and valves.

System Intended Functions

The auxiliary building HVAC system provides isolation of the auxiliary building and maintains a suitable environment for safety-related equipment in the auxiliary building under both normal conditions and design basis events. Therefore, the auxiliary building HVAC system is within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1).

Portions of the auxiliary building HVAC system are in scope as nonsafety-related affecting safety-related components based upon the criterion of 10 CFR 54.4(a)(2) for spatial interaction and structural integrity.

Portions of the auxiliary building HVAC system are required to support fire protection and environmental qualification requirements based upon the criteria of 10 CFR 54.4(a)(3).

Callaway FSAR References

Additional details of the auxiliary building HVAC system are included in
FSAR Section 9.4.3 SP.

License Renewal Boundary Drawings

The license renewal boundary drawings for the auxiliary building HVAC system are listed below:
LR-CW-GL-M-22GL01
LR-CW-GL-M-22GL02
LR-CW-GL-M-22GL03

Component-Function Relationship Table

The component types subject to aging management review are indicated in
Table 2.3.3-13 - *Auxiliary Building HVAC System*.

Table 2.3.3-13 Auxiliary Building HVAC System

Component Type	Intended Function
Closure Bolting	Pressure Boundary
Damper	Fire Barrier Pressure Boundary
Ductwork	Pressure Boundary Throttle
Fan	Pressure Boundary
Flex Connectors	Pressure Boundary
Heat Exchanger (Aux Bldg HVAC)	Heat Transfer Leakage Boundary (spatial) Pressure Boundary
Piping	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)
Pump	Leakage Boundary (spatial)

Table 2.3.3-13 Auxiliary Building HVAC System (Continued)

Component Type	Intended Function
Tubing	Leakage Boundary (spatial) Pressure Boundary
Valve	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)

The AMR results for these component types are provided in Table 3.3.2-13, *Auxiliary Systems – Summary of Aging Management Evaluation – Auxiliary Building HVAC System*.

2.3.3.14 Fuel Building HVAC System

System Description

The purpose of the fuel building HVAC system is to provide conditioned outside air for ventilation and cooling or heating, as required, to all areas of the fuel building. The fuel building and auxiliary building share common ventilation exhaust system for normal and emergency operation. The normal exhaust portion of the system exhausts air from the area above the spent fuel pool during normal operation and provides a means of purging smoke following a postulated fire. Actuation of the fuel building isolation signal or safety injection signal shuts down the normal exhaust system and isolates the nonessential portion of the fuel building HVAC system. In the event of a fuel handling accident, the emergency exhaust portion of the system collects and processes the airborne particulates in the fuel building. In the event of a LOCA, the emergency exhaust portion of the system processes the atmosphere of the auxiliary building. The pump room coolers portion of the system provides a suitable ambient temperature for the electric motor drives of the safety-related spent fuel pool cooling pumps.

The fuel building HVAC system consists of the fuel building supply system which includes the fuel building heating coil unit, the fuel building supply air handlers, and the fuel handling area cooling coil; the emergency exhaust system which includes the emergency exhaust heating coil, and the emergency filter absorber units, the emergency exhaust fans, radiation monitors, dampers and ductwork; the auxiliary/fuel building normal exhaust system; the spent fuel pool cooling pump room coolers; and the various space heaters.

System Intended Functions

The fuel building HVAC system provides a suitable environment for the operation of the safety-related spent fuel pool cooling pumps. The fuel building HVAC system also isolates the fuel building HVAC and provides a flow path for the control of radioactivity release through the emergency exhaust system during a fuel handling accident. Therefore, the fuel building HVAC system is within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1).

Portions of the fuel building HVAC system are within the scope of license renewal as nonsafety-related affecting safety-related components based on the criterion of 10 CFR 54.4(a)(2) for spatial interaction and for structural integrity.

Portions of the fuel building HVAC system are within the scope of license renewal to support fire protection requirements based on the criteria of 10 CFR 54.4(a)(3).

Callaway FSAR References

Additional details of the fuel building HVAC system are included in FSAR Sections 9.4.2 SP and 9.4.3 SP.

License Renewal Boundary Drawings

The license renewal boundary drawings for the fuel building HVAC system are listed below:
LR-CW-GG- M-22GG01
LR-CW-GG- M-22GG02

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.3.3-14 - *Fuel Building HVAC System*.

Table 2.3.3-14 Fuel Building HVAC System

Component Type	Intended Function
Closure Bolting	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)
Damper	Fire Barrier Pressure Boundary
Ductwork	Pressure Boundary
Fan	Pressure Boundary
Filter	Pressure Boundary
Flex Connectors	Pressure Boundary
Flow Indicator	Pressure Boundary
Heat Exchanger (Fuel Bldg HVAC)	Heat Transfer Leakage Boundary (spatial) Pressure Boundary

Table 2.3.3-14 Fuel Building HVAC System (Continued)

Component Type	Intended Function
Piping	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)
Pump	Leakage Boundary (spatial) Pressure Boundary
Solenoid Valve	Pressure Boundary
Tubing	Leakage Boundary (spatial) Pressure Boundary
Valve	Leakage Boundary (spatial) Pressure Boundary

The AMR results for these component types are provided in Table 3.3.2-14, *Auxiliary Systems – Summary of Aging Management Evaluation – Fuel Building HVAC System.*

2.3.3.15 Miscellaneous Buildings HVAC System

System Description

The purpose of the miscellaneous buildings HVAC system is to provide conditioned outside air from the auxiliary building ventilation system for cooling or heating as required to the tendon access gallery, outside air for ventilation and cooling or heating for the main steam enclosure building, a suitable atmosphere for personnel and equipment within the access tunnel and auxiliary boiler room, suitable ambient conditions in the auxiliary feedwater pump room for the electric motor drivers and safety-related motor driven auxiliary feedwater pumps, and heating for the refueling water storage tank valve house, the reactor makeup water storage tank valve house, and the condensate and demineralized water pipe tunnels.

The miscellaneous buildings HVAC system contains safety-related auxiliary feedwater pump room coolers, dampers, piping and valves. The miscellaneous buildings HVAC system also contains nonsafety-related ductwork, dampers, piping, valves, pumps and heat exchangers that are located within safety-related areas.

System Intended Functions

The miscellaneous buildings HVAC system provides a suitable ambient environment for the electric motor drivers in the motor-driven auxiliary feedwater pump rooms and provides the capability to isolate HVAC system penetrations of the auxiliary building boundary to ensure safety-related HVAC system functions are not compromised. Therefore, the miscellaneous buildings HVAC system is within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1).

Portions of the miscellaneous buildings HVAC system are within the scope of license renewal as nonsafety-related affecting safety-related components based on the criterion of 10 CFR 54.4(a)(2) for spatial interaction and structural integrity.

Portions of the miscellaneous buildings HVAC system are within the scope of license renewal to support fire protection and environmental qualification requirements based upon the criteria of 10 CFR 54.4(a)(3).

Callaway FSAR References

Additional details of the miscellaneous buildings HVAC system are included in FSAR Section 9.4.3 SP.

License Renewal Boundary Drawings

The license renewal boundary drawing for the miscellaneous buildings HVAC system is listed below:
LR-CW-GF-M-22GF01

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.3.3-15 - *Miscellaneous Buildings HVAC System*.

Table 2.3.3-15 Miscellaneous Buildings HVAC System

Component Type	Intended Function
Closure Bolting	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)
Damper	Pressure Boundary
Ductwork	Pressure Boundary
Fan	Pressure Boundary
Flex Connectors	Pressure Boundary
Heat Exchanger (Aux Feedwater Room)	Heat Transfer Pressure Boundary
Heat Exchanger (Main Steam Enc. Bldg.)	Leakage Boundary (spatial)
Piping	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)
Tubing	Leakage Boundary (spatial) Pressure Boundary
Valve	Leakage Boundary (spatial) Pressure Boundary

The AMR results for these component types are provided in Table 3.3.2-15, *Auxiliary Systems – Summary of Aging Management Evaluation – Miscellaneous Buildings HVAC System*.

2.3.3.16 Diesel Generator Building HVAC System

System Description

The purpose of the diesel generator building HVAC system is to provide combustion air and cooling for the diesel generators, using outside air as the medium. Outside air is supplied to the building, circulated, and is returned outside through exhaust louvers. In the event of a fire, heat and smoke venting for each diesel generator room is provided utilizing the exhaust flow path. In an emergency, the exhaust air flow path is a backup source for combustion air. Each diesel generator room is provided with a separate ventilation system. Nonsafety-related electric unit heaters are provided in each room for space heating.

The diesel generator building HVAC system consists of safety-related supply fans, dampers, and connecting ductwork. Nonsafety-related electric unit heaters are provided in each room for space heating.

The ventilation air supply and exhaust louvers for the diesel generator building HVAC system are evaluated as structural components in Section 2.4.5, *Diesel Generator Building*.

System Intended Functions

The diesel generator building HVAC system provides combustion air and a suitable environment for operation of the diesel generators during design basis events. Therefore, the diesel generator building HVAC system is within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1).

Portions of the diesel generator building HVAC system are within the scope of license renewal to support fire protection requirements based on the criterion of 10 CFR 54.4(a)(3).

Callaway FSAR References

Additional details of the diesel generator building HVAC system are included in FSAR Section 9.4.7 SP and Appendix 9.5B SP.

License Renewal Boundary Drawings

The license renewal drawing for the diesel generator building HVAC system is listed below:
LR-CW-GM-M-22GM01

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.3.3-16 – *Diesel Generator Building HVAC System*.

Table 2.3.3-16 Diesel Generator Building HVAC System

Component Type	Intended Function
Closure Bolting	Pressure Boundary
Damper	Pressure Boundary
Ductwork	Filter Pressure Boundary
Fan	Pressure Boundary
Filter	Pressure Boundary
Flex Connectors	Pressure Boundary
Valve	Pressure Boundary

The AMR results for these component types are provided in Table 3.3.2-16, *Auxiliary Systems – Summary of Aging Management Evaluation – Diesel Generator Building HVAC System*.

2.3.3.17 Radwaste Building HVAC System

System Description

The purpose of the radwaste building HVAC system is to provide a suitable environment for equipment and for personnel occupation. The radwaste building ventilation system is nonsafety-related and performs no safety-related functions.

The portion of the radwaste building HVAC system within the scope of license renewal consists of the exhaust filter adsorber, unit charcoal filter, fire suppression piping and fusible-link actuated fire dampers in various locations in the system.

System Intended Functions

The radwaste building HVAC system performs no safety-related function. Failure of any radwaste building ventilation system component will not prevent the satisfactory accomplishment of any safety-related functions.

Portions of the radwaste building HVAC system are within the scope of license renewal to support fire protection requirements based upon the criteria of 10 CFR 54.4(a)(3).

Callaway FSAR References

Additional details of the radwaste HVAC system are included in FSAR Sections 9.4.5 SP, 9.5.1 SP, and Appendix 9.5A SP.

License Renewal Boundary Drawings

The license renewal drawings for the radwaste HVAC system are listed below:
LR-CW-GH-M-22GH01
LR-CW-GH-M-22GH02

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.3.3-17 - *Radwaste Building HVAC System*.

Table 2.3.3-17 Radwaste Building HVAC System

Component Type	Intended Function
Damper	Fire Barrier
Piping	Pressure Boundary

The AMR results for these component types are provided in Table 3.3.2-17, *Auxiliary Systems – Summary of Aging Management Evaluation – Radwaste Building HVAC System*.

2.3.3.18 Turbine Building HVAC System

System Description

The purpose of the turbine building HVAC system is to provide outside air for heating, ventilation and cooling for various rooms and areas of the turbine building and the communication corridor. Portions of the turbine building HVAC system provide isolation of the auxiliary building (plant vent) following a design basis event and are safety-related.

The turbine building HVAC system consists of the main building heating and ventilation systems, the lube oil room ventilation and heating system, the computer room HVAC system, the conference room HVAC system, the condenser air removal filtration system, the battery room ventilation and cooling system, and the electrohydraulic controls cabinet room air-conditioning system. The computer room and the conference room are part of the communication corridor.

The portions of the turbine building HVAC system within the scope of license renewal consist of condenser air removal filtration system isolation dampers and associated ductwork, and various fire dampers.

System Intended Functions

The turbine building HVAC system provides capability to isolate HVAC system penetrations of the auxiliary building boundary following a design basis event to control gaseous radioactive release. Therefore, the turbine building HVAC system is within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1).

Portions of the turbine building HVAC system are within the scope of license renewal to support fire protection and environmental qualification requirements based on the criteria of 10 CFR 54.4(a)(3).

Callaway FSAR References

Additional details of the turbine building HVAC system are included in FSAR Sections 9.4.4 SP and 10.4.2 SP.

License Renewal Boundary Drawings

The license renewal drawings for the turbine building HVAC system are listed below:
LR-CW-GE-M-22GE01
LR-CW-GE-M-22GE02
LR-CW-GE-M-22GE03
LR-CW-GE-M-22GE04
LR-CW-GE-M-22GE05

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.3.3-18 - *Turbine Building HVAC System*.

Table 2.3.3-18 Turbine Building HVAC System

Component Type	Intended Function
Closure Bolting	Pressure Boundary
Damper	Fire Barrier Pressure Boundary
Ductwork	Pressure Boundary
Piping	Pressure Boundary
Valve	Pressure Boundary

The AMR results for these component types are provided in Table 3.3.2-18, *Auxiliary Systems – Summary of Aging Management Evaluation – Turbine Building HVAC System.*

2.3.3.19 Containment Cooling System

System Description

The purpose of the containment cooling system is to maintain a suitable atmosphere for equipment located within the containment during normal operation. During a design basis event, the purpose of the containment cooling system is to remove heat from the containment and to provide mixing of the containment atmosphere to prevent pockets of hydrogen from forming. The system is cooled by the essential service water system during both normal and accident conditions.

The containment cooling system consists of safety-related heat exchangers, fans, piping and valves. In addition, the containment cooling system contains nonsafety-related piping that is located in safety-related areas.

System Intended Functions

The containment cooling system provides containment isolation, heat removal and control of containment atmosphere. Therefore, the containment cooling system is within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1).

Portions of the containment cooling system are within the scope of license renewal as nonsafety-related affecting safety-related components based on the criterion of 10 CFR 54.4(a)(2) for spatial interaction and structural integrity.

Portions of the containment cooling system are within the scope of license renewal to support fire protection and environmental qualification requirements based on the criteria of 10 CFR 54.4(a)(3).

Callaway FSAR References

Additional details of the containment cooling system are included in FSAR Section 6.2.2.2 SP.

License Renewal Boundary Drawings

The license renewal drawing for the containment cooling system is listed below:
LR-CW-GN-M-22GN01

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.3.3-19 - *Containment Cooling System*.

Table 2.3.3-19 Containment Cooling System

Component Type	Intended Function
Closure Bolting	Leakage Boundary (spatial) Pressure Boundary
Fan	Pressure Boundary
Flex Connectors	Pressure Boundary
Heat Exchanger (Containment Fan Cooling Coil)	Heat Transfer Pressure Boundary
Heat Exchanger Housing	Pressure Boundary
Instrument Bellows	Pressure Boundary
Piping	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)
Thermowell	Pressure Boundary
Tubing	Leakage Boundary (spatial) Pressure Boundary
Valve	Pressure Boundary

The AMR results for these component types are provided in Table 3.3.2-19, *Auxiliary Systems – Summary of Aging Management Evaluation – Containment Cooling System*.

2.3.3.20 Fire Protection System

System Description

The purpose of the fire protection system is to provide the capability to detect, alarm, control, and extinguish any fire or probable combinations of fires which might occur within the plant area. Fire detection devices are provided throughout the plant area to detect fire and alert the control room operators by activation of fire alarms. In plant areas where toxic inert gas is used for fire protection, personnel alarms are provided in accordance with the national fire codes. The fire protection system minimizes the effects of fire on plant structures, systems, and components important to safety to the extent that a fire will not compromise the ability to achieve safe shutdown of the plant.

The fire protection system consists of two 300,000 gallon storage tanks, two 1500 gallons per minute diesel engine-driven fire water pumps, one 1500 gallons per minute electric motor-driven fire pump, hydrants, hose stations, underground power block loop, an interconnected fire water distribution system within the turbine, auxiliary, fuel and containment buildings, wet-pipe sprinklers, deluge valves, post indicating valves and piping, halon 1301 storage cylinders, distribution piping and discharge nozzles. The safety-related components at the containment penetration are included in this system.

The fire detection and actuation portion of the system is evaluated as part of the electrical and instrumentation and control evaluations in Section 2.5, *Scoping and Screening Results: Electrical and Instrumentation and Control Systems*. Except where specifically identified, fire dampers are evaluated as part of the assigned HVAC systems. Other passive fire barriers are screened as part of their associated structures in Section 2.4, *Scoping and Screening Results: Structures*. Fire suppression piping components for the fuel building ventilation charcoal filter elements and control room ventilation charcoal filter elements are evaluated as part of their associated heating, ventilation and air conditioning systems. Containment penetrations are evaluated as part of the reactor building structure in Section 2.4.1, *Reactor Building*.

System Intended Functions

The fire protection system provides containment isolation at a containment penetration. Therefore, the fire protection system is within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1).

Portions of the fire protection system are within the scope of license renewal as nonsafety-related affecting safety-related components based on the criterion of 10 CFR 54.4(a)(2) for structural integrity.

Portions of the fire protection system are within the scope of license renewal to support fire protection requirements and environmental qualification requirements based upon the criteria of 10 CFR 54.4(a)(3).

Callaway FSAR References

Additional details of the fire protection system are included in FSAR Section 9.5.1 SP.

License Renewal Boundary Drawings

The license renewal boundary drawings for the fire protection system are listed below:
LR-CW-KC-M-22KC01
LR-CW-KC-M-22KC02
LR-CW-KC-M-22KC03
LR-CW-KC-M-22KC04
LR-CW-KC-M-22KC05
LR-CW-KC-M-22KC06
LR-CW-KC-M-22KC07
LR-CW-KC-M-22KC08
LR-CW-KC-X-89633
LR-CW-KC-X-89634
LR-CW-KC-X-89635

LR-CW-KC-X-89636
LR-CW-KC-X-89637
LR-CW-KC-X-89638
LR-CW-KC-X-89639
LR-CW-KC-X-89640
LR-CW-KC-X-89641

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.3.3-20 – *Fire Protection System*.

Table 2.3.3-20 Fire Protection System

Component Type	Intended Function
Closure Bolting	Pressure Boundary
Expansion Joint	Pressure Boundary
Filter	Pressure Boundary
Filter (Halon)	Pressure Boundary
Flame Arrestor	Pressure Boundary
Flexible Hoses	Pressure Boundary
Flow Element	Pressure Boundary
Flow Orifice	Pressure Boundary
Heat Exchanger (DFP Jacket Water)	Pressure Boundary
Hose Station	Pressure Boundary
Hydrant	Pressure Boundary
Piping	Pressure Boundary Structural Integrity (attached)
Piping (Halon)	Pressure Boundary
Pump	Pressure Boundary
Silencer	Pressure Boundary
Solenoid Valve	Pressure Boundary
Solenoid Valve (Halon)	Pressure Boundary

Table 2.3.3-20 Fire Protection System (Continued)

Component Type	Intended Function
Spray Nozzle	Spray
Spray Nozzle (Halon)	Spray
Strainer	Pressure Boundary
Tank	Pressure Boundary
Tank (Halon)	Pressure Boundary
Tubing	Pressure Boundary
Valve	Pressure Boundary Structural Integrity (attached)
Valve (Halon)	Pressure Boundary

The AMR results for these component types are provided in Table 3.3.2-20, *Auxiliary Systems – Summary of Aging Management Evaluation – Fire Protection System*.

2.3.3.21 Emergency Diesel Engine Fuel Oil Storage and Transfer System

System Description

The purpose of the emergency diesel engine fuel oil storage and transfer system is to provide onsite storage and transfer of fuel oil to the emergency diesel engines. Each of the two diesel engines has its own system. Each underground storage tank is sized to be capable of providing fuel oil to its associated emergency diesel engine for seven days of operation at rated continuous engine output power.

The emergency diesel engine fuel oil storage and transfer system for each diesel engine has an underground storage tank with a transfer pump, day tank, strainers, piping, tubing, valves, instruments and controls.

System Intended Functions

The emergency diesel engine fuel oil storage and transfer system provides onsite storage and delivery of fuel oil for the operation of the emergency diesel engines which provide capability to safely shut down the reactor and maintain it in a safe condition. Therefore, the emergency diesel engine fuel oil storage and transfer system is within the scope of license renewal based upon the criteria of 10 CFR 54.4(a)(1).

Portions of the emergency diesel engine fuel oil storage and transfer system are within the scope of license renewal as nonsafety-related affecting safety-related components based on the criterion of 10 CFR 54.4(a)(2) for spatial interaction and structural integrity.

Portions of the emergency diesel engine fuel oil storage and transfer system are within the scope of license renewal to support fire protection and environmental qualification requirements based upon the criteria of 10 CFR 54.4(a)(3).

Callaway FSAR References

Additional details of the emergency diesel engine fuel oil storage and transfer system are included in FSAR Section 9.5.4 SP.

License Renewal Boundary Drawings

The license renewal boundary drawing for the emergency diesel engine fuel oil storage and transfer system is listed below:
LR-CW-JE-M-22JE01

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.3.3-21 – *Emergency Diesel Engine Fuel Oil Storage and Transfer System*.

Table 2.3.3-21 Emergency Diesel Engine Fuel Oil Storage and Transfer System

Component Type	Intended Function
Closure Bolting	Leakage Boundary (spatial) Pressure Boundary
Flame Arrestor	Leakage Boundary (spatial) Structural Integrity (attached)
Flow Element	Pressure Boundary
Piping	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)
Pump	Pressure Boundary
Sight Gauge	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)
Strainer	Filter Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)
Tank	Pressure Boundary

Table 2.3.3-21 Emergency Diesel Engine Fuel Oil Storage and Transfer System (Continued)

Component Type	Intended Function
Tubing	Pressure Boundary
Valve	Leakage Boundary (spatial), Pressure Boundary, Structural Integrity (attached)

The AMR results for these component types are provided in Table 3.3.2-21, *Auxiliary Systems – Summary of Aging Management Evaluation – Emergency Diesel Engine Fuel Oil Storage and Transfer System*.

2.3.3.22 Standby Diesel Generator Engine System

System Description

The purpose of the standby diesel generator engine system is to provide a standby power source to the 4.16 kV bus for the operation of engineered safety features and emergency systems during and following a reactor shutdown when offsite power sources are not available.

The standby diesel generator engine system contains several subsystems. These include the diesel generator cooling water system, starting system, lubrication system, and combustion air intake and exhaust system.

<u>Diesel Generator Cooling Water System</u>

The purpose of the diesel generator cooling water system is to circulate sufficient quantities of cooling water to dissipate heat given off by the air coolers, governor oil and lube oil cooler, and engine water jackets, under full load conditions.

The system consists of pumps, heat exchangers, heaters, tanks, piping, valves, and governor lube oil cooler.

<u>Diesel Generator Starting System</u>

The purpose of the diesel generator starting system is to start the diesel engine using compressed air. Each diesel generator is provided with two starting air systems.

The diesel starting system consists of air dryers, air accumulators, associated piping and valves.

Diesel Generator Lubrication System

The purpose of the diesel generator lubrication system is to provide a self-contained lube oil system for each diesel generator engine.

The system consists of pumps, heat exchangers, heaters, tanks, filters, strainers, piping, and valves.

Diesel Generator Combustion Air Intake and Exhaust System

The purpose of the diesel generator combustion air intake and exhaust system is to supply the diesel generator engine with a sufficient quantity of combustion air and then discharge the exhaust gases.

The diesel generator combustion air intake and exhaust system consists of combustion air intake filters and silencers, exhaust silencers, combustion air manifold, exhaust manifolds, turbocharger, associated piping and valves.

Each emergency diesel engine has its own fuel oil storage and transfer system which is evaluated in Section 2.3.3.21, *Emergency Diesel Engine Fuel Oil Storage and Transfer System*.

System Intended Functions

The standby diesel generator engine system provides onsite emergency AC power for equipment that acts to shutdown the reactor and maintains it in a safe shutdown condition. Therefore, the standby diesel generator engine system is within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1).

Portions of the standby diesel generator engine system are within the scope of license renewal as nonsafety-related affecting safety-related components based on the criterion of 10 CFR 54.4(a)(2) for spatial interaction and structural integrity.

Portions of the standby diesel generator engine system are within the scope of license renewal to support fire protection, environmental qualification, and station blackout requirements based upon the criteria of 10 CFR 54.4(a)(3).

Callaway FSAR References

Additional details of the standby diesel generator engine system are included in FSAR Sections 8.3.1.1.3 SP, 9.5.5 SP, 9.5.6 SP, 9.5.7 SP, and 9.5.8 SP.

License Renewal Boundary Drawings

The license renewal boundary drawings for the standby diesel generator engine system are listed below:

LR-CW-KJ-M-22KJ01
LR-CW-KJ-M-22KJ02
LR-CW-KJ-M-22KJ03
LR-CW-KJ-M-22KJ04
LR-CW-KJ-M-22KJ05
LR-CW-KJ-M-22KJ06

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.3.3-22 – *Standby Diesel Generator Engine System*.

Table 2.3.3-22 Standby Diesel Generator Engine System

Component Type	Intended Function
Closure Bolting	Leakage Boundary (spatial) Pressure Boundary
Compressor	Leakage Boundary (spatial)
Dryer	Structural Integrity (attached)
Expansion Joint	Pressure Boundary
Filter	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)
Flex Connectors	Pressure Boundary
Flow Orifice	Pressure Boundary Throttle
Heat Exchanger (DG Aftercooler)	Leakage Boundary (spatial) Structural Integrity (attached)
Heat Exchanger (DG Intercooler)	Heat Transfer Pressure Boundary
Heat Exchanger (DG Jacket Water)	Heat Transfer Pressure Boundary
Heat Exchanger (DG Lube Oil)	Heat Transfer Pressure Boundary
Heater	Pressure Boundary
Insulation	Insulate (Mechanical)
Piping	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)
Pump	Pressure Boundary

Table 2.3.3-22 Standby Diesel Generator Engine System (Continued)

Component Type	Intended Function
Sight Gauge	Leakage Boundary (spatial) Structural Integrity (attached)
Silencer	Pressure Boundary
Solenoid Valve	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)
Strainer	Pressure Boundary
Strainer Element	Filter
Tank	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)
Thermowell	Pressure Boundary
Trap	Leakage Boundary (spatial) Structural Integrity (attached)
Tubing	Pressure Boundary
Valve	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)
Vent	Leakage Boundary (spatial)

The AMR results for these component types are provided in Table 3.3.2-22, *Auxiliary Systems – Summary of Aging Management Evaluation – Standby Diesel Generator Engine System*.

2.3.3.23 EOF and TSC Diesels, Security Building System

System Description

The purpose of the EOF and TSC Diesels, Security Building system is to provide backup power to the emergency operations facility (EOF), technical support center (TSC) and security building. Also included is mechanical equipment supporting several nonsafety-related buildings.

The EOF and TSC Diesels, Security Building system includes the diesel generators and the supporting subsystems for each of the emergency operations facility (EOF), technical support center (TSC), and security building. The EOF, TSC and Security Building system is nonsafety-related.

The diesel generator for the security building is also relied upon to supply backup AC power to support station blackout.

The portion of the EOF and TSC Diesels, Security Building system within the scope of license renewal consists of a skid-mounted security diesel generator, exhaust piping, muffler and rain cap, fuel lines, day tank, day tank vent/piping and drain valve/piping.

System Intended Functions

Portions of the EOF and TSC Diesels, Security Building system are within the scope of license renewal to support station blackout requirements based on the criteria of 10 CFR 54.4(a)(3).

Callaway FSAR References

Additional details of the EOF and TSC Diesels, Security Building system are included in FSAR Sections 8.3.1.1.1 SP and 8.3A.4.A SP.

License Renewal Boundary Drawings

The license renewal boundary drawing for the EOF and TSC Diesels, Security Building system is listed below:
LR-CW-UB-8600-X-89888

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.3.3-23 – *EOF and TSC Diesels, Security Building System*.

Table 2.3.3-23 – EOF and TSC Diesels, Security Building System

Component Type	Intended Function
Closure Bolting	Pressure Boundary
Expansion Joint	Pressure Boundary
Flame Arrestor	Pressure Boundary
Flexible Hoses	Pressure Boundary
Piping	Pressure Boundary
Silencer	Pressure Boundary

Table 2.3.3-23 – EOF and TSC Diesels, Security Building System (Continued)

Component Type	Intended Function
Tank	Pressure Boundary
Valve	Pressure Boundary

The AMR results for these component types are provided in Table 3.3.2-23, *Auxiliary Systems – Summary of Aging Management Evaluation – EOF and TSC Diesels, Security Building System*.

2.3.3.24 Liquid Radwaste System

System Description

The purpose of the liquid radwaste system is to collect, segregate, process, and recycle both the reactor grade and non-reactor grade liquid wastes during plant power, refueling, and maintenance operations. Specifically, it handles potentially radioactive floor and equipment drains, laundry, and chemical waste. The system serves to minimize the release of fission products following a loss of coolant accident or fuel handling accident, provides part of the safety-related pressure boundary of the component cooling water system, and provides containment isolation.

The liquid radwaste system consists of several tanks and pumps, an evaporator, heat exchanger, demineralizers, charcoal adsorbers, filters, and a reverse osmosis unit.

System Intended Functions

The liquid radwaste system serves to minimize the release of fission products following a loss of coolant accident or fuel handling accident, provides part of the safety-related pressure boundary of the component cooling water system, and provides containment isolation. Therefore, the liquid radwaste system is within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1).

Portions of the liquid radwaste system are within the scope of license renewal as nonsafety-related affecting safety-related components based on the criterion of 10 CFR 54.4(a)(2) for spatial interaction and structural integrity.

Portions of the liquid radwaste system are within the scope of license renewal to support environmental qualification requirements based upon the criteria of 10 CFR 54.4(a)(3).

Callaway FSAR References

Additional details of the liquid radwaste system are included in FSAR Sections 3.11(B)-9 SP, 6.2.4 SP, and 11.2 SP.

License Renewal Boundary Drawings

The license renewal drawings for the liquid radwaste system are listed below:
LR-CW-BB-M-22BB02
LR-CW-HB-M-22HB01
LR-CW-HB-M-22HB03

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.3.3-24 – *Liquid Radwaste System*.

Table 2.3.3-24 Liquid Radwaste System

Component Type	Intended Function
Closure Bolting	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)
Flow Element	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached) Throttle
Heat Exchanger (RCDT Heat Exchanger)	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)
Instrument Bellows	Leakage Boundary (spatial) Structural Integrity (attached)
Piping	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)
Pump	Leakage Boundary (spatial) Structural Integrity (attached)
Tank	Leakage Boundary (spatial) Structural Integrity (attached)
Thermowell	Leakage Boundary (spatial) Pressure Boundary
Tubing	Leakage Boundary (spatial) Pressure Boundary
Valve	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)

The AMR results for these component types are provided in Table 3.3.2-24, *Auxiliary Systems – Summary of Aging Management Evaluation – Liquid Radwaste System*.

2.3.3.25 Decontamination System

System Description

The purpose of the decontamination system is to provide for on-site cleaning of contaminated equipment and clothing. Except for an associated containment penetration, the decontamination system does not provide any safety-related function and is not required for a safe shutdown.

The decontamination system consists of cask washdown pit spray nozzles, wash tanks, filters, pump, spray booth, ultrasonic generator, and associated piping and valves. The system includes the laundry decontamination facility which includes clothes washers and dryers.

The decontamination system includes a containment penetration to introduce steam into containment for the in-place decontamination of the portions of the refueling pool, reactor vessel head, and reactor vessel head laydown area located in containment. The system also includes provisions for the decontamination of spent fuel shipping casks after they are loaded with spent fuel.

System Intended Functions

The decontamination system provides the function of containment integrity. Therefore, the decontamination system is within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1).

Portions of the decontamination system are within the scope of license renewal as nonsafety-related affecting safety-related components based on the criterion of 10 CFR 54.4(a)(2) for spatial interaction and structural integrity.

Portions of the decontamination system are within the scope of license renewal to support environmental qualification requirements based on the criteria of 10 CFR 54.4(a)(3).

Callaway FSAR References

Additional details of the decontamination system are included in FSAR Section 12.3.1.1.2 SP and Tables 6.2.4-1 SP and 18.2-2 (Sheet 2) SP.

License Renewal Boundary Drawings

The license renewal drawings for the decontamination system are listed below:
LR-CW-BL-M-22BL01
LR-CW-BN-M-22BN01

LR-CW-AB-M-22FB02
LR-CW-HD-M-22HD01

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.3.3-25 - *Decontamination System*.

Table 2.3.3-25 Decontamination System

Component Type	Intended Function
Closure Bolting	Leakage Boundary (spatial) Structural Integrity (attached)
Piping	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)
Spray Nozzle	Leakage Boundary (spatial)
Valve	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)

The AMR results for these component types are provided in Table 3.3.2-25, *Auxiliary Systems – Summary of Aging Management Evaluation – Decontamination System*.

2.3.3.26 Oily Waste System

System Description

The purpose of the oily waste system is to collect nonradioactive waste water from areas where oil may be present for processing and disposal and collect waste water that may contain oil and/or trace amounts of radioactive contaminants for processing and recycling. The mechanical portions of the oily waste system are nonsafety and perform no safety-related functions.

The portions of the oily waste system within the scope of license renewal consist of sumps, sump pumps, piping, valves, and control and instrumentation equipment located in the diesel generator building, auxiliary building, control building and the tendon access gallery.

The safety-related portion of the oily waste system for leak detection in the diesel generator rooms is evaluated as part of the electrical and instrumentation and control evaluation in Section 2.5, *Scoping and Screening Results: Electrical and Instrumentation and Control Systems*.

System Intended Functions

Portions of the oily waste system are within the scope of license renewal as nonsafety-related affecting safety-related components based on the criterion of 10 CFR 54.4(a)(2) for spatial interaction.

Portions of the oily waste system are within the scope of license renewal to support fire protection requirements based upon the criteria of 10 CFR 54.4(a)(3).

Callaway FSAR References

Additional details of the oily waste system are included in FSAR Sections 9.3.3 SP, 9.5.1 SP, and Appendices 9.5A SP and 9.5B SP.

License Renewal Boundary Drawings

The license renewal drawings for the oily waste system are listed below:
LR-CW-LE-M-22LE01
LR-CW-LE-M-22LE02
LR-CW-LE-M-22LE04

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.3.3-26 – *Oily Waste System*.

Table 2.3.3-26 Oily Waste System

Component Type	Intended Function
Closure Bolting	Leakage Boundary (spatial)
Piping	Leakage Boundary (spatial) Pressure Boundary
Pump	Leakage Boundary (spatial) Pressure Boundary
Tank	Leakage Boundary (spatial)
Valve	Leakage Boundary (spatial) Pressure Boundary

The AMR results for these component types are provided in Table 3.3.2-26, *Auxiliary Systems – Summary of Aging Management Evaluation – Oily Waste System*.

2.3.3.27 Floor and Equipment Drainage System

System Description

The purpose of the floor and equipment drainage system is to collect, monitor, and direct liquid waste generated within the plant to the proper area for processing or disposal. The system also contains and drains away any reactor coolant pump lubricating oil leakage.

Drainage from safety-related rooms is designed to prevent flooding via drainage piping backflow. Safety-related level instrumentation is provided in the residual heat removal pump room sumps, the auxiliary building sump, the control building sump, and the containment normal sump for the purpose of detecting leakage from safety-related systems following a loss of coolant accident or that could affect the operation of safety-related equipment. Redundant safety-related sump pump discharge isolation valves are provided which isolate on any safety injection signal and prevent discharge of the auxiliary building and residual heat removal pump room potentially radioactive nontritiated waste from leaving the auxiliary building.

The floor and equipment drainage system consists of sumps, pumps, piping, valves, instrumentation for operational control, and two reactor coolant lubricating oil drain tanks.

System Intended Functions

The floor and equipment drainage system supports the functions of containment integrity, and maintenance of vital auxiliaries. Therefore, the floor and equipment drainage system is within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1).

Portions of the floor and equipment drainage system are within the scope of license renewal as nonsafety-related affecting safety-related components based on the criterion of 10 CFR 54.4(a)(2) for spatial interaction, structural integrity, and flood control.

Portions of the floor and equipment drainage system are within the scope of license renewal to support fire protection and environmental qualification requirements based upon the criteria of 10 CFR 54.4(a)(3).

Callaway FSAR References

Additional details of the floor and equipment drainage system are included in FSAR Sections 6.2.4 SP, 9.3.3 SP, and 9.5.1 SP.

License Renewal Boundary Drawings

The license renewal drawings for the floor and equipment drainage system are listed below:
LR-CW-LF-M-22LF01
LR-CW-LF-M-22LF02
LR-CW-LF-M-22LF03

LR-CW-LF-M-22LF04
LR-CW-LF-M-22LF05
LR-CW-LF-M-22LF06
LR-CW-LF-M-22LF07
LR-CW-LF-M-22LF08
LR-CW-LF-M-22LF09
LR-CW-LF-M-22LF10

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.3.3-27 – *Floor and Equipment Drainage System.*

Table 2.3.3-27 Floor and Equipment Drainage System

Component Type	Intended Function
Closure Bolting	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)
Drain	Pressure Boundary
Flame Arrestor	Pressure Boundary
Flexible Hoses	Leakage Boundary (spatial) Pressure Boundary
Piping	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)
Pump	Leakage Boundary (spatial) Structural Integrity (attached)
Sight Gauge	Pressure Boundary
Splash Guard	Direct Flow
Tank	Pressure Boundary
Tubing	Leakage Boundary (spatial) Pressure Boundary
Valve	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)

The AMR results for these component types are provided in Table 3.3.2-27, *Auxiliary Systems – Summary of Aging Management Evaluation – Floor and Equipment Drainage System.*

2.3.3.28 Miscellaneous Systems in scope ONLY for Criterion 10 CFR 54.4(a)(2)

Systems within the scope of license renewal based upon the criterion of 10 CFR 54.4(a)(2) were identified using the methods described in Section 2.1.2.2, *10 CFR 54.4(a)(2) – Nonsafety-Related Affecting Safety-Related*. A review of mechanical systems was performed to identify nonsafety-related systems or nonsafety-related portions of safety-related systems with the potential for adverse spatial interaction with safety-related systems or components. Components subject to aging management review due only to scoping criterion 10 CFR 54.4(a)(2) are evaluated in this section.

The following systems are within the scope of license renewal only based on the criterion of 10 CFR 54.4(a)(2):

- Condensate System
- Demineralized Water Makeup System
- Condensate and Feedwater Chemical Addition System
- Plant Heating System
- Central Chilled Water System
- Gaseous Radwaste System
- Solid Radwaste System
- Boron Recycle System
- Secondary Liquid Waste System
- Domestic Water System
- Sanitary Drainage System
- Roof Drains System
- Chemical and Detergent Waste System

System Descriptions/System Intended Functions

Condensate System

The purpose of the condensate system is to provide a steam cycle heat sink, provide a surge volume and miscellaneous flow collection points, provide for removal of air and non-condensable gasses, provide a source of water to the suction of the main feedwater pumps via the condensate polishers, feedwater heaters or bypass line, provide turbine exhaust hood sprays, provide a cooling medium to the steam generator blowdown regenerative heat exchanger, provide seal water to the condensate and turbine-driven main feedwater pumps and accept steam flow which is bypassed to the main condenser. The condensate system is nonsafety-related and performs no safety-related functions.

The condensate system consists of pumps, valves, piping, heat exchangers and the main condenser. The condensate system, together with the feedwater system, delivers feedwater to the steam generators at the required pressure and temperature. The condensate system interfaces with the condensate demineralizer system, the feedwater system and the main steam system. The condensate system contains nonsafety-related piping and valves that are located within safety-related areas. The condensate system contains nonsafety-related components which are connected to safety-related components.

Portions of the condensate system are within the scope of license renewal as nonsafety-related affecting safety-related components based on the criterion of 10 CFR 54.4(a)(2) for spatial interaction and structural integrity.

Demineralized Water Makeup System

The purpose of the demineralized water makeup and transfer system is to store water for use upon demand for makeup within the plant and to transfer water to various components. For reactor makeup water, a degasifier removes oxygen from the demineralized water as it is transferred. The effluent from several systems which process waste, which can be recycled within the plant, are also passed through the demineralized water makeup and transfer system degasifier before being transferred to the reactor makeup water storage tank. The demineralized water makeup and transfer system is nonsafety and performs no safety-related functions.

The demineralized water makeup and transfer system consists of tanks, pumps, piping and valves. The demineralized water makeup and transfer system contains nonsafety-related piping and valves that are located within safety-related areas. The demineralized water makeup and transfer system contains nonsafety-related components which are connected to safety-related components.

Portions of the demineralized water makeup and transfer system are within the scope of license renewal as nonsafety-related affecting safety-related components based on the criterion of 10 CFR 54.4(a)(2) for spatial interaction and structural integrity.

Condensate and Feedwater Chemical Addition System

The purpose of the condensate and feedwater chemical addition system is to inject hydrazine and ammonia or an alternate amine into the condensate pump discharge downstream of the condensate demineralizers and to inject additional hydrazine and ammonia into the four main feedwater lines connecting with the four steam generators. The condensate and feedwater chemical addition system is nonsafety-related and performs no safety-related functions.

The condensate and feedwater chemical addition system contains nonsafety-related piping located within safety-related areas.

Portions of the condensate and feedwater chemical injection system are within the scope of license renewal as nonsafety affecting safety-related components based on the criterion of 10 CFR 54.4(a)(2) for spatial interaction and structural integrity.

Plant Heating System

The purpose of the plant heating system is to serve as the heating medium for air to provide a suitable environment for personnel and equipment. The plant heating system is nonsafety-related and performs no safety-related functions.

The plant heating system contains nonsafety-related components that are located with safety-related areas including heat exchangers, piping, pumps, tanks, and valves.

Portions of the plant heating system are within the scope of license renewal as nonsafety-related affecting safety-related components based on the criterion of 10 CFR 54.4(a)(2) for spatial interaction.

Central Chilled Water System

The purpose of the central chilled water system is to provide the cooling medium, when required, for equipment and ventilation system cooling coils. The central chilled water system is composed of redundant chilled-water pumps and chillers and a supply and return piping system. The service water system serves as the heat sink for the chillers. The central chilled water system is nonsafety and performs no safety-related functions.

The central chilled water system consists of nonsafety piping, valves and chillers that are attached to safety-related components and nonsafety piping and valves that are located in safety-related areas.

Portions of the central chilled water system are within the scope of license renewal as nonsafety-related affecting safety-related components based on the criterion of 10 CFR 54.4(a)(2) for spatial interaction and structural integrity.

Gaseous Radwaste System

The purpose of the gaseous radwaste system is to accept fission gases removed from radioactive fluids and contain these gases, eliminating the need for regularly scheduled discharge of radioactive gases into the atmosphere during normal plant operation. The gaseous radwaste system is designed to continuously process fission product gases removed from the reactor coolant system and intermittently from other process system sources that contain hydrogen. The major input to the system during normal power operation comes from the gas space in the volume control tank. The system has the capacity for long-term storage. The gaseous radwaste system is nonsafety-related and performs no safety-related functions.

The gaseous radwaste system consists of two waste gas compressor packages, two catalytic hydrogen recombiner packages, six gas decay tanks for normal power operation, and two gas decay tanks for service during startup and shutdown. The system also has a gaseous radwaste drain collection tank, gas decay tank drain pump, four gas traps, and a waste gas drain filter to permit drainage from the system

Portions of the gaseous radwaste system are within the scope of license renewal as nonsafety-related affecting safety-related components based on the criterion of 10 CFR 54.4(a)(2) for spatial interaction and structural integrity.

Solid Radwaste System

The purpose of the solid radwaste system is to collect, process, and package radioactive wastes generated as a result of normal plant operation, including anticipated operational occurrences, and to store this packaged waste until it is shipped offsite to a licensed burial site. The solid radwaste system is nonsafety-related and performs no safety-related functions.

The solid radwaste system consists of components located in the radwaste building with a small number of components located in the auxiliary building and the radwaste tunnel. The portion of the solid radwaste system located in the auxiliary building that is in the scope of license renewal receives spent resins from the chemical and volume control system for processing. The boundary of the portion of the solid radwaste system extends from the volume control system to the point at which the solid radwaste system exits the auxiliary building. The solid radwaste system components which are in the scope of license renewal consist of piping, valves, sight gauges and a tank.

Portions of the solid radwaste system are within the scope of license renewal as nonsafety-related affecting safety-related components based on the criterion of 10 CFR 54.4(a)(2) for spatial interaction.

Boron Recycle System

The purpose of the boron recycle system is to recycle reactor coolant for reuse of boric acid and makeup water. The system decontaminates the effluent by means of demineralization and gas stripping and uses evaporation to separate and recover the boric acid and makeup water. The boron recycle system is nonsafety-related and performs no safety-related functions.

The boron recycle system consists of nonsafety-related components that are located within safety-related areas including piping and valves.

Portions of the boron recycle system are within scope of license as nonsafety-related affecting safety-related components based on the criterion of 10 CFR 54.4(a)(2) for spatial interaction and structural integrity.

Secondary Liquid Waste System

The purpose of the secondary liquid waste system is to process condensate demineralizer regeneration wastes and potentially radioactive liquid waste collected in the turbine building. Processed liquid waste may be reused in the plant or discharged to the environment. The secondary liquid waste system is nonsafety and performs no safety-related functions.

The secondary liquid waste system consists of pumps, valves, piping and tanks. The secondary liquid waste system contains nonsafety-related piping and valves that are located within safety-related areas.

Portions of the secondary liquid waste system are within the scope of license renewal as nonsafety-related affecting safety-related components based on the criterion of 10 CFR 54.4(a)(2) for spatial interaction.

Domestic Water System

The purpose of the domestic water system is to distribute and heat chlorinated potable water for drinking, cooking, showers, lavatories, toilets, and washdown.

The domestic water distribution system consists of instantaneous hot water heaters, hot water circulator, and necessary interconnecting valves and piping. The nonsafety-related domestic water system contains components whose failure could prevent the satisfactory accomplishment of a safety-related function for systems, structures, and components (spatial interaction) in the auxiliary, control, and fuel buildings.

The domestic water system serves no safety function and has no safety design basis.

Portions of the domestic water system are within the scope of license renewal as nonsafety-related affecting safety-related components based on the criterion of 10 CFR 54.4(a)(2) for spatial interaction.

Sanitary Drainage System

The purpose of the sanitary drainage system is to collect non-corrosive, non-radioactive, non-oily liquid wastes and plant sewage from service facilities, pantry facilities, electric water coolers, electric water heaters, clean showers, plumbing fixtures and toilet room floor drains within the non-radioactive areas of the power block. The sanitary drainage system is nonsafety and performs no safety-related functions.

The sanitary drainage system consists of drain piping, fittings, a gas tight sewage sump, a duplex arrangement of sewage sump pumps, discharge valves, discharge piping, sump level control circuitry. The sump and associated components are located in the communications corridor.

Portions of the sanitary drainage system are within scope of license renewal as nonsafety-related affecting safety-related components based on the criterion of 10 CFR 54.4(a)(2) for spatial interaction.

Roof Drains System

The purpose of the roof drains system is to collect water resulting from precipitation on building roofs and convey the water by gravity to the site storm drain system. The roof drains system is nonsafety and performs no safety-related functions.

The roof drains system contains nonsafety piping that is located within safety-related areas.

Portions of the roof drains system are within the scope of license renewal as nonsafety-related affecting safety-related components based on the criterion of 10 CFR 54.4(a)(2) for spatial interaction.

Chemical and Detergent Waste System

The purpose of the chemical and detergent waste system is to collect waste from selected laboratory sinks and washers, recycle evaporator and reagent tank, waste evaporator and reagent tank, secondary liquid waste evaporator and reagent tank, radwaste building sample panel, evaporator bottoms tank overflow, decon showers, and men's showers. These wastes are routed to the detergent drain tank, chemical equipment drain sump, or to the chemical drain tank. The chemical and detergent waste system is nonsafety-related and performs no safety-related functions.

The chemical and detergent waste system consists of nonsafety components that are located within safety-related areas and include a detergent drain tank, two detergent drain-tank pumps, piping and valves.

Portions of the chemical and detergent waste system are within the scope of license renewal as nonsafety-related affecting safety-related components based on the criterion of 10 CFR 54.4(a)(2) for spatial interaction.

Callaway FSAR References

Details of the condensate system are discussed in FSAR Section 10.4.7 SP.

Details of the demineralized water makeup system are discussed in FSAR Sections 9.2.3 SA, 9.2.3 SP, and Tables 9.2-3 SA and 9.2-14 SP.

Details of the condensate and feedwater chemical addition system are discussed in FSAR Section 10.4.7.2.1 SP.

Details of the plant heating system are discussed in FSAR Section 9.4.9 SP.

Details of the central chilled water system are discussed in FSAR Section 9.4.10 SP.

Details of the gaseous radwaste system are discussed in FSAR Section 11.3 SP and Table 3.2-1 SP.

Details of the solid radwaste system are discussed in FSAR Section 11.4 SP.

Details of the boron recycle system are discussed in FSAR Section 9.3.6 SP.

Details of the secondary liquid waste system are discussed in FSAR Sections 1.2.8.9 SP and 10.4.10 SP.

Details of the domestic water system are discussed in FSAR Sections 9.2.4 SP and 9.2.4 SA.

Details of the sanitary drainage system are discussed in FSAR Sections 9.2.4 SP, 9.2.4 SA, 9.3.3.1.2 SP, 9.3.3.2.1.2 SP, 9.3.3.2.2 SP, and Appendix 9.5A SP.

Details of the roof drains system are discussed in FSAR Section 9.3.3 SP and Table 3.2-1 SP.

Details of the chemical and detergent waste system are discussed in FSAR Section 9.3.3 SP.

License Renewal Boundary Drawings

The license renewal boundary drawing for the condensate system is listed below:
LR-CW-AD-M-22AD06

The license renewal boundary drawing for the demineralized water makeup system is listed below:
LR-CW-AN-M-22AN01

The license renewal boundary drawings for the condensate and feedwater chemical addition system are listed below:
LR-CW-AE-M-22AE02
LR-CW-AQ-M-22AQ02

The license renewal boundary drawing for the plant heating system is listed below:
LR-CW-GA-M-22GA02

The license renewal boundary drawing for the central chilled water system is listed below:
LR-CW-GB-M-22GB01

The license renewal boundary drawings for the gaseous radwaste system are listed below:
LR-CW-HA-M-22HA01
LR-CW-HA-M-22HA03

The license renewal boundary drawings for the solid radwaste system are listed below:
LR-CW-BG-M-22BG02
LR-CW-BG-M-22BG04

LR-CW-HC-M-22HC02
LR-CW-HC-M-22HC03
LR-CW-HC-M-22HC04

The license renewal boundary drawings for the boron recycle system are listed below:
LR-CW-HE-M-22HE01
LR-CW-HE-M-22HE03

The license renewal boundary drawings for the secondary liquid waste system are listed below:
LR-CW-HF-M-22HF01
LR-CW-HF-M-22HF02
LR-CW-HF-M-22HF03

The license renewal boundary drawings for the domestic water system are listed below:
LR-CW-KD-M-22KD01
LR-CW-KD-M-22KD02

The license renewal boundary drawing for the sanitary drainage system is listed below:
LR-CW-LA-M-22LA02

The license renewal boundary drawings for the roof drains system are listed below:
LR-CW-LB-M-23LB01
LR-CW-LB-M-23LB02
LR-CW-LB-M-23LB06
LR-CW-LB-M-23LB07
LR-CW-LB-M-23LB11

The license renewal boundary drawing for the chemical and detergent waste system is listed below:
LR-CW-LD-M-22LD01

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.3.3-28 - *Miscellaneous Systems In scope ONLY based on Criterion 10 CFR 54.4(a)(2).*

Table 2.3.3-28 Miscellaneous Systems In scope ONLY based on Criterion 10 CFR 54.4(a)(2)

Component Type	Intended Function
Chiller	Structural Integrity (attached)
Closure Bolting	Leakage Boundary (spatial) Structural Integrity (attached)

Eyewash Station	Leakage Boundary (spatial)
Flexible Hoses	Leakage Boundary (spatial)
Flow Orifice	Leakage Boundary (spatial)
Instrument Bellows	Leakage Boundary (spatial)
Piping	Leakage Boundary (spatial) Structural Integrity (attached)
Pump	Leakage Boundary (spatial)
Sight Gauge	Leakage Boundary (spatial)
Strainer	Leakage Boundary (spatial)
Tank	Leakage Boundary (spatial)
Trap	Leakage Boundary (spatial)
Tubing	Leakage Boundary (spatial)
Valve	Leakage Boundary (spatial) Structural Integrity (attached)

The AMR results for these component types are provided in Table 3.3.2-28, *Auxiliary Systems – Summary of Aging Management Evaluation – Miscellaneous Systems in scope ONLY for Criterion 10 CFR 54.4(a)(2).*

2.3.4 Steam and Power Conversion Systems

This section addresses scoping and screening results for the following systems:

- Main Turbine System (Section 2.3.4.1)
- Main Steam Supply System (Section 2.3.4.2)
- Main Feedwater System (Section 2.3.4.3)
- Steam Generator Blowdown System (Section 2.3.4.4)
- Auxiliary Feedwater System (Section 2.3.4.5)
- Condensate Storage and Transfer System (Section 2.3.4.6)

2.3.4.1 Main Turbine System

System Description

The purpose of the main turbine system is to convert the thermal energy from steam transferred by the main steam system to mechanical energy to drive the main generator.

The main turbine system consists of a high pressure turbine, three low pressure turbines, four main steam stop valves, four control valves, four moisture separator reheaters, six combined intermediate valves, strainers, turbine shaft turning gear, associated piping, valves, and instrumentation.

The portion of the main turbine system within the scope of license renewal consists of piping, valves and instruments in the turbine building that support ATWS requirements.

System Intended Functions

Portions of the main turbine system are within the scope of license renewal to support ATWS requirements based on the criteria of 10 CFR 54.4(a)(3).

Callaway FSAR References

Additional details of the main turbine system are included in FSAR Sections 7.7.1.11 SP and 10.2 SP.

License Renewal Boundary Drawings

The license renewal boundary drawing for the main turbine system is listed below:
LR-CW-AC-M-22AC01

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.3.4-1 – *Main Turbine System*.

Table 2.3.4-1 Main Turbine System

Component Type	Intended Function
Closure Bolting	Pressure Boundary
Piping	Pressure Boundary
Tubing	Pressure Boundary
Valve	Pressure Boundary

The AMR results for these component types are provided in Table 3.4.2-1, *Steam and Power Conversion Systems – Summary of Aging Management Evaluation – Main Turbine System.*

2.3.4.2 Main Steam Supply System

System Description

The purpose of the main steam supply system is to convey the generated steam produced in the steam generators to the turbine generator, turbine driven feedwater pumps, the turbine-driven auxiliary feed pump, steam dumps, reheaters, and the auxiliary steam system.

The main steam supply system consists of four main steam lines, each equipped with one power-operated atmospheric relief valve, five spring-loaded safety valves and one main steam isolation valve (MSIV). The power-operated atmospheric relief valves provide a method for controlled removal of reactor decay heat when the MSIVs are shut. Two main steam lines, upstream of the MSIVs, are cross-connected to supply steam to an auxiliary feedwater pump turbine. The main steam supply to the auxiliary steam system is connected to a cross-tie header downstream of the MSIVs. The turbine bypass system, also called the steam dump system, is part of the main steam supply system and has the capability to bypass main steam from the steam generators to the main condenser to minimize transient effects on the reactor coolant system of startup, hot shutdown, cooldown, load reduction. The main steam supply system includes the main steam vent and drain piping and valves.

The auxiliary steam system is included with the evaluation of the main steam supply system. It is designed to provide the steam required for plant heating and processing during plant startup, complete shutdown, and normal operation. The system consists of steam distribution headers and condensate return/makeup equipment.

System Intended Functions

The main steam supply system provides heat removal from the reactor coolant system for controlled cooldown during normal, accident and post accident conditions. Portions of the main steam supply system provide containment isolation and overpressure protection for the secondary side of the steam generators and the main steam piping. The main steam supply system also provides steam as a motive force to support the operation of the turbine-driven auxiliary feedwater pump. Therefore, the main steam supply system is within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1).

Portions of the main steam supply system are within the scope of license renewal as nonsafety-related affecting safety-related components based on the criterion of 10 CFR 54.4(a)(2) for spatial interaction and structural integrity.

Portions of the main steam supply system are within the scope of license renewal to support fire protection, station blackout and environmental qualification requirements based upon the criteria 10 CFR 54.4(a)(3).

Callaway FSAR References

Additional details of the main steam supply system are included in FSAR Sections 10.3 SP and 10.4 SP.

License Renewal Boundary Drawings

The license renewal boundary drawings for the main steam supply system and boilers are listed below:
LR-CW-AB-M-22AB01
LR-CW-AB-M-22AB02
LR-CW-AB-M-22FB01
LR-CW-AB-M-22FB02
LR-CW-AD-M-22AD06

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.3.4-2 - *Main Steam Supply System*.

Table 2.3.4-2 Main Steam Supply System

Component Type	Intended Function
Closure Bolting	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)
Flow Orifice	Leakage Boundary (spatial)

Table 2.3.4-2 Main Steam Supply System (Continued)

Component Type	Intended Function
Insulation	Insulate (Mechanical)
Piping	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)
Pump	Leakage Boundary (spatial)
Silencer	Leakage Boundary (spatial) Structural Integrity (attached)
Strainer	Leakage Boundary (spatial)
Tank	Leakage Boundary (spatial) Structural Integrity (attached)
Trap	Leakage Boundary (spatial) Structural Integrity (attached)
Tubing	Leakage Boundary (spatial) Pressure Boundary
Valve	Filter, Leakage Boundary (spatial) Pressure Boundary Pressure Relief Structural Integrity (attached)

The AMR results for these component types are provided in Table 3.4.2-2, *Steam and Power Conversion Systems – Summary of Aging Management Evaluation – Main Steam Supply System.*

2.3.4.3 Main Feedwater System

System Description

The purpose of the main feedwater system is to receive condensate from the condensate system and deliver feedwater at required pressure, temperature, and flowrate to the four steam generators.

The main feedwater system consists of two turbine-driven feedwater pumps, a motor-driven start-up feedwater pump, high pressure feedwater heaters, feedwater control valves, system-medium regulated feedwater isolation valves, feedwater flow elements, and associated piping, valves and instrumentation.

System Intended Functions

The main feedwater system provides containment isolation, feedwater isolation for reactivity control during accident conditions, and a flow path for auxiliary feedwater for decay heat removal. Therefore, the main feedwater system is within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1).

Portions of the main feedwater system are within the scope of license renewal as nonsafety-related affecting safety-related components based on the criterion of 10 CFR 54.4(a)(2) for spatial interaction and structural integrity.

Portions of the main feedwater system are within the scope of license renewal to support fire protection, environmental qualification, ATWS and station blackout requirements based on the criteria of 10 CFR 54.4(a)(3).

Callaway FSAR References

Additional details of the main feedwater system are included in FSAR Section 10.4.7 SP.

License Renewal Boundary Drawings

The license renewal boundary drawings for the main feedwater system are listed below:
LR-CW-AE-M-22AE01
LR-CW-AE-M-22AE02

Component-Function Relationship Table

The component types subject to aging management review are indicated in
Table 2.3.4-3 – *Main Feedwater System*.

Table 2.3.4-3 Main Feedwater System

Component Type	Intended Function
Closure Bolting	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)
Flow Element	Pressure Boundary
Flow Orifice	Structural Integrity (attached)
Heat Exchanger (Feedwater Heater)	Structural Integrity (attached)
Insulation	Insulate (Mechanical)
Piping	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)

Table 2.3.4-3 Main Feedwater System (Continued)

Component Type	Intended Function
Pump	Structural Integrity (attached)
Solenoid Valve	Pressure Boundary
Tubing	Pressure Boundary
Valve	Pressure Boundary Structural Integrity (attached)

The AMR results for these component types are provided in Table 3.4.2-3, *Steam and Power Conversion Systems – Summary of Aging Management Evaluation – Main Feedwater System.*

2.3.4.4 Steam Generator Blowdown System

System Description

The purpose of the steam generator blowdown system is to maintain the steam generator secondary side water within the chemical specifications. Heat is recovered from the blowdown and returned to the feedwater system. The blowdown is then treated to remove impurities before being returned to the condenser.

The steam generator blowdown system consists of a 2350 gallon steam generator blowdown flash tank, two 100-percent steam generator drain pumps, valves, instrumentation, and piping used to convey the blowdown to the flash tank and the sampling system.

System Intended Functions

The steam generator blowdown provides containment isolation for four containment penetrations with isolation valves inside and outside of containment. Therefore, the steam generator blowdown system is within the scope of license renewal based on the criterion of 10 CFR 54.4(a)(1).

Portions of the steam generator blowdown system are within the scope of license renewal as nonsafety-related affecting safety-related components based on the criterion of 10 CFR 54.4(a)(2) for spatial interaction and structural integrity.

Portions of the steam generator blowdown system are within the scope of license renewal to support fire protection, environmental qualification, and ATWS requirements based on the criteria of 10 CFR 54.4(a)(3).

Callaway FSAR References

Additional details of the steam generator blowdown system are included in FSAR Sections 7.7.1.11 SP and 10.4.8 SP.

License Renewal Boundary Drawings

The license renewal boundary drawings for the steam generator blowdown system are listed below:
LR-CW-BM-M-22BM01
LR-CW-BM-M-22BM02
LR-CW-EM-M-22EP01
LR-CW-SJ-M-22SJ01

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.3.4-4 - Steam Generator Blowdown System.

Table 2.3.4-4 Steam Generator Blowdown System

Component Type	Intended Function
Closure Bolting	Leakage Boundary (spatial) Pressure Boundary
Piping	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)
Pump	Leakage Boundary (spatial)
Solenoid Valve	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)
Tank	Structural Integrity (attached)
Tubing	Leakage Boundary (spatial) Pressure Boundary
Valve	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached) Structural Support

The AMR results for these component types are provided in Table 3.4.2-4, *Steam and Power Conversion Systems – Summary of Aging Management Evaluation – Steam Generator Blowdown System.*

2.3.4.5 Auxiliary Feedwater System

System Description

The purpose of the auxiliary feedwater system is to supply feedwater to the steam generators during startup, shutdown, and emergency conditions. The auxiliary feedwater system takes feedwater from the condensate storage tank (CST) or the essential service water system through the auxiliary feedwater pumps and discharges to the steam generators. Two motor-driven auxiliary feedwater pumps and one turbine-driven auxiliary feedwater pump are available to ensure the required feedwater flow to the steam generators is available.

The auxiliary feedwater system consists of piping, valves and components associated with the motor-driven and steam-driven auxiliary feedwater pumps from the CST and the essential service water system to the steam generators.

The auxiliary feedwater system includes the auxiliary turbines system. The CST is evaluated with the condensate storage and transfer system in Section 2.3.4.6, *Condensate Storage and Transfer System*.

System Intended Functions

The auxiliary feedwater system provides decay heat removal in post accident conditions. Therefore, the auxiliary feedwater system is relied upon as the source of feedwater supply to the steam generators to maintain a secondary heat sink for design basis event mitigation. Therefore, the auxiliary feedwater system is within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1).

Portions of the auxiliary feedwater system are within the scope of license renewal as nonsafety-related affecting safety-related components based on the criterion of 10 CFR 54.4(a)(2) for spatial interaction and structural integrity.

Portions of auxiliary feedwater system are within the scope of license renewal to support fire protection, environmental qualification, ATWS, and station blackout requirements based on the criteria of 10 CFR 54.4(a)(3).

Callaway FSAR References

Additional details of the auxiliary feedwater system are included in FSAR Sections 7.3.6 SP and 10.4.9 SP.

License Renewal Boundary Drawings

The license renewal boundary drawings for the auxiliary feedwater system are listed below:
LR-CW-AL-M-22AL01
LR-CW-AL-M-22FC02

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.3.4-5 - *Auxiliary Feedwater System*.

Table 2.3.4-5 Auxiliary Feedwater System

Component Type	Intended Function
Closure Bolting	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)
Filter	Filter Pressure Boundary
Flexible Hoses	Leakage Boundary (spatial)
Flow Element	Pressure Boundary Throttle
Flow Orifice	Pressure Boundary Throttle
Heat Exchanger (AF Turbine Oil Cooler)	Heat Transfer Pressure Boundary
Insulation	Insulate (Mechanical)
Piping	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)
Pump	Pressure Boundary
Sight Gauge	Pressure Boundary
Strainer	Filter Pressure Boundary
Trap	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)
Tubing	Leakage Boundary (spatial) Pressure Boundary
Turbine	Pressure Boundary

Table 2.3.4-5 Auxiliary Feedwater System (Continued)

Component Type	Intended Function
Valve	Filter Leakage Boundary (spatial) Pressure Boundary Pressure Relief Structural Integrity (attached)

The AMR results for these component types are provided in Table 3.4.2-5, *Steam and Power Conversion Systems – Summary of Aging Management Evaluation – Auxiliary Feedwater System.*

2.3.4.6 Condensate Storage and Transfer System

System Description

The purpose of the condensate storage and transfer system is to supply or receive condensate to compensate for changes in plant systems inventory as required by the condenser hotwell level control system. It is also a nonseismically designed source of water to the auxiliary feedwater system and is not credited for accident mitigation. The condensate storage and transfer system is nonsafety-related and performs no safety-related functions.

The condensate storage and transfer system consists of one 450,000 gallon condensate storage tank and associated valves and piping.

System Intended Functions

Portions of the condensate storage and transfer system are in scope as nonsafety-related affecting safety-related components based on the criterion of 10 CFR 54.4(a)(2) for spatial interaction.

Portions of the condensate storage and transfer system are within the scope of license renewal to support fire protection, environmental qualification, and station blackout requirements based upon the criteria of 10 CFR 54.4(a)(3).

Callaway FSAR References

Additional details of the condensate storage and transfer system are included in FSAR Section 9.2.6 SP.

License Renewal Boundary Drawings

The license renewal boundary drawings for the condensate storage and transfer system are listed below:
LR-CW-AL-M-22AL01
LR-CW-AP-M-22AP01

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.3.4-6 – *Condensate Storage and Transfer System*.

Table 2.3.4-6 Condensate Storage and Transfer System

Component Type	Intended Function
Closure Bolting	Pressure Boundary
Insulation	Insulate (Mechanical)
Piping	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)
Tank	Pressure Boundary
Valve	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)

The AMR results for these component types are provided in Table 3.4.2-6, *Steam and Power Conversion Systems – Summary of Aging Management Evaluation – Condensate Storage and Transfer System.*

2.4 SCOPING AND SCREENING RESULTS: STRUCTURES

The containments, structures, and component supports scoping and screening results consist of lists of component types that require aging management review, arranged by structure. Brief descriptions and intended functions are provided for structures within the scope of license renewal. For each in-scope structure, component types requiring an aging management review are provided.

In addition to the structures within the scope of license renewal presented in this section, the component supports are evaluated as a commodity.

A license renewal site drawing (LR-CW-STRUC-8600X88100) was created for structures based on the site plan.

This section provides the following information for each structure within the scope of license renewal:

- A description of the structure,
- Structure purpose and intended function(s)
- Reference to the applicable FSAR section(s), and
- A listing of the component types requiring aging management review and associated component intended functions.

For component supports, this section provides the following information:

- A general description of commodity,
- Purpose and intended function of the commodity,
- Reference to the applicable FSAR section(s), and
- A listing of the component types requiring aging management review and associated component intended functions.

The containments, structures, and component supports scoping and screening results are provided for the following structures and commodity groups:

- Reactor Building (Section 2.4.1)
- Control Building (Section 2.4.2)
- Auxiliary Building (Section 2.4.3)
- Turbine Building (Section 2.4.4)
- Diesel Generator Building (Section 2.4.5)
- Miscellaneous In-Scope Structures (Section 2.4.6)
- In-Scope Tank Foundations and Structures (Section 2.4.7)
- Electrical Foundations and Structures (Section 2.4.8)
- Radwaste Building (Section 2.4.9)
- Fuel Building (Section 2.4.10)
- Essential Service Water Structures (Section 2.4.11)
- Supports (Section 2.4.12)

2.4.1 Reactor Building

Structure Description

The purpose of the reactor building is to support and shelter and protect the reactor vessel, reactor coolant system, steam generators, pressurizer, reactor coolant pumps, accumulators, and the containment air coolers.

The reactor building is a seismic Category I structure founded on stabilized backfill. The shell of the building is a prestressed, reinforced concrete, cylindrical structure with a hemispherical dome roof. The foundation is a conventionally reinforced concrete base slab with a central cavity and instrumentation tunnel to house the reactor vessel. Interaction between the containment shell and other structures, both internal and external, is minimized by a specified isolation gap. The fuel transfer tube, the residual heat removal system, and the containment spray system are designed with expansion joint bellows where these systems penetrate the containment building. These bellows allow relative movement between the reactor building and adjacent structures. These bellows are evaluated for aging management with their respective systems. A continuous peripheral tendon access gallery below the base slab is provided for the installation and inspection of the vertical post-tensioning system.

The interior of the reactor building is lined with carbon steel plates welded together to form a barrier which is essentially leak tight. The liner is thickened locally around the penetrations, large brackets, and major attachments which transfer loads through the liner plate to the concrete structure. Major structural attachments include polar crane brackets, floor beam brackets, and pipe support brackets.

In addition to the concrete shell discussed above, the reactor building contains the following major structural components:

- Steel liner plate
- Penetrations
- Reactor building internal structures

<u>Steel Liner Plate</u>

A welded steel liner is attached to the inside face of the reactor building concrete to serve as the leakage barrier. The floor liner plate is installed on top of the foundation slab and is anchored to the concrete structure for stability. At all penetrations, the liner plate is thickened to reduce stress concentration. Insert plates are provided in the liner to transfer concentrated loads to the wall, slab, and dome.

<u>Penetrations</u>

In general, a containment penetration consists of a sleeve embedded in the concrete wall or floor and welded to the reactor building liner plate. Loads on the penetration are transferred to the reactor building. The component that must penetrate the reactor building, such as process pipe, airlock assembly, or cable feed-through assembly, passes through the sleeve and is seal welded to the sleeve. Additional detail is provided below.

Fuel Transfer Tube

A fuel transfer tube penetrates the reactor building wall connecting the refueling canal in the reactor building with the fuel transfer canal in the fuel building. This penetration consists of a pipe installed inside a sleeve. The tube is sealed to the steel liners in both the refueling canal and fuel transfer canal. The tube is closed with a blind flange on the reactor building side and a gate valve on the fuel building side.

Equipment Hatch

An equipment hatch, equipped with an inside mounted steel hatch cover and a concrete external shield door, is provided to allow access into the reactor building for large equipment. The external shield door is evaluated as a reactor building concrete element and acts as a biological and missile shield. The hatch cover is sealed using a double-gasketed flanged design.

Personnel Access Locks (Airlocks)

Two airlocks penetrate the reactor building wall; a personnel access lock and an auxiliary access lock. The access locks each consist of steel tubes passing through the reactor building wall and welded to the reactor building liner plate. Each access lock has a bulkhead with an airlock door at each end. The doors are interlocked to prevent simultaneous opening. Each door contains double-gasketed seals.

Mechanical Penetrations

Piping penetrations consist of a sleeve around the outside of the piping where it passes through the containment boundary. The piping is welded to a flued head, which is welded to the pipe sleeve. The sleeve is welded to the reactor building liner plate. Reactor building ECCS sump recirculation pipes are seal welded to the liner plate via a steel adapter plate. Instrumentation penetrations consist of a sleeve that passes through the containment boundary. The sleeve is welded to the reactor building liner plate, and a cap is welded to the sleeve inside containment. Instrumentation lines that pass through the penetration are welded to the cap. Spare penetrations consist of a sleeve which passes through the containment boundary. The sleeve is welded to the reactor building liner plate and a cap is welded to the sleeve inside containment.

Electrical Penetrations

Electrical penetrations consist of a sleeve that passes through the containment boundary. The sleeve is welded to the reactor building liner plate. A cable feed-through assembly is inserted in the sleeve and welded or flanged to the sleeve inside the reactor building for the electrical penetrations.

<u>Reactor Building Internal Structures</u>

Concrete

The reactor cavity is a heavily reinforced concrete structure that houses the reactor and provides the primary shielding barrier. The wall of the cavity structure provides missile protection for the reactor building and liner plate. The cavity wall provides biological shielding, supports the reactor, and transmits loads to the base slab.

The secondary shield walls are thick reinforced concrete walls anchored into the base slab to ensure stability and prevent uplift. The compartment housing the pressurizer is an integral part of the secondary shield wall. The compartments housing the steam generators, reactor coolant pumps, and RCS loops are formed by the secondary shield walls on the exterior and the refueling canal walls on the interior. These compartments provide missile protection for the RCS components.

The operating floor surrounds the refueling canal wall and the secondary shield walls. The operating floor is bounded by the reactor building wall. The operating floor slab is supported by the refueling canal walls and the secondary shield walls. Access openings are provided above each reactor coolant pump. Concrete plugs are provided to close the access openings during operation.

Steel

The steel provides support for various safety-related and nonsafety-related systems and components, including piping, ducts, miscellaneous equipment, electrical cable trays and conduit, instruments and tubing, electrical and instrumentation enclosures and racks, steel beams and columns, stairways, ladders, and attachments to concrete walls and liners. The internal structures that support large components, such as the steam generators and reactor coolant pumps, are anchored to the base slab in order to transfer the loads. Structural and miscellaneous steel is installed in the reactor building to facilitate access to the various elevations and areas for inspection and maintenance. During operation, a steel missile barrier is installed above the reactor head to provide missile and biological shielding.

Refueling Canal

The refueling canal is a reinforced concrete structure, lined with stainless steel, which is used during refueling to transfer fuel elements underwater between the reactor and the spent fuel pool. It is also a lay down area for the reactor vessel upper and lower internals.

Reactor Coolant System Supports

RCS supports are evaluated in Section 2.4.12, *Supports*.

Miscellaneous Items

Included in this group are the debris barriers, which include bioshield debris barriers and trench strainer baskets, which provide debris protection. The containment recirculation strainers are evaluated as "containment recirculation strainer" with the containment spray system in Section 2.3.2.1, *Containment Spray System*.

Structure Intended Function

The reactor building provides structural support and shelter and protection for safety-related SSCs required to mitigate the consequences of accidents that could result in potential offsite exposure. Therefore, the reactor building is within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1).

Portions of the reactor building provide structural support and shelter and protection for nonsafety-related SSCs whose failure could prevent performance of a safety-related function. Therefore, the reactor building is within the scope of license renewal based on the criterion of 10 CFR 54.4(a)(2).

Portions of the reactor building provide structural support and shelter and protection for SSCs that are within the scope of license renewal to support fire protection, ATWS, and station blackout requirements based upon criteria of 10 CFR 54.4(a)(3).

Callaway FSAR References

Additional details of the reactor building are included in FSAR Sections 3.8.1 SP, 3.8.2 SP, and 3.8.3 SP.

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.4-1 - *Reactor Building*.

Table 2.4-1 Reactor Building

Component Type	Intended Function
Barrier	Missile Barrier Shelter, Protection
Bolting (Pressure-retaining)	Structural Pressure Boundary Structural Support
Bolting (Structural)	Structural Support
Caulking and Sealant	Flood Barrier Shelter, Protection
Coatings	Maintain Coating Integrity
Compressible Joints and Seals	Expansion/Separation Shelter, Protection Structural Pressure Boundary
Concrete Elements	Fire Barrier Flood Barrier Missile Barrier Shelter, Protection Shielding Structural Pressure Boundary Structural Support
Debris Barrier	Filter Shelter, Protection
Fire Barrier Coatings/Wraps	Fire Barrier
Fire Barrier Doors	Fire Barrier Missile Barrier Shelter, Protection
Gate	Shelter, Protection Structural Pressure Boundary
Hatch Emergency Airlock	Fire Barrier Shelter, Protection Shielding Structural Pressure Boundary Structural Support
Hatch Equipment	Shelter, Protection Shielding Structural Pressure Boundary Structural Support

Table 2.4-1 Reactor Building (Continued)

Component Type	Intended Function
Hatch Personnel Airlock	Fire Barrier Shelter, Protection Shielding Structural Pressure Boundary Structural Support
Hatches and Plugs	Missile Barrier Shelter, Protection
High Strength Bolting	Structural Support
Liner Containment	Shelter, Protection Structural Pressure Boundary
Liner Refueling	Shelter, Protection
Liner Sumps	Shelter, Protection Structural Pressure Boundary
Penetration	Shelter, Protection Shielding Structural Pressure Boundary Structural Support
Penetration - Electrical	Shelter, Protection Structural Pressure Boundary Structural Support
Penetrations Mechanical	Shelter, Protection Shielding Structural Pressure Boundary Structural Support
Pipe Whip Restraints and Jet Shields	HELB Shielding Missile Barrier Pipe Whip Restraint Structural Support
Stairs, Platforms and Grates	Structural Support
Structural Steel	Shelter, Protection Structural Support
Tendons	Structural Support

The AMR results for these component types are provided in Table 3.5.2-1, *Containments, Structures, and Component Supports - Summary of Aging Management Evaluation - Reactor Building*.

2.4.2 Control Building

Structure Description

The purpose of the control building is to support and shelter and protect the main control room, access control areas, upper and lower cable spreading rooms, electrical and mechanical equipment rooms, Class 1E switchgear, battery rooms and other equipment supporting the control room habitability systems.

The control building is a rectangular structural steel and reinforced concrete seismic Category I structure supported by a reinforced concrete basemat founded on compacted soil. The intermediate floors and the roof are reinforced concrete slabs supported by structural steel beams and girders. The floor and roof framing are supported by exterior reinforced concrete bearing walls and interior steel columns.

The communications corridor adjacent to the control building is a non-Category I structure which is designed to preclude gross collapse upon safety-related structures or components under loads imposed by the design basis tornado.

Structure Intended Function

The control building provides structural support and shelter and protection for safety-related SSCs providing the capability to shutdown the reactor and maintains it in a safe shutdown condition. Therefore, the control building is within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1).

Portions of the control building provide structural support and shelter and protection for nonsafety-related SSCs whose failure could prevent performance of a safety-related function. Therefore, the control building is within the scope of license renewal based on the criterion of 10 CFR 54.4(a)(2).

Portions of the control building provide structural support and shelter and protection for SSCs that are within the scope of license renewal to support fire protection, ATWS, and station blackout requirements based upon criteria of 10 CFR 54.4(a)(3).

Callaway FSAR References

Additional details of the control building are included in FSAR Sections 1.1.2 SP, 1.2.6 SP, 2.5.1.2.5.5 SA, 3.3.2.3 SP, and 3.8.4.1 SP.

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.4-2 - *Control Building*.

Table 2.4-2 Control Building

Component Type	Intended Function
Bolting (Structural)	Structural Support
Caulking and Sealant	Flood Barrier Shelter, Protection
Compressible Joints and Seals	Expansion/Separation Flood Barrier Shelter, Protection
Concrete Block (Masonry Walls)	Fire Barrier Shelter, Protection Structural Support
Concrete Elements	Fire Barrier Flood Barrier Missile Barrier Shelter, Protection Structural Pressure Boundary Structural Support
Door	Missile Barrier Shelter, Protection Shielding Structural Pressure Boundary
Fire Barrier Coatings/Wraps	Fire Barrier
Fire Barrier Doors	Fire Barrier Missile Barrier Shelter, Protection Shielding Structural Pressure Boundary
Fire Barrier Seals	Fire Barrier
High Strength Bolting	Structural Support
Penetrations Electrical	Structural Support
Penetrations Mechanical	Structural Support
Roofing Membrane	Flood Barrier Shelter, Protection
Stairs, Platforms and Grates	Structural Support
Structural Steel	Missile Barrier Shelter, Protection Structural Support

The AMR results for these component types are provided in Table 3.5.2-2, *Containments, Structures, and Component Supports - Summary of Aging Management Evaluation - Control Building*.

2.4.3 Auxiliary Building

Structure Description

The purpose of the auxiliary building is to support and shelter and protect the safety injection system, residual heat removal system, chemical and volume control monitoring system, auxiliary feedwater pumps, steam and feedwater isolation and relief valves, heat exchangers, other pumps, tanks, filters, and demineralizers, and heating and ventilating equipment.

The auxiliary building is a multistory, structural steel and reinforced concrete seismic Category I structure supported by a reinforced concrete basemat founded on compacted soil. The intermediate floors and the roof are reinforced concrete slabs supported by structural steel beams and girders. The floor and roof framing are supported by exterior reinforced concrete bearing walls and interior steel columns.

The auxiliary building also includes the non-Category I radioactive material storage building and laundry decontamination facility whose structural framing is designed to preclude gross collapse upon auxiliary building or its components under loads imposed by the design basis tornado. The radioactive material storage building is located on the southwest corner of the auxiliary building roof. The laundry decontamination facility is located on the south side of the auxiliary building.

Structure Intended Function

The auxiliary building provides structural support and shelter and protection for safety-related SSCs providing the capability to shutdown the reactor and maintains it in a safe shutdown condition. Therefore, the auxiliary building is within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1).

Portions of the auxiliary building provide structural support and shelter, and protection for nonsafety-related SSCs whose failure could prevent performance of a safety-related function. Therefore, the auxiliary building is within the scope of license renewal based on the criterion of 10 CFR 54.4(a)(2).

Portions of the auxiliary building provide structural support and shelter and protection for SSCs that are within the scope of license renewal to support fire protection, ATWS, and station blackout requirements based upon criteria of 10 CFR 54.4(a)(3).

Callaway FSAR References

Additional details of the auxiliary building are included in FSAR Sections 1.2.2.1B SP, 3.3.2.3 SP, and 3.8.4.1.1 SP.

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.4-3 - *Auxiliary Building*.

Table 2.4-3 Auxiliary Building

Component Type	Intended Function
Bolting (Structural)	Structural Support
Caulking and Sealant	Flood Barrier Shelter, Protection
Compressible Joints and Seals	Expansion/Separation Shelter, Protection
Concrete Block (Masonry Walls)	Fire Barrier Shelter, Protection Structural Support
Concrete Elements	Fire Barrier Flood Barrier HELB Shielding Missile Barrier Shelter, Protection Structural Pressure Boundary Structural Support
Door	Flood Barrier HELB Shielding Missile Barrier Shelter, Protection Structural Pressure Boundary
Fire Barrier Coatings/Wraps	Fire Barrier
Fire Barrier Doors	Fire Barrier Flood Barrier HELB Shielding Missile Barrier Shelter, Protection Structural Pressure Boundary
Fire Barrier Seals	Fire Barrier
Hatch	Fire Barrier HELB Shielding Missile Barrier Shelter, Protection

Table 2.4-3 Auxiliary Building (Continued)

Component Type	Intended Function
Hatches and Plugs	Fire Barrier HELB Shielding Missile Barrier Shelter, Protection Shielding
High Strength Bolting	Structural Support
Metal Siding	Shelter, Protection
Penetrations Electrical	Structural Support
Penetrations Mechanical	Structural Support
Roofing Membrane	Flood Barrier Shelter, Protection
Stairs, Platforms and Grates	Structural Support
Structural Steel	Shelter, Protection Structural Support

The AMR results for these component types are provided in Table 3.5.2-3, *Containments, Structures, and Component Supports - Summary of Aging Management Evaluation - Auxiliary Building*.

2.4.4 Turbine Building

Structure Description

The purpose of the turbine building is to support and shelter and protect the turbine generator, condensers, main feed pumps, and other power-conversion equipment. The non-Category I turbine building is a three level steel structure supported on both mat and spread footing foundations. The auxiliary boiler room, which houses the auxiliary boiler, is also evaluated with the turbine building in this section.

The turbine building is located north of the auxiliary building and east of the communications corridor, which are evaluated separately. Non-Category I structures located near seismic Category I SSCs have been designed to preclude gross collapse upon safety-related structures or components under loads imposed by the design basis tornado.

Structure Intended Functions

Portions of the turbine building provide structural support and shelter and protection for nonsafety-related SSCs whose failure could prevent performance of a safety-related function. Therefore, the turbine building is within the scope of license renewal based on the criterion of 10 CFR 54.4(a)(2).

Portions of the turbine building provide structural support and shelter and protection for SSCs that are within the scope of license renewal to support fire protection and ATWS requirements based upon criteria of 10 CFR 54.4(a)(3).

Callaway FSAR References

Additional design requirements applicable to the turbine building are included in FSAR Sections 2.5.4.10.2.1 SA, 3.3.2.3 SP, and Appendix 9.5B SP.

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.4-4 - *Turbine Building*.

Table 2.4-4 Turbine Building

Component Type	Intended Function
Bolting (Structural)	Structural Support
Caulking and Sealant	Flood Barrier Shelter, Protection
Compressible Joints and Seals	Expansion/Separation Shelter, Protection
Concrete Block (Masonry Walls)	Fire Barrier Flood Barrier Shelter, Protection Structural Support
Concrete Elements	Fire Barrier Flood Barrier Missile Barrier Shelter, Protection Structural Support
Door	Shelter, Protection
Fire Barrier Coatings/Wraps	Fire Barrier
Fire Barrier Doors	Fire Barrier Shelter, Protection
Fire Barrier Seals	Fire Barrier

Table 2.4-4 Turbine Building (Continued)

Component Type	Intended Function
Hatch	Missile Barrier Shelter, Protection
Hatches and Plugs	Fire Barrier Missile Barrier Shelter, Protection Structural Support
High Strength Bolting	Structural Support
Metal Siding	Fire Barrier Shelter, Protection
Penetrations Electrical	Shelter, Protection Structural Support
Penetrations Mechanical	Shelter, Protection Structural Support
Roofing Membrane	Flood Barrier Shelter, Protection
Stairs, Platforms and Grates	Structural Support
Structural Steel	Shelter, Protection Structural Support

The AMR results for these component types are provided in Table 3.5.2-4, *Containments, Structures, and Component Supports - Summary of Aging Management Evaluation - Turbine Building*.

2.4.5 Diesel Generator Building

Structure Description

The purpose of the diesel generator building is to support and shelter and protect the emergency diesel generators, diesel auxiliaries, emergency fuel oil day tanks, exhaust silencers, and exhaust stacks.

The diesel generator building is a seismic Category I, single story, rectangular, structural steel and reinforced concrete structure which is supported by a reinforced concrete base mat founded 10 feet below plant grade on crushed rock. The roof has a reinforced concrete penthouse which houses the intake and exhaust louvers. The roof itself is a reinforced concrete slab supported by structural steel beams and girders. The roof framing is supported by reinforced concrete bearing walls and steel columns. A fire barrier wall separates the two standby diesel generator rooms.

The diesel generator building also includes fuel oil storage tanks, located just south of the building. The emergency fuel oil storage tanks consist of two buried cylindrical steel tanks and associated reinforced concrete access vaults. The diesel exhaust stacks are evaluated as part of the standby diesel engine system in Section 2.3.3.22, *Standby Diesel Generator Engine System*.

Structure Intended Function

The diesel generator building provides structural support and shelter and protection for safety-related SSCs providing the capability to shutdown the reactor and maintains it in a safe shutdown condition. Therefore, the diesel generator building is within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1).

Portions of the diesel generator building provide structural support and shelter and protection for nonsafety-related SSCs whose failure could prevent performance of a safety-related function. Therefore, the diesel generator building is within the scope of license renewal based on the criterion of 10 CFR 54.4(a)(2).

Portions of the diesel generator building provide structural support and shelter and protection for SSCs that are within the scope of license renewal to support fire protection and station blackout requirements based upon criteria of 10 CFR 54.4(a)(3).

Callaway FSAR References

Additional details of the diesel generator building are included in FSAR Sections 3.7(B).1.4 SP, 3.8.4.1.4 SP, 3.8.4.1.6 SP, and Appendix 9.5B SP.

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.4-5 – *Diesel Generator Building*.

Table 2.4-5 Diesel Generator Building

Component Type	Intended Function
Bolting (Structural)	Structural Support
Caulking and Sealant	Flood Barrier Shelter, Protection
Compressible Joints and Seals	Expansion/Separation Shelter, Protection

Table 2.4-5 Diesel Generator Building (Continued)

Component Type	Intended Function
Concrete Elements	Direct Flow Fire Barrier Flood Barrier Missile Barrier Shelter, Protection Structural Pressure Boundary Structural Support
Door	Missile Barrier Shelter, Protection
Fire Barrier Coatings/Wraps	Fire Barrier
Fire Barrier Seals	Fire Barrier
High Strength Bolting	Structural Support
Penetrations Electrical	Structural Support
Penetrations Mechanical	Structural Support
Roofing Membrane	Flood Barrier Shelter, Protection
Stairs, Platforms and Grates	Structural Support
Structural Steel	Missile Barrier Shelter, Protection Structural Support

The AMR results for these component types are provided in Table 3.5.2-5, *Containments, Structures, and Component Supports - Summary of Aging Management Evaluation - Diesel Generator Building*.

2.4.6 Miscellaneous In-Scope Structures

Structure Description

The purpose of the miscellaneous in-scope structures is to support and shelter and protect equipment required for fire protection or station blackout recovery. The miscellaneous in-scope structures include the following structures:

- fire pumphouse
- security diesel generator building

- security building (main access facility)
- switchyard control building
- circulating and service water pumphouse
- cooling tower basin

The fire pumphouse is a single story metal sided enclosure supported by structural steel framing on three sides and a concrete masonry block wall on the west face. The fire pumphouse is supported by reinforced concrete footings on structural backfill. The fire pumphouse has a built-up roof over rigid insulation and metal deck supported by metal roof joists. There are also interior block walls which serve as fire barriers.

The adjacent fire water storage tanks foundations are evaluated in Section 2.4.7, *In-Scope Tank Foundations and Structures.*

The security diesel generator building is a single story metal sided enclosure with a built-up roof. The security diesel generator building is supported by a reinforced concrete foundation on structural backfill.

The security building (main access facility) is a multistory reinforced concrete structure with furred metal siding. The main access facility intermediate floor framing and reinforced concrete bearing walls are supported by reinforced concrete footings on structural backfill. The facility has a reinforced concrete roof deck with built-up roofing over rigid insulation.

The switchyard control building is a single story concrete masonry block wall building with a built-up roof. The switchyard control building is supported by reinforced concrete footings on structural backfill.

The circulating and service water pumphouse is a multistory reinforced concrete and structural steel framed building. The circulating and service water pumphouse is supported by reinforced concrete footings on structural backfill. The circulating and service water pumphouse has a built-up roof over rigid insulation and metal deck supported by metal roof joists.

The cooling tower basin is a reinforced concrete slab with sidewalls and is founded on reinforced concrete piers and structural backfill. The cooling tower basin provides water for the service water pumps supplying fire water to hose stations located in the essential service water pumphouse. The service water system is evaluated in Section 2.3.3.5, *Service Water System*.

Structure Intended Function

Portions of the miscellaneous in-scope structures provide structural support and shelter and protection for SSCs that are within the scope of license renewal to support fire protection and station blackout requirements based upon criteria of 10 CFR 54.4(a)(3).

Callaway FSAR References

Additional details of the Miscellaneous In-Scope Structures are included in FSAR Sections 8.3.A.4.A SP, 9.2.5.3 SA and 9.5.1.3 SA.

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.4-6 – *Miscellaneous In-Scope Structures.*

Table 2.4-6 Miscellaneous In-Scope Structures

Component Type	Intended Function
Barrier	Shelter, Protection
Bolting (Structural)	Structural Support
Caulking and Sealant	Flood Barrier Shelter, Protection
Concrete Block (Masonry Walls)	Fire Barrier Shelter, Protection Structural Support
Concrete Elements	Shelter, Protection Structural Support
Door	Shelter, Protection
Metal Siding	Shelter, Protection
Penetrations Electrical	Structural Support
Penetrations Mechanical	Structural Support
Roofing Membrane	Flood Barrier Shelter, Protection
Structural Steel	Shelter, Protection Structural Support

The AMR results for these component types are provided in Table 3.5.2-6, *Containments, Structures, and Component Supports - Summary of Aging Management Evaluation - Miscellaneous In-Scope Structures*.

2.4.7 In-Scope Tank Foundations and Structures

Structure Description

The purpose of the in-scope tank foundations is to provide support and shelter and protection to the seismic Category I safety-related refueling water storage tank (RWST) and valvehouse. The nonsafety-related condensate storage tank (CST), the CST trench, and the fire water storage tanks are also included.

The foundation for refueling water storage tank is a concrete mat founded on compacted fill and some lean concrete backfill under the interface of tank foundation and valvehouse. The RWST foundation scope includes the RWST slab foundation, and the RWST valvehouse. The ductbanks associated with the RWST valvehouse are evaluated separately with electrical foundations and structures in Section 2.4.8, *Electrical Foundations and Structures*. The condensate storage tank foundation is also concrete slab founded on compacted backfill. The CST foundation scope includes the CST slab foundation, the CST pipehouse, CST trench, and all associated structural components. The fire water storage tanks are supported on reinforced concrete ring beams founded on compacted backfill. The tanks themselves are evaluated under their respective mechanical systems in Section 2.3, *Scoping and Screening Results: Mechanical Systems*.

The emergency diesel fuel oil storage tanks are evaluated under emergency diesel engine fuel oil storage and transfer system in Section 2.3.3.21, *Emergency Diesel Engine Fuel Oil Storage and Transfer System*. The access vaults to the emergency diesel fuel oil storage tanks are evaluated with the diesel generator building in Section 2.4.5, *Diesel Generator Building*.

Structure Intended Function

The in-scope tank foundations and structures provide structural support and shelter and protection for safety-related SSCs providing the capability to shutdown the reactor and maintain it in a safe shutdown condition. Therefore, the in-scope tank foundations and structures are within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1).

Portions of the in-scope tank foundations and structures provide structural support and shelter and protection for nonsafety-related SSCs whose failure could prevent performance of a safety-related function. Therefore, the in-scope tank foundations and structures are within the scope of license renewal based on the criterion of 10 CFR 54.4(a)(2).

Portions of the in-scope tank foundations and structures provide structural support and shelter and protection for SSCs that are within the scope of license renewal to support fire protection and station blackout requirements based upon criteria of 10 CFR 54.4(a)(3).

Callaway FSAR References

Additional details of the in-scope tank foundations and structures are included in FSAR Sections 1.2.2 SP, 3.8.4.1.5 SP, 3.8.5.1.5 SP, 8.3A.5.1 SP, 9.5.1 SA, and 10.4.9.1.2 SP.

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.4-7 – *In-Scope Tank Foundations and Structures*.

Table 2.4-7 In-Scope Tank Foundations and Structures

Component Type	Intended Function
Bolting (Structural)	Structural Support
Caulking and Sealant	Flood Barrier Shelter, Protection
Concrete Block (Masonry Walls)	Shelter, Protection Structural Support
Concrete Elements	Flood Barrier Shelter, Protection Structural Support
Door	Shelter, Protection
Expansion Joint	Expansion/Separation
Hatch	Shelter, Protection
High Strength Bolting	Structural Support
Penetrations Electrical	Structural Support
Penetrations Mechanical	Structural Support
Roofing Membrane	Flood Barrier Shelter, Protection
Stairs, Platforms and Grates	Structural Support
Structural Metals	Shelter, Protection
Structural Steel	Shelter, Protection Structural Support

The AMR results for these component types are provided in Table 3.5.2-7, *Containments, Structures, and Component Supports - Summary of Aging Management Evaluation - In-Scope Tank Foundations and Structures*.

2.4.8 Electrical Foundations and Structures

Structure Description

The purpose of the electrical foundations and structures is to support and shelter and protect the station transformers, cables, and other in-scope electrical SSCs. Electrical foundations and structures consist of the following:

The concrete pads for station transformers (ESF, startup, main, unit auxiliary and station service) are reinforced concrete pads founded on structural backfill. The main and unit auxiliary transformers and support equipment are mounted on one common pad and are separated by concrete barrier walls. The two ESF transformers and support equipment are mounted on another common pad and are separated by a concrete barrier wall. The startup and station service transformers and associated support equipment are mounted on separate pads.

The seismic Category I electrical duct banks are located a minimum of 3.5 ft below grade and consist of a number of PVC conduits encased in reinforced concrete. Safety-related electrical cables are housed in the conduits. The essential service water system (ESWS) electrical duct banks exit the control building and traverse to the essential service water pumphouse and to the UHS cooling tower. Duct banks also connect the ESF transformers to the turbine building and to the switchyard. Electrical manholes are reinforced concrete underground chambers founded on reinforced concrete slabs. The electrical manholes are used for installing and pulling electrical cables in the ductbanks.

All of the transmission towers between the ESF and startup transformers and the 345 kV switchyard are steel towers with reinforced concrete foundations.

All equipment from the ESF transformers, safeguard transformers, and startup transformer up to and including the first breakers in the 345 kV switchyard are supported by reinforced concrete slabs founded on structural backfill.

Structure Intended Function

The electrical foundations and structures provide structural support and shelter and protection for safety-related SSCs providing the capability to shutdown the reactor and maintain it in a safe shutdown condition and SSCs required to mitigate the consequences of accidents that could result in potential offsite exposure. Therefore, the electrical foundations and structures are within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1).

Portions of the electrical foundations and structures provide structural support and shelter and protection for nonsafety-related SSCs whose failure could prevent performance of a safety-related function. Therefore, the electrical foundations and structures are within the scope of license renewal based on the criterion of 10 CFR 54.4(a)(2).

Portions of the electrical foundations and structures provide structural support and shelter and protection for SSCs that are within the scope of license renewal to support fire protection and station blackout requirements based upon criteria of 10 CFR 54.4(a)(3).

Callaway FSAR References

Additional details of the electrical foundations and structures are included in FSAR Section 3.8.4.1.3 SA, and Appendices 9.5B SP and 9.5B SA.

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.4-8 – *Electrical Foundations and Structures*.

Table 2.4-8 – Electrical Foundations and Structures

Component Type	Intended Function
Bolting (Structural)	Structural Support
Caulking and Sealant	Flood Barrier Shelter, Protection
Compressible Joints and Seals	Expansion/Separation Shelter, Protection
Concrete Elements	Fire Barrier Flood Barrier Shelter, Protection Structural Support
Duct Banks and Manholes	Shelter, Protection Structural Support
Hatches and Plugs	Missile Barrier Shelter, Protection
Penetrations Electrical	Structural Support
Structural Steel	Shelter, Protection Structural Support
Transmission Tower	Structural Support

The AMR results for these component types are provided in Table 3.5.2-8, *Containments, Structures, and Component Supports - Summary of Aging Management Evaluation - Electrical Foundations and Structures*.

2.4.9 Radwaste Building

Structure Description

The purpose of the radwaste building is to provide support and shelter and protection for radioactive waste treatment facilities, tanks, filters, and other miscellaneous equipment. The radwaste pipe tunnel provides access and carries electrical cable trays and piping between the auxiliary building and the radwaste building.

The radwaste building is a rectangular, multistory, structural steel and reinforced concrete structure. The building is supported on a reinforced concrete mat foundation constructed on structural backfill. The building has a built-up roof supported by structural steel beams and girders and the roof and intermediate floor framing are supported by structural steel columns and reinforced concrete bearing walls. The radwaste pipe tunnel is a below grade, reinforced concrete, two-cell box structure connecting the auxiliary building and the radwaste building. It is separated from both buildings by isolation joints.

With the exception of the radwaste tunnel, the radwaste building is physically separated from the rest of the plant by approximately 100 ft. The radwaste tunnel is separated from the connected auxiliary building by a fire barrier wall.

Structure Intended Function

Portions of the radwaste building are within the scope of license renewal to support fire protection requirements based on the criteria of 10 CFR 54.4(a)(3).

Callaway FSAR References

Additional details of the radwaste building are included in FSAR Section 3.8.6 SP and Appendices 9.5A SP and 9.5B SP.

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.4-9 – *Radwaste Building*.

Table 2.4-9 – Radwaste Building

Component Type	Intended Function
Bolting (Structural)	Structural Support
Caulking and Sealant	Flood Barrier Shelter, Protection
Compressible Joints and Seals	Expansion/Separation Shelter, Protection

Table 2.4-9 – Radwaste Building (Continued)(

Component Type	Intended Function
Concrete Block (Masonry Walls)	Flood Barrier Shelter, Protection Structural Support
Concrete Elements	Fire Barrier Flood Barrier Missile Barrier Shelter, Protection Structural Support
Door	Flood Barrier Shelter, Protection
Fire Barrier Coatings/Wraps	Fire Barrier
Fire Barrier Doors	Fire Barrier Shelter, Protection
Fire Barrier Seals	Fire Barrier
High Strength Bolting	Structural Support
Penetrations Electrical	Structural Support
Penetrations Mechanical	Structural Support
Roofing Membrane	Flood Barrier Shelter, Protection
Stairs, Platforms and Grates	Structural Support
Structural Steel	Shelter, Protection Structural Support

The AMR results for these component types are provided in Table 3.5.2-9, *Containments, Structures, and Component Supports - Summary of Aging Management Evaluation - Radwaste Building*.

2.4.10 Fuel Building

Structure Description

The purpose of the fuel building is to provide support and shelter and protection for the spent fuel pool, transfer canal, cask loading pool and cask washdown pit, spent fuel pool bridge crane, cask handling crane, and other miscellaneous equipment. The spent fuel pool receives spent fuel from the containment through the fuel transfer tube. The spent fuel pool, including the transfer canal, cask loading pool, and cask washdown pit consist of reinforced concrete walls and floors lined with stainless steel plates. A leak chase system is provided to check the leaktightness of the liners. The concrete dividing walls and the spent fuel pool gates permit de-watering of the spent fuel pool without dewatering the entire pool.

The fuel building is a multistory, structural steel and reinforced concrete seismic Category I structure, supported by a two-way reinforced concrete basemat founded on structural backfill. The exterior walls have integral reinforced concrete pilasters. The elevated floors and roof are reinforced concrete slabs supported by steel beams and girders. The floor and roof framing are supported by reinforced concrete bearing walls.

Structure Intended Function

The fuel building provides structural support and shelter and protection for safety-related SSCs required to mitigate the consequences of accidents that could result in potential offsite exposure. Therefore, the fuel building is within the scope of license renewal based on the criteria of 10 CFR 54(a)(1).

Portions of the fuel building provide structural support and shelter and protection for nonsafety-related SSCs whose failure could prevent performance of a safety-related function. Therefore, the auxiliary building is within the scope of license renewal based on the criterion of 10 CFR 54.4(a)(2).

Portions of the fuel building provide structural support and shelter and protection for SSCs that are within the scope of license renewal to support fire protection requirements based upon criteria of 10 CFR 54.4(a)(3).

Callaway FSAR References

Additional details of the fuel building are included in FSAR Section 3.8.4.1.2 SP.

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.4-10 – *Fuel Building*.

Table 2.4-10 – Fuel Building

Component Type	Intended Function
Bolting (Structural)	Structural Support
Caulking and Sealant	Flood Barrier Shelter, Protection
Compressible Joints and Seals	Expansion/Separation Shelter, Protection

Table 2.4-10 – Fuel Building (Continued)

Component Type	Intended Function
Concrete Elements	Fire Barrier Flood Barrier Missile Barrier Shelter, Protection Structural Support
Door	Shelter, Protection
Fire Barrier Coatings/Wraps	Fire Barrier
Fire Barrier Doors	Fire Barrier Shelter, Protection
Fire Barrier Seals	Fire Barrier
Hatch	Shelter, Protection
High Strength Bolting	Structural Support
Liner Spent Fuel Pool	Shelter, Protection Structural Pressure Boundary
Penetrations Electrical	Structural Support
Penetrations Mechanical	Structural Support
Roofing Membrane	Flood Barrier Shelter, Protection
Stairs, Platforms and Grates	Structural Support
Structural Metals	Shelter, Protection
Structural Steel	Missile Barrier Shelter, Protection Structural Support

The AMR results for these component types are provided in Table 3.5.2-10, *Containments, Structures, and Component Supports - Summary of Aging Management Evaluation - Fuel Building*.

2.4.11 Essential Service Water Structures

Structure Description

The purpose of the essential service water (ESW) structures is to support and shelter and protect the SSCs required for the ESW system and ultimate heat sink (UHS).

The ESW structures consist of the following structures.

Essential Service Water Pumphouse

The purpose of the ESW pumphouse is to provide support and shelter and protection of the ESW pumps and associated piping systems.

The ESW pumphouse is a rectangular, reinforced concrete seismic Category I structure. The ESW pumphouse is supported on a reinforced concrete floor with integral footings at grade, grade beams with varying depths below grade, and a forebay apron slab below grade which extends into the UHS retention pond. The roof is constructed of a concrete slab and contains removable hatches.

Tornado-resistant concrete missile shields protect the entrances and exits of the ventilation system at the roof elevation and protect the doors at grade. Structural steel commodities are provided for trash rack and stop log slots, guideways for the traveling water screens and walls.

ESWS Supply Lines Yard Vault

A below-grade, reinforced concrete ESWS supply lines yard vault houses the transition of ESWS stainless steel piping to polyethylene piping. Tornado resistant manholes with removable covers are provided to permit inspection and maintenance of the piping.

UHS Cooling Tower

The purpose of the UHS cooling tower is to provide support and shelter and protection for the UHS cooling tower fans and UHS electrical equipment room components.

The mechanical draft UHS cooling tower is a reinforced concrete seismic Category I structure founded on a concrete base slab. Exterior and interior reinforced concrete walls are supported on shear walls.

Tornado-resistant concrete missile shields protect the UHS cooling tower fans, fan deck slabs, and the electrical room roof slabs.

UHS retention pond and ancillary structures

The purpose of the UHS retention pond and ancillary structures is to provide support and shelter and protection for the cooling water for the UHS cooling tower and two submerged discharge structures.

The normally submerged seismic Category I UHS retention pond is an excavation in existing and fill soils. The retention pond side slopes are protected by riprap. The two ESW system discharge structures are submerged seismic Category I reinforced concrete structures that rest on the side slopes of the UHS. The structures consist of an apron slab, wing walls, and a head wall that the ESW system discharge pipes passes through.

Structure Intended Function

The ESW structures provide structural support and shelter and protection for safety-related SSCs providing the capability to shutdown the reactor and maintain it in a safe shutdown condition and SSCs required to mitigate the consequences of accidents that could result in potential offsite exposure. Therefore, the ESW structures are within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1).

Portions of the ESW structures provide structural support and shelter and protection for nonsafety-related SSCs whose failure could prevent performance of a safety-related function. Therefore, the ESW structures are within the scope of license renewal based on the criterion of 10 CFR 54.4(a)(2).

Portions of the ESW structures provide structural support and shelter and protection for SSCs that are within the scope of license renewal to support fire protection requirements based upon criteria of 10 CFR 54.4(a)(3).

Callaway FSAR References

Additional details of the essential service water structures are included in FSAR Sections 3.8.4 SA, and 9.2.5 SA.

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.4-11 - *Essential Service Water Structures*.

Table 2.4-11 Essential Service Water Structures

Component Type	Intended Function
Bolting (Structural)	Structural Support
Caulking and Sealant	Flood Barrier Shelter, Protection
Compressible Joints and Seals	Shelter, Protection
Concrete Block (Masonry Walls)	Shelter, Protection Structural Support
Concrete Elements	Fire Barrier Flood Barrier Missile Barrier Shelter, Protection Structural Support

Table 2.4-11 Essential Service Water Structures (Continued)

Component Type	Intended Function
Dams and Dikes	Heat Sink Shelter, Protection
Door	Missile Barrier Shelter, Protection
Fan Stack	Shelter, Protection
Fire Barrier Doors	Fire Barrier Shelter, Protection
Fire Barrier Seals	Fire Barrier
Hatch	Missile Barrier Shelter, Protection Structural Support
Hatches and Plugs	Missile Barrier Shelter, Protection
Penetrations Electrical	Structural Support
Penetrations Mechanical	Structural Support
Roofing Membrane	Flood Barrier Shelter, Protection
Stairs, Platforms and Grates	Structural Support
Structural Steel	Missile Barrier Shelter, Protection Structural Support

The AMR results for these component types are provided in Table 3.5.2-11, *Containments, Structures, and Component Supports - Summary of Aging Management Evaluation - Essential Service Water Structures*.

2.4.12 Supports

Structure Description

Mechanical and Electrical Supports

Structural supports for mechanical and electrical components are an integral part of all systems. Many of these supports are not uniquely identified with component identification numbers. However, characteristics of the supports, such as design, materials of construction, environments, and anticipated stressors, are similar. Therefore, structural supports for mechanical and electrical components are evaluated as commodities across system boundaries.

The commodity evaluation applies to structural supports within structures identified as within the scope of license renewal. The following structural supports for mechanical components are addressed:

- Supports for ASME Class 1 piping and components
- Supports for ASME Class 2 and 3 piping and components
- Supports for HVAC ducts, tube track, instrument tubing, instruments, and non-ASME piping and components

The following electrical components and supports are addressed:

- Cable trays and supports
- Conduit and supports
- Electrical panels and enclosures
- Instrument panels and racks

Structural support evaluation boundaries are based upon the following:

Integral attachments (such as plate welded to pipe at anchor points, saddles welded to heat exchangers, etc.) are evaluated with the specific component (pipe, pump, heat exchanger, etc.).

All pins, bolting, and other removable hardware that are part of the connection to component integral attachments are evaluated with the structural support, except high strength bolts for Class 1 NSSS supports, which are evaluated separately. A separate component for these high strength bolts is included.

The exposed portions of embedded components (i.e., end portion of the threaded anchor and nut) are evaluated with the component supports, except high strength bolts for Class 1 NSSS supports, as noted above.

Concrete and supporting structural hardware (including the embedded portion of threaded anchors) are evaluated with the structure. The concrete around anchorages must be evaluated with the supports to identify any concrete degradation that would impair the function of the anchors. This package includes a separate component for the anchorage concrete for in-scope mechanical and electrical components in each building.

The following reactor coolant system component supports are included with the ASME Class 1 piping and component commodity group:

Reactor Vessel Supports

Supports for the reactor vessel are individual air-cooled rectangular box structures beneath reactor vessel nozzles bolted to the primary shield wall concrete. Each box structure consists of a horizontal top plate that receives loads from the reactor vessel shoe, a horizontal bottom plate which transfers loads to the primary shield wall concrete, and connecting vertical plates which bear against an embedded support. The supports are air-cooled to maintain the supporting concrete temperature within acceptable levels.

Steam Generator Supports

The steam generator supports consist of the following elements:

Vertical Support

Four individual columns provide vertical support for each steam generator. These are bolted at the top to the steam generator and at the bottom to the concrete structure. Spherical ball bushings at the top and bottom of each column allow unrestrained lateral movement of the steam generator during heatup and cooldown. The column base design permits both horizontal and vertical adjustment of the steam generator for erection and adjustment of the system.

Lower Lateral Support

The lower lateral support is provided at the generator tube sheet by fabricated steel girders and struts. These are bolted to the compartment walls and include bumpers that bear against the steam generator but permit unrestrained movement of the steam generator during changes in system temperature. Stresses in the beams caused by wall displacements during compartment pressurization and the building seismic evaluation are considered in the design.

Upper Lateral Support

The upper lateral support of the steam generator is provided by a ring band at the operating deck. One-way acting limit stops restrain sudden seismic or blowdown induced motion, but permit the normal thermal movement of the steam generator. Movement perpendicular to the thermal growth direction of the steam generator is prevented by shear keys.

Reactor Coolant Pump Supports

Three individual columns, similar to those used for the steam generator, provide the vertical support for each pump. Lateral support for seismic and blowdown loading is provided by three lateral tension tie bars.

Pressurizer Supports

The supports for the pressurizer consist of a steel ring between the pressurizer skirt and the supporting concrete slab and the upper lateral support which consists of struts cantilevered off the compartment walls that bear against the seismic lugs provided on the pressurizer. The steel ring serves as a leveling and adjusting member for the pressurizer, and may also be used as a template for positioning the concrete anchor bolts.

Structure Intended Functions

Structural supports are within the scope of license renewal because they support and protect safety-related components. Therefore, safety-related supports are within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1).

Nonsafety-related supports are within the scope of license renewal based on the criterion of 10 CFR 54.4(a)(2) when they prevent interaction between safety-related and nonsafety-related components.

Other supports provide support for components that are within the scope of license renewal to support fire protection, ATWS, and station blackout requirements based upon criteria of 10 CFR 54.4(a)(3).

Callaway FSAR References

Additional details of supports are included in FSAR Sections 5.4.14 SP and 9.5.1.2 SP.

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.4-12 - Supports.

Table 2.4-12 Supports

Component Type	Intended Function
Bolting (Structural)	Structural Support
Cable Trays and Supports	Structural Support
Conduit And Supports	Shelter, Protection Structural Support
Electrical Panels and Enclosures	Shelter, Protection Structural Support
High Strength Bolting	Structural Support
Instrument Panels and Racks	Structural Support
Spring Hangers/ Sliding Surfaces	Expansion/Separation Structural Support
Supports ASME 1	Structural Support
Supports ASME 2 and 3	Structural Support
Supports HVAC Duct	Structural Support
Supports Instrument	Structural Support

Table 2.4-12 Supports (Continued)

Component Type	Intended Function
Supports Insulation	Structural Support
Supports Mech Equip Class 1	Structural Support
Supports Mech Equip Class 2 and 3	Structural Support
Supports Mech Equip Non ASME	Structural Support
Supports Non ASME	Structural Support

The AMR results for these component types are provided in Table 3.5.2-12, *Containments, Structures, and Component Supports - Summary of Aging Management Evaluation - Supports*.

Table 2.4-13 Component Types Assigned to Supports by Building/Structure

Support Components Associated with Structures	Elect/I&C Components					Mechanical Components							
	Cable Trays and Supports	Conduit and Supports	Electrical Panels and Enclosures	Instrument Panels and Racks	Instrument Supports	ASME Class 1 Pipe Supports	ASME Class 2 and 3 Pipe Supports	Non-ASME Pipe Supports	Mechanical Equipment Class 1 Supports	Mechanical Equipment Class 2 and 3 Supports	Mechanical Equip Non-Code Supports	HVAC Duct Supports	Insulation Supports
Reactor Building	x	x	x	x	x	x	x	x	x	x	x	x	x
Control Building	x	x	x	x	x		x	x		x	x	x	
Auxiliary Building	x	x	x	x	x		x	x		x	x	x	x
Turbine Building	x	x	x	x	x			x			x	x	
Diesel Generator Building	x	x	x	x	x		x	x		x	x	x	
Miscellaneous In-Scope Structures	x	x	x	x	x			x			x		
In-scope Tank Foundations and Structures					x		x	x				x	
Electrical Foundations and Structures	x	x	x	x	x			x			x		
Radwaste Building	x	x	x	x	x			x					
Fuel Building	x	x	x	x	x		x	x		x	x	x	
Essential Service Water Structures	x	x	x	x	x		x	x		x	x	x	

2.5 SCOPING AND SCREENING RESULTS: ELECTRICAL AND INSTRUMENTATION AND CONTROL SYSTEMS

The scoping and screening results for electrical and instrumentation and control system components consist of a list (Table 2.5-1, *Electrical and I&C Component Groups Requiring Aging Management Review*) of component types that require aging management review.

Using the “plant spaces” approach all electrical and instrumentation and control components were reviewed as a group regardless of the system assigned to each component. Bounding environmental conditions were used to evaluate the identified aging effect(s) with respect to component function(s) to determine the component groups that require aging management review. This methodology is discussed in Section 2.1.3.3, *Electrical and Instrumentation and Control System Scoping Methodology* and is consistent with the guidance in NEI 95-10, *Industry Guideline for Implementing the Requirements of 10 CFR Part 54 - The License Renewal Rule*.

The interface of electrical and instrumentation and control components with other types of components and the assessments of these interfacing components are provided in the appropriate mechanical or structural sections. The evaluation of electrical racks, panels, frames, cabinets, cable trays, conduit, manhole, duct banks, transmission towers and their supports is provided in the structural assessment documented in Section 2.4, *Scoping and Screening Results: Structures*.

The following electrical component groups were evaluated to determine the groups that require aging management review:

- Cable connections (metallic parts)
- Connectors
- High voltage insulator
- Insulated cable and connections (includes the following):
    - Electrical cables and connections not subject to 10 CFR 50.49 EQ requirements
    - Electrical cables and connections not subject to 10 CFR 50.49 EQ requirements used in instrumentation circuits that are sensitive to reduction in conductor insulation resistance
    - Inaccessible power cables not subject to 10 CFR 50.49 EQ requirements
- Switchyard bus and connections
- Terminal blocks

- Transmission conductors
- Transmission connections
- Electrical equipment subject to 10 CFR 50.49 environmental qualification (EQ) requirements
- Metal Enclosed Bus (including the following):
  - Bus and connections
  - Enclosure
  - Insulation and insulators
- Fuse holders (not part of a larger assembly)
- Penetrations, electrical
- Grounding conductors
- Cable tie wraps

License renewal drawing (LR-CW-ELEC-E-21001) was created based on the electrical single line diagram. The license renewal drawing schematically shows the portions of the plant AC electrical distribution system, including the SBO recovery path, that are included within the scope of license renewal.

2.5.1 Electrical Component Groups

2.5.1.1 Cable Connections (metallic parts)

The cable connections component type includes the metallic portions of cable connections that are located within passive and active equipment.

The function of the cable connections (metallic parts) is to electrically connect specified sections of an electrical circuit to deliver voltage, current or signals.

2.5.1.2 Connectors

The connectors component type includes the connector contacts for electrical connectors exposed to borated water leakage.

The function of the connections is to electrically connect specified sections of an electrical circuit to deliver voltage, current, or signals.

2.5.1.3 High Voltage Insulators

The high voltage insulators within the scope of license renewal are those associated with the power feeds from the switchyard to the plant that are used to connect the plant to the offsite power. These power feeds are required for the restoration of offsite power to meet the station blackout requirements.

The function of the high voltage insulators is to support and insulate the high voltage transmission conductors and switchyard bus.

2.5.1.4 Insulated Cable and Connections

Electrical insulated cables and connections not subject to environmental qualification requirements of 10 CFR 50.49 were evaluated for aging management based on the comparison of material property capability with environmental conditions. All electrical cables routed within raceway in structures within the scope of license renewal and in an adverse localized environment are subject to aging evaluation.

The function of insulated cables and connections is to electrically connect specified sections of an electrical circuit to deliver voltage, current or signals. The types of insulated cables includes medium voltage power cables, low voltage power cables, control cables, excore instrumentation cables and insulated ground cables. The types of insulated connections included in this review are splices, connectors, insulating material of fuse holders, and terminal blocks.

The electrical cables and connections used at Callaway Plant in radiation monitoring instrumentation circuits within the scope of license renewal with sensitive, high voltage, low-level signals are subject to 10 CFR 50.49 EQ requirements. These cables are evaluated as a time-limited aging analysis and are managed under the EQ program as discussed in Section 4.4, *Environmental Qualification (EQ) of Electric Equipment*.

2.5.1.5 Switchyard Bus and Connections

The switchyard buses within the scope of license renewal are those associated with the power feeds from the switchyard to the plant that are used to connect the plant to the offsite power sources. These power feeds are required for the restoration of offsite power to meet the station blackout requirements. The switchyard bus connects the high voltage transmission conductors to the switchyard circuit breakers.

The function of the switchyard buses is to electrically connect specified sections of an electrical circuit to deliver voltage and current.

2.5.1.6 Terminal Blocks

The terminal block component type includes terminal blocks not subject to environmental qualification requirements of 10 CFR 50.49 that are not part of active equipment that are installed within terminal boxes.

The function of the terminal block is to electrically connect specified sections of an electrical circuit to deliver voltage, current or signals.

2.5.1.7 Transmission Conductors

The transmission conductors within the scope of license renewal are those associated with the power feeds from the switchyard to the plant that are used to connect the plant to the offsite power. These power feeds are required for the restoration of offsite power to meet the station blackout requirements.

The function of the transmission conductors is to supply offsite power to various plant systems.

2.5.1.8 Transmission Connections

The transmission connections within the scope of license renewal are those associated with the power feeds from the switchyard to the plant that are used to connect the plant to the offsite power. These power feeds are required for the restoration of offsite power to meet the station blackout requirements.

The function of the transmission connections is to supply offsite power to various plant systems

2.5.1.9 Electrical Equipment Subject to 10 CFR 50.49 Environmental Qualification (EQ) Requirements

Electrical equipment subject to 10 CFR 50.49 EQ requirements is evaluated as a time-limited aging analysis and is managed under the environmental qualification program, as discussed in Section 4.4, *Environmental Qualification (EQ) of Electric Equipment*.

2.5.1.10 Metal Enclosed Bus

Metal enclosed bus is an enclosure that is not part of an active component such as switchgear, load centers, or motor control centers. There are typically three types of metal enclosed bus:

- Isolated phase bus
- Non-segregated phase bus
- Segregated phase bus

The isolated phase bus supports no license renewal intended function. Therefore aging management is not required.

The non-segregated phase bus that supports the service water pumps to provide fire suppression hose stations in the ESW building are within the scope of license renewal. The non-segregated phase bus is evaluated as a component type metal enclosed bus with the following parts:

- Bus and connections
- Enclosure
- Insulation and insulators

Callaway does not use segregated phase bus.

The function of the metal enclosed bus and connections is to electrically connect specified sections of an electrical circuit to deliver voltage and current.

The function of the metal enclosed bus enclosure is to provide for the expansion and separation of the bus as well as structural support.

The function of the metal enclosed bus insulation is to electrically insulate the bus bars from each other.

The function of the metal enclosed bus insulators is to support and electrically insulate the bus bars from the enclosure.

2.5.1.11 Fuse Holders (not part of a larger assembly)

The fuse holder component type includes fuse holders not subject to environmental qualification requirements of 10 CFR 50.49 that are not part of larger assemblies.

The function of the fuse holder is to electrically connect specified sections of an electrical circuit to deliver voltage, and current.

Callaway Plant has no stand alone fuse holders that support a license renewal intended function.

2.5.1.12 Penetrations, Electrical

Primary containment electrical penetrations at Callaway Plant are within the scope of license renewal. The electrical continuity of the environmentally qualified penetrations is managed under the environmental qualification program, which is evaluated as a time-limited aging analysis. The pressure boundary function of all electrical penetrations is evaluated in Section 2.4.1, *Reactor Building*.

Callaway Plant has no non-EQ electrical penetrations.

2.5.1.13 Grounding Conductors

Uninsulated grounding conductors bond metal raceways, building structural steel, and plant equipment to earth ground through an installed grounding grid. The uninsulated grounding conductors are nonsafety-related and provide for personnel and equipment protection. In the event of a fault in an electrical circuit or component, the grounding conductors provide a direct path to ground for the fault currents to minimize equipment damage. The grounding conductors do not prevent faults and are not required for equipment operation. Failure of a grounding conductor cannot affect the accomplishment of any intended functions. Therefore, the grounding conductors do not perform an intended function that meets the criteria of 10 CFR 54.4(a) and are not within the scope of license renewal.

2.5.1.14 Cable Tie Wraps

Cable tie wraps are used as an aid during cable installation to establish power cable spacing in cable trays. Once the cables have been installed and are in place, the cable's own weight in the tray and the inherent rigidity of the Class B copper stranding will continue to maintain the spacing. This spacing provides a path for natural circulation of air through the cables in the tray. The power cables are sized to carry currents well in excess of load requirements with margin considering worst case routing. Tie wraps are not credited in Callaway Plant seismic qualification of the cable tray support system.

The CLB and design documents were reviewed to determine that cable tie wraps perform no license renewal functions and failure of cable tie wraps would not prevent any safety-related equipment from performing its intended functions. Callaway Plant has no CLB requirements that cable tie wraps remain functional during and following design basis events. Therefore, the tie wraps do not perform an intended function that meets the criteria of 10 CFR 54.4(a) and are not within the scope of license renewal.

2.5.2 Electrical and I&C Component Groups Subject to Aging Management Review

The electrical and instrumentation and control component groups requiring an AMR and their intended functions are indicated in Table 2.5-1, *Electrical and I&C Component Groups Subject to Aging Management Review*.

Table 2.5-1 – Electrical and I&C Component Groups Subject to Aging Management Review

Component Type	Intended Function
Cable Connections (Metallic Parts)	Electrical Continuity
Connectors	Electrical Continuity
High Voltage Insulator	Insulate (Electrical) Structural Support

Table 2.5-1 – Electrical and I&C Component Groups Subject to Aging Management Review (Continued)

Component Type	Intended Function
Insulated Cable and Connections	Insulate (Electrical)
Metal Enclosed Bus (Bus/Connections)	Electrical Continuity
Metal Enclosed Bus (Enclosure)	Expansion/Separation Structural Support
Metal Enclosed Bus (Insulation/Insulator)	Insulate (Electrical)
Switchyard Bus and Connections	Electrical Continuity
Terminal Blocks	Insulate (Electrical)
Transmission Conductors	Electrical Continuity
Transmission Connections	Electrical Continuity

The AMR results for these component types are provided in Table 3.6.2-1, *Electrical and Instrumentation and Controls – Summary of Aging Management Evaluation – Electrical Components*.

CHAPTER 3

AGING MANAGEMENT REVIEW

3.0 AGING MANAGEMENT REVIEW

Chapter 3 provides the results of the aging management review (AMR) for those structures and component types identified in Chapter 2 as being subject to AMR. Organization of this chapter is based on Tables 3.1-1 through 3.6-1 of NUREG-1800, *Standard Review Plan for the Review of License Renewal Applications for Nuclear Power Plants*, Revision 2, dated December 2010.

The major sections of this chapter are:

- Aging Management of Reactor Vessel, Internals, and Reactor Coolant System (Section 3.1)
- Aging Management of Engineered Safety Features (Section 3.2)
- Aging Management of Auxiliary Systems (Section 3.3)
- Aging Management of Steam and Power Conversion System (Section 3.4)
- Aging Management of Containments, Structures, and Component Supports (Section 3.5)
- Aging Management of Electrical and Instrumentation and Controls (Section 3.6)

Descriptions of the internal and external service environments that were used in the AMR to determine aging effects requiring management are included in Table 3.0-1, *Mechanical Environments*, Table 3.0-2, *Structural Environments*, and Table 3.0-3, *Electrical and Instrumentation and Controls Environments*. The environments used in the AMRs are listed in the Evaluated Environment column.

The AMR results in Chapter 3 are presented in the following types of tables:

• **Table 3.x.1** - where '**3.x**' indicates the LRA section number from NUREG-1800, and '**1**' indicates that this is the first table type in Section 3.x. For example, in the Reactor Vessel, Internals, and Reactor Coolant subsection, this table would be number 3.1.1. For ease of discussion, this table type will hereafter be referred to in this chapter as "Table 1."

• **Table 3.x.2-y** - where '**3.x**' indicates the LRA section number from NUREG-1800, and '**2**' indicates that this is the second table type in Section 3.x; and 'y' indicates the system table number. For example, for the Reactor Vessel and Internals, within the Reactor Vessel, Internals, and Reactor Coolant System subsection, the Table would be Table 3.1.2-1 and for the Reactor Coolant System, it would be Table 3.1.2-2. For the Containment Spray System, within the Engineered Safety Features subsection, this Table would be Table 3.2.2-1. This table type will hereafter be referred to in this chapter as "Table 2."

Table Description

NUREG-1801 contains the generic evaluation of existing plant programs. It documents the technical basis for determining where existing programs are adequate without modification, and where existing programs should be augmented for the extended period of operation. The evaluation results documented in the report indicate that many of the existing programs are adequate to manage the aging effects for particular structures or components, within the scope of license renewal, without change. The report also contains recommendations on specific areas for which existing programs should be augmented for license renewal. In order to take full advantage of NUREG-1801, a comparison between the AMR results and the tables of NUREG-1801 has been made. The results of that comparison are provided in the two tables.

Table 1

The purpose of Table 1 is to provide a summary comparison of how the project aligns with the corresponding tables of NUREG-1800. The table is similar to Tables 3.1-1 through 3.6-1 provided in NUREG-1800, except that the “ID” and "Type” column has been replaced by an "Item Number" column and the "Rev 2 Item and Rev 1 Item columns have been replaced by a "Discussion" column. The "Item Number" column provides the reviewer with a means to cross-reference from Table 2 to Table 1. The "Discussion" column is used to provide clarifying/amplifying information. The following are examples of information that might be contained within this column:

- "Further Evaluation Recommended" information or reference to where that information is located. The name of a plant specific aging management program being used.
- Exceptions to the NUREG-1801 assumptions
- A discussion of how the line is consistent with NUREG-1801 aging management reviews
- A discussion of how the item is different than NUREG-1801 aging management reviews when it may appear to be consistent (e.g., when there is exception taken to an aging management program that is listed in NUREG-1801)

The format of Table 1 provides the reviewer with a means of aligning a specific Table 1 line with the corresponding Table 2 line.

Table 2

Table 2 provides the detailed results of the AMRs for those component types identified in Chapter 2 as being subject to AMR. There is a Table 2 for each of the systems and structures identified in Chapter 2 that have components within the scope of license renewal.

Table 2 consists of the following nine columns:

- Component Type
- Intended Function
- Material
- Environment
- Aging Effect Requiring Management
- Aging Management Program
- NUREG-1801 Item
- Table 1 Item
- Notes

Component Type

The first column identifies all of the component types from Chapter 2 that are subject to AMR. They are listed in alphabetical order.

Intended Function

The second column contains the license renewal intended functions (including abbreviations where applicable) for the listed component type. Definitions and abbreviations of intended functions are contained in Table 2.1-1, *Intended Functions – Abbreviations and Definitions*.

Material

The third column lists the particular materials of construction for the component type.

Environment

The fourth column lists the environments to which the component types are exposed. Internal and external environments are indicated and a listing and descriptions of these environments is provided in Table 3.0-1, *Mechanical Environments*, Table 3.0-2, *Structural Environments*, and Table 3.0-3, *Electrical and Instrumentation and Control Environments*. The three tables compare the evaluated environments to the environments listed in NUREG-1801 tables and the NUREG-1801, Chapter IX.D environments. The description column and NUREG-1801 column of the three tables provides specific environment considerations to be used when determining the NUREG-1801 consistency that is presented in column seven of Table 2. For example, stainless steel components that are exposed to a treated borated water, secondary water, or closed cycle cooling water environment of >60^{o}C (140^{o}F), the aging effect of cracking would also apply.

Aging Effect Requiring Management

As part of the AMR process, aging effects requiring management for the material and environment combination in order to maintain the intended function of the component type are determined. These aging effects requiring management are listed in column five.

Aging Management Programs

The aging management programs used to manage the aging effects requiring management are listed in column six of Table 2.

NUREG-1801 Item

Each combination of component type, material, environment, aging effect requiring management, and aging management program that is listed in Table 2, is compared to NUREG-1801 with consideration given to the standard notes, to identify consistencies. When they are identified, they are documented by noting the appropriate NUREG-1801 item number in column seven of Table 2. If there is no corresponding item number in NUREG-1801, this line in column seven is marked “none.” That way, a reviewer can readily identify where there is correlation between the plant specific tables and the NUREG-1801 tables.

Table 1 Item

Each combination of component, material, environment, aging effect requiring management, and aging management program that has an identified NUREG-1801 item number must also have a Table 3.x.1 line item reference number. The corresponding line item from Table 1 is listed in column eight of Table 2. If there is no corresponding item in NUREG-1801, this field in column eight is marked “none.” That way, the information from the two tables can be correlated.

Notes

Notes are established to identify how the information in Table 2 aligns with the information in NUREG-1801. All note references with letters are standard notes that will be the same throughout the application. Any notes the plant requires which are in addition to the standard notes will be identified by a number and deemed plant specific.

Standard Notes used in this application include:

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

B. Consistent with NUREG-1801 item for component, material, environment and aging effect. AMP takes some exceptions to NUREG-1801 AMP.

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

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

E. Consistent with NUREG-1801 item for material, environment and aging effect, but a different aging management program is credited or NUREG-1801 identifies a plant-specific aging management program.

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

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

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

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

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

TABLE USAGE

Table 1

The reviewer evaluates each line in Table 1 by moving from left to right across the table. Since the Component Type, Aging Effect/Mechanism, Aging Management Programs and Further Evaluation Recommended information is taken directly from NUREG-1800, no further analysis of those columns is required. The information intended to help the reviewer the most in this table is contained within the discussion column. Here the reviewer is given information necessary to determine, in summary, how the project evaluations and programs align with NUREG-1801. This may be in the form of descriptive information within the Discussion column or the reviewer may be referred to other locations within the LRA.

Table 2

Table 2 contains all of the AMR information for the plant, whether or not it aligns with NUREG-1801. For a given row within the table, the reviewer is able to see the intended function, material, environment, aging effect requiring management and aging management program combination for a particular component type within a system. In addition, if there is a correlation between the combination in Table 2 and a combination in NUREG-1801 this will be identified by a referenced item number in column seven, NUREG-1801 Item. The reviewer can refer to the item number in NUREG-1801, if desired, to verify the correlation. If the column is blank, the corresponding combination in NUREG-1801 is marked as "none." As the reviewer continues across the table from left to right, within a given row, the next column is labeled Table 1 Item. If there is a reference number in this column, the reviewer is able to use that reference number to locate the corresponding line in Table 1 and see how the aging management program for this particular combination aligns with NUREG-1801.

Table 2 provides the reviewer with a means to navigate from the component types subject to AMR in Chapter 2 all the way through the evaluation of the programs that will be used to manage the effects of aging of those component types.

A listing of the acronyms used in this Chapter is provided in Section 1.5.

Table 3.0-1 Mechanical Environments

Mechanical Environments		
Evaluated Environment	**NUREG-1801 Environment**	**Description**
Any Environment (Note: Use Appropriate Environment for External or Submerged Surface	Any Environment	Any environment applies only to bolting components with an aging effect of loss of preload. The environment for evaluation of bolting components with a loss of preload aging effect will be selected using one of the external or submerged evaluated environments noted below.
Atmosphere/ Weather	Air – Outdoor Air – Outdoor (External) Air – Outdoor (Internal) Air - indoor, controlled or uncontrolled or Air – outdoor Air -indoor, uncontrolled or Air – outdoor Any Environment [Loss of Preload]	The atmosphere/weather environment consists of moist, possibly salt laden air (or other aggressive contaminants), ambient temperatures, humidity, and exposure to weather, including precipitation and wind. The component is exposed to air, local weather conditions, external condensation, and potentially salt laden air (or other aggressive contaminants). Temperature extremes range from -26°F to 116°F.
Borated Water Leakage	Air With Reactor Coolant Leakage. Air With Borated Water Leakage. Air With Borated Water Leakage (Internal) [Encapsulation Components V.A.EP-43] Air With Reactor Coolant Leakage (Internal) or reactor coolant [RPV Leak Detection Line IV.A2.R-74] Air With Metal Temperature up to 288º C (550º F) [Pressurizer Integral Support - IV.C2.R-19] System Temperature up to 340º C (644º F) [RCS Fatigue TLAA IV.C2.R-18] Any Environment [Loss of Preload]	The borated water leakage environment applies in plant indoor and outdoor areas that include components and systems that contain borated water and that could leak on nearby components or structures.

Table 3.0-1 Mechanical Environments (Continued)

Mechanical Environments		
Evaluated Environment	**NUREG-1801 Environment**	**Description**
Buried	Soil	Buried components are in direct contact with soil. Soil is a mixture of inorganic materials produced by the weathering of rocks and clays, and organic material produced by decomposition of vegetation. Voids containing air and moisture occupy about 50 percent of the soil volume. Properties of soil that can affect aging include moisture content, pH, ion exchange capacity, density, and hydraulic conductivity. External environments included in the soil category consist of components at the air/soil interface, buried in the soil, or exposed to ground water in the soil. The groundwater has been determined to be non-aggressive.
	Soil or concrete	
	Any Environment [Loss of Preload]	
Closed Cycle Cooling Water	Closed Cycle Cooling Water	Water for component cooling that is treated and monitored for quality under the Closed-Cycle Cooling Water System program.
	Closed Cycle Cooling Water >60º C (140º F) [SCC Threshold for Stainless Steel]	
	Treated Water	
	Any Environment [Loss of Preload]	
Condensation (When used as Internal)	Condensation (Internal) [Common Miscellaneous Material/Environments]	An internal environment with the potential for condensation or moist air. Condensation can occur, but only rarely; equipment surfaces are normally dry. Plant indoor air (internal) or non-dried compressed gas is evaluated with the NUREG-1801 environment
	Condensation (Internal/External) [Glass - Common Miscellaneous Material/Environments]	

Table 3.0-1 Mechanical Environments (Continued)

Mechanical Environments		
Evaluated Environment	**NUREG-1801 Environment**	**Description**
	Moist Air or Condensation [Diesel Piping Components VII.H2.A-23] and [Fire Protection Piping VII.G.A-23]	of condensation when the air contains significant amounts of moisture (enough to cause loss of material) and the internal surface has temperatures below the dew point. Plant Indoor Air is evaluated with the NUREG-1801 environment of condensation when used for the drains associated with the internal surfaces exposed to condensation. Plant indoor air environments evaluated with condensation or moist air are considered to be potentially aggressive when surface contaminants are present.
	Air – Indoor Uncontrolled (Internal)	
	Air [Glass Piping Elements VII.J.AP-48 & VIII.I.SP-33]	
	Condensation	
	Any Environment [Loss of Preload]	
Demineralized Water	Treated Water	Demineralized water or chemically purified water which is the source for water in all clean systems such as the primary or secondary coolant systems. Demineralized water is monitored for quality under the Water Chemistry program and depending on the system; demineralized water may require additional processing.
	Any Environment [Loss of Preload]	
Diesel Exhaust	Diesel Exhaust [VII H2.AP-128 & H2.AP-104	Gases, fluids, particles present in diesel engine exhaust.
	Any Environment [Loss of Preload]	
Dry Gas	Air- Dry [Common Miscellaneous Material/Environments]	Internal gas environments from dry air (conditioned to reduce the dew point well below the system operating temperature), inert or non-reactive gases. Includes compressed instrument air, nitrogen, oxygen, hydrogen, helium, halon, CO_2 or freon.
	Air- Dry (Internal/External) [Common Miscellaneous Material/Environments]	
	Gas [Common Miscellaneous Material/Environments]	
	Any Environment [Loss of Preload]	

Table 3.0-1 Mechanical Environments (Continued)

Mechanical Environments		
Evaluated Environment	**NUREG-1801 Environment**	**Description**
Concrete	Concrete	Piping or components that are encased in concrete. Tank surfaces supported on concrete foundations.
	Soil or concrete	
Fuel Oil	Fuel Oil	Diesel fuel oil or liquid hydrocarbons used to fuel diesel engines. Fuel oil is monitored for the possibility of water and microbiological organisms by the Fuel Oil Chemistry program.
	Any Environment [Loss of Preload]	
Lubricating Oil	Lubricating Oil	Lubricating oils, including hydraulic oils (non-water based), are low-to-medium viscosity hydrocarbons, with the possibility of containing contaminants and/or moisture, used for bearing, gear, and engine lubrication and in valve actuators. Lubricating oil and hydraulic oils are monitored for the possibility of water by the Lubricating Oil Analysis program.
	Any Environment [Loss of Preload]	
Plant Indoor Air (When used as External)	Air – Indoor Uncontrolled (External)	Indoor air with temperatures higher than the dew point. Condensation can occur, but only rarely; equipment surfaces are normally dry. Plant indoor air is evaluated with the NUREG-1801 environment of condensation when the air contains significant amounts of moisture (enough to cause loss of material) and the external surface has temperatures below the dew point. Plant indoor air is evaluated with the NUREG-1801 environment of condensation when used for the drains associated with the external surfaces exposed to condensation. Plant indoor air environments evaluated with condensation or moist air are considered to be potentially aggressive when surface
	Air – Indoor Uncontrolled (Internal/External)	
	Air – Indoor Controlled (External) [VII.J.AP-36 and VIII.I.SP-1]	
	Air With Leaking Secondary Side Water and/or Steam [Steam Generator (Once Through) – IV.D2R-31]	
	Air With Steam or Water Leakage [Closure Bolting]	

Table 3.0-1 Mechanical Environments (Continued)

Mechanical Environments		
Evaluated Environment	**NUREG-1801 Environment**	**Description**
	Condensation (External)	contaminants are present. Controlled indoor air on mechanical components is humidity-controlled (i.e. air conditioned) environment and sufficient to eliminate the cited aging effects of contamination and oxidation.
	Condensation (Internal/External) [Glass - Common Miscellaneous Material/Environments]	
	Air - indoor, uncontrolled	
	Air - indoor, controlled or uncontrolled or Air – outdoor	
	Air -indoor, uncontrolled or Air – outdoor	
	Any Environment [Loss of Preload]	
Potable Water	Raw Water (potable water)	Water treated for drinking or other personnel uses.
	Any Environment [Loss of Preload]	
Raw Water	Raw Water	Water from the circulating water system or ultimate heat sink for use in open-cycle cooling systems. Raw Water consists of untreated surface or groundwater, whether fresh, brackish, or saline in nature.
	Raw water (internal)	
	Any Environment [Loss of Preload]	
Reactor Coolant	Reactor Coolant	Water in reactor coolant pressure boundary systems at or near full operating temperature that is treated and monitored for quality under the Water Chemistry program.
	Reactor Coolant >250C (>482F) [CASS]	
	Reactor Coolant and Neutron Flux [Neutron Irradiation Embrittlement and Reactor Internals]	

Table 3.0-1 Mechanical Environments (Continued)

Mechanical Environments		
Evaluated Environment	**NUREG-1801 Environment**	**Description**
	Reactor Coolant and Secondary Feedwater/Steam [Steam Generator Tube TLAA IV.D1.R-46]	
	Reactor Coolant or Steam [RCS Piping IV.C2.RP-159 and Pressurizer IV. C2.RP-156]	
	Any Environment [Loss of Preload]	
Secondary Water	Treated Water	Steam generator secondary systems water (including condensate and feedwater) that is treated and monitored for quality under the Water Chemistry program and controlled for protection of steam generators.
	Treated Water >60 ° C (140 ° F) [SCC Threshold for Stainless Steel]	
	Secondary Feedwater	
	Secondary feedwater or steam	
	Any Environment [Loss of Preload]	
Steam	Steam	Secondary water that has been converted to steam or heating and process steam produced from the auxiliary boiler.
	Steam or Treated water	
	Any Environment [Loss of Preload]	

Table 3.0-1 Mechanical Environments (Continued)

Mechanical Environments		
Evaluated Environment	**NUREG-1801 Environment**	**Description**
Submerged (Note: External Surface is Evaluated With Appropriate Internal Environment)	Use Appropriate Internal Environment	Components/equipment that are completely or partially submerged in: • Water (operating or process fluid) • Oil/fluids (lube, fuel, electro-hydraulic, etc.) The environment for submerged components will be identified using one of the internal environments previously identified.
Sodium Hydroxide	This Environment is not in NUREG-1801	Treated water with elevated pH due to the presence of NaOH. Sodium hydroxide and lithium hydroxide are used in the regeneration process for demineralizer resins, and as a water treatment chemical to achieve and maintain an elevated pH in some treated water applications.
Treated Borated Water	Treated Borated Water Treated Borated Water >60º C (140º F) [SCC Threshold for Stainless Steel] Treated Water (Borated) Treated Water (Borated) >60º C (140º F) [SCC Threshold for Stainless Steel] Treated Water (Borated) >250º C (482º F) [Thermal Embrittlement Threshold for CASS] Any Environment [Loss of Preload]	Treated water with boric acid in non-reactor coolant pressure boundary systems that is monitored for quality under the Water Chemistry program.
Underground	Air-indoor uncontrolled or condensation (external) [VII.I.AP-294], [VIII.H.SP-161]	Underground piping and tanks are below grade, but are contained within a tunnel or vault such that they are in contact with air and are located where access for inspection is restricted. The underground environment is limited to mechanical components.

Table 3.0-1 Mechanical Environments (Continued)

Mechanical Environments		
Evaluated Environment	**NUREG-1801 Environment**	**Description**
	Air - indoor, uncontrolled (External) or condensation (External) [V.E.EP-123]	
	Any Environment [Loss of Preload]	
Ventilation Atmosphere	Air – Indoor Uncontrolled	Atmospheric/room/building air for ventilation systems with temperatures higher than the dew point, i.e. condensation can occur but only rarely, equipment surfaces are normally dry. Condensation on the surfaces of systems with temperatures below the dew point is considered raw water due to the potential for surface contamination. Also the environment to which the external surface of components inside HVAC systems is exposed.
	Air – Indoor Uncontrolled (External)	
	Air – Indoor Uncontrolled (Internal)	
	Condensation	
	Condensation (Internal)	
	Condensation (External)	
	Air – Indoor Uncontrolled (Internal/External)	
	Air – Indoor Controlled (External) [VII.J.AP-36 and VIII.I.SP-1]	
	Any Environment [Loss of Preload]	
Waste Water	Waste Water	Radioactive, potentially radioactive, or non-radioactive waters that are collected from equipment and floor drains. Waste waters may contain contaminants, including oil and boric acid, depending on location, as well as originally treated water that is not monitored by a chemistry program.
	Any Environment [Loss of Preload]	

Table 3.0-2 Structural Environments

Structural Environments		
Evaluated Environment	**NUREG-1801 Environment**	**Description**
Atmosphere/ Weather	Any Environment [Reaction With Aggregates]	The atmosphere/weather environment consists of moist, possibly salt laden air (or other aggressive contaminants), ambient temperatures, humidity, and exposure to weather, including precipitation and wind. The component is exposed to air, local weather conditions, external condensation, and potentially salt laden air (or other aggressive contaminants). Temperature extremes range from -26°F to 116°F.
	Any Environment [Loss of Preload]	
	Air – Outdoor	
	Soil [Cracks and Distortion Due to Increased Stress Levels From Settlement]	
	Water – Flowing [Leaching of Calcium Hydroxide]	
	Various [Elastomers III A6-TP7]	
	Air -indoor, uncontrolled or Air – outdoor	
	Air -indoor, uncontrolled or Air – outdoor or Ground water/soil	
	Air - outdoor or Ground water/soil	
	Air - outdoor or Water - flowing or standing or Ground water/soil	
	Air - indoor, uncontrolled or Air - outdoor or Water - flowing or standing	

Table 3.0-2 Structural Environments (Continued)

Structural Environments		
Evaluated Environment	**NUREG-1801 Environment**	**Description**
Borated Water Leakage	Air With Borated Water Leakage [Supports]	The borated water leakage environment applies in plant indoor and outdoor areas that include components and systems that contain borated water and that could leak on nearby components or structures. This environment is specified in the aging management review results only for materials susceptible to boric acid corrosion (carbon steel, low-alloy steels, and copper alloys).
Buried	Any [Reaction With Aggregates] Any Environment [Loss of Preload] Groundwater/Soil Soil [Cracks and Distortion Due to Increased Stress Levels From Settlement] Water - Flowing [Leaching of Calcium Hydroxide] Water - Flowing Under Foundation [Porous Concrete Sub-foundation] Various [Elastomers III A6-TP7] Air -indoor, uncontrolled or Air - outdoor or Ground water/soil Air - outdoor or Ground water/soil	Structures/components that are buried in soil. Soil is a mixture of inorganic materials produced by the weathering of rocks and clays, and organic material produced by decomposition of vegetation. Voids containing air and moisture occupy about 50% of the soil volume. Properties of soil that can affect aging include water content, pH, ion exchange capacity, density, and permeability. The groundwater has been determined to be non-aggressive. Structures/components that are buried and may be exposed to: • Soil, dry under normal conditions • Soil with ground water present • Flowing water causing possible leaching condition • Foundation aging

Table 3.0-2 Structural Environments (Continued)

Structural Environments		
Evaluated Environment	**NUREG-1801 Environment**	**Description**
	Air - outdoor or Water - flowing or standing or Ground water/soil	• Soft soil and settlement issues • An aggressive environment caused by contaminants in the soil
Concrete	See NUREG-1801 Mechanical Item	Components that are encased in concrete.
Plant Indoor Air	Any [Reaction With Aggregates]	Structures are subject to the same conditions covered in Plant Indoor Air Mechanical Environment. Indoor air on structures with temperatures higher than the dew point, i.e., condensation can occur but only rarely, structural surfaces are normally dry.
	Any Environment [Loss of Preload]	
	Air – Indoor Uncontrolled	
	Soil [Cracks and Distortion Due to Increased Stress Levels From Settlement]	
	Various [Elastomers III A6-TP7]	
	Water - Flowing[Leaching of Calcium Hydroxide]	
	Air -indoor, uncontrolled or Air – outdoor	
	Air -indoor, uncontrolled or Air - outdoor or Ground water/soil	
	Air - indoor, uncontrolled or Air - outdoor or Water - flowing or standing	
Submerged	Any Environment [Loss of Preload]	Structures that are completely or partially covered, or structures that are partially filled (such as tanks, sumps, etc.) with operating or process fluids such as:
	Water – Standing [Stainless steel tank liner]	

Table 3.0-2 Structural Environments (Continued)

Structural Environments		
Evaluated Environment	**NUREG-1801 Environment**	**Description**
	Water – Flowing (includes Raw Water which includes untreated salt water) [Abrasion/Cavitation (concrete), Earthen Water Control Structures, and Water Control Structures Metal Components]	treated water, treated borated water, raw water, fuel oil, lubricating oil, etc. Structures that are exposed to flowing water conditions potentially causing: • Abrasion • Cavitation • Leaching • Loss of Material • Loss of Form
	Water – Flowing or standing (includes Raw Water which includes untreated salt water) [Earthen Water Control Structures, and Water Control Structures Metal Components]	
	Treated Water or Treated Borated Water [Fuel Pool Liner – III.A5]	
	Treated Water [Supports]	
	Air - outdoor or Water - flowing or standing or Ground water/soil	
	Air - indoor, uncontrolled or Air - outdoor or Water - flowing or standing	
	Various [Elastomers in Water Control Structures III.A6.TP]	
	As applicable, see NUREG-1801 Mechanical environments: raw water, fuel oil, lubricating oil, etc.	

Table 3.0-3 Electrical and Instrumentation and Controls Environments

Electrical Environments		
Evaluated Environment	**NUREG-1801 Environment**	**Description**
Adverse Localized Environment	Adverse localized environment caused by significant moisture	Adverse localized environments are limited to the immediate vicinity of an electrical component and can be due to any of the following: (1) exposure to significant moisture (2) heat, radiation, or moisture or (3) heat, radiation, oxygen, moisture, or voltage.
	Adverse localized environment caused by heat, radiation, or moisture	
	Adverse localized environment caused by heat, radiation, oxygen, moisture, or voltage (TLAA)	
Atmosphere/ Weather	Air – Outdoor	The atmosphere/weather environment consists of moist, possibly salt laden air (or other aggressive contaminants), ambient temperatures, humidity, and exposure to weather, including precipitation and wind. The component is exposed to air, local weather conditions, external condensation, and potentially salt laden air (or other aggressive contaminants). Temperature extremes range from -26°F to 116°F.
	Air - indoor, controlled or uncontrolled or Air – outdoor	
	Air -indoor, uncontrolled or Air – outdoor	
Borated Water Leakage	Air with Borated Water Leakage	The borated water leakage environment applies in plant indoor and outdoor areas that include components and systems that contain borated water and that could leak on nearby components or structures. This environment is specified in the aging management review results only for materials susceptible to boric acid corrosion (carbon steel, low-alloy steels, and copper alloys).
Plant Indoor Air	Air - Indoor, controlled or uncontrolled	Uncontrolled indoor air on electrical components with temperatures higher than the dew point, i.e., condensation can occur but only rarely, equipment surfaces are normally dry. Controlled indoor air on electrical components is humidity- controlled (i.e. air conditioned) environment and sufficient to eliminate the cited aging effects of contamination and oxidation without affecting resistance.
	Air - Indoor, controlled	
	Air – Indoor, uncontrolled	
	Air - indoor, controlled or uncontrolled or Air – outdoor	
	Air -indoor, uncontrolled or Air – outdoor	

3.1 AGING MANAGEMENT OF REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM

3.1.1 Introduction

Section 3.1 provides the results of the aging management reviews (AMRs) for those component types identified in Section 2.3.1, *Reactor Vessel, Internals, and Reactor Coolant System*, subject to AMR. These systems are described in the following sections:

- Reactor Vessel and Internals (Section 2.3.1.1)
- Reactor Coolant System (Section 2.3.1.2)
- Pressurizer (Section 2.3.1.3)
- Steam Generators (Section 2.3.1.4)

Table 3.1-1, *Summary of Aging Management Programs in Chapter IV of NUREG-1801 for Reactor Vessel, Internals, and Reactor Coolant System*, provides the summary of the programs evaluated in NUREG-1801 that are applicable to the component types in this section. Table 3.1-1 uses the format of Table 1 described in Section 3.0, *Aging Management Review*.

3.1.2 Results

The following tables summarize the results of the AMR for the systems in the Reactor Vessel, Internals, and Reactor Coolant System area:

- Table 3.1.2-1, *Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Reactor Vessel and Internals*
- Table 3.1.2-2, *Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Reactor Coolant System*
- Table 3.1.2-3, *Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Pressurizer*
- Table 3.1.2-4, *Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Steam Generators*

These tables use the format of Table 2 discussed in Section 3.0, *Aging Management Review*.

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

The materials from which the component types are fabricated, the environments to which they are exposed, the potential aging effects requiring management, and the aging management programs used to manage these aging effects are provided for each of the above systems in the following sections.

3.1.2.1.1 Reactor Vessel and Internals

Materials

The materials of construction for the reactor vessel and internals component types are:

- Carbon Steel
- Carbon Steel with Stainless Steel Cladding
- High Strength Low Alloy Steel (Bolting)
- Nickel-Alloys
- Stainless Steel

Environment

The reactor vessel and internals components are exposed to the following environments:

- Borated Water Leakage
- Reactor Coolant

Aging Effects Requiring Management

The following reactor vessel and internals aging effects require management:

- Changes in dimension
- Cracking
- Loss of fracture toughness
- Loss of fracture toughness and loss of material
- Loss of fracture toughness and loss of preload
- Loss of fracture toughness, change in dimension, and loss of preload
- Loss of material
- Loss of preload and loss of material

Aging Management Programs

The following aging management programs manage the aging effects for the reactor vessel and internals component types:

- ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)
- Boric Acid Corrosion (B2.1.4)
- Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components (PWRs only) (B2.1.5)
- Flux Thimble Tube Inspection (B2.1.22)
- One-Time Inspection (B2.1.18)
- PWR Vessel Internals (B2.1.6)
- Reactor Head Closure Stud Bolting (B2.1.3)
- Reactor Vessel Surveillance (B2.1.17)
- Water Chemistry (B2.1.2)

3.1.2.1.2 Reactor Coolant System

Materials

The materials of construction for the reactor coolant system component types are:

- Carbon Steel
- Copper Alloy
- Stainless Steel
- Stainless Steel Cast Austenitic

Environment

The reactor coolant system component types are exposed to the following environments:

- Borated Water Leakage
- Closed Cycle Cooling Water
- Condensation
- Demineralized Water
- Dry Gas

- Lubricating Oil
- Plant Indoor Air
- Reactor Coolant
- Treated Borated Water

Aging Effects Requiring Management

The following reactor coolant system aging effects require management:

- Cracking
- Loss of fracture toughness
- Loss of material
- Loss of preload
- Reduction of heat transfer

Aging Management Programs

The following aging management programs manage the aging effects for the reactor coolant system component types:

- ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)
- Bolting Integrity (B2.1.8)
- Boric Acid Corrosion (B2.1.4)
- Closed Treated Water Systems (B2.1.11)
- External Surfaces Monitoring of Mechanical Components (B2.1.21)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)
- Lubricating Oil Analysis (B2.1.24)
- One-Time Inspection (B2.1.18)
- One-Time Inspection of ASME Code Class 1 Small-Bore Piping (B2.1.20)
- Water Chemistry (B2.1.2)

3.1.2.1.3 Pressurizer

Materials

The materials of construction for the pressurizer component types are:

- Carbon Steel
- Carbon Steel with Stainless Steel Cladding
- Nickel-Alloys
- Stainless Steel

Environment

The pressurizer component types are exposed to the following environments:

- Borated Water Leakage
- Reactor Coolant

Aging Effects Requiring Management

The following pressurizer aging effects require management:

- Cracking
- Loss of material
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for the pressurizer component types:

- ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)
- Bolting Integrity (B2.1.8)
- Boric Acid Corrosion (B2.1.4)
- Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components (PWRs only) (B2.1.5)
- One-Time Inspection (B2.1.18)
- Water Chemistry (B2.1.2)

3.1.2.1.4 Steam Generators

Materials

The materials of construction for the steam generator component types are:

- Carbon Steel
- Carbon Steel with Stainless Steel Cladding
- Nickel-Alloys
- Stainless Steel

Environment

The steam generator component types are exposed to the following environments:

- Borated Water Leakage
- Plant Indoor Air
- Reactor Coolant
- Secondary Water

Aging Effects Requiring Management

The following steam generator aging effects require management:

- Cracking
- Loss of material
- Loss of preload
- Wall thinning

Aging Management Programs

The following aging management programs manage the aging effects for the steam generator component types:

- ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)
- Bolting Integrity (B2.1.8)
- Boric Acid Corrosion (B2.1.4)
- Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components (PWRs only) (B2.1.5)

- External Surfaces Monitoring of Mechanical Components (B2.1.21)
- Flow-Accelerated Corrosion (B2.1.7)
- Steam Generators (B2.1.9)
- Water Chemistry (B2.1.2)

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

NUREG-1801 provides the basis for identifying those programs that warrant further evaluation by the reviewer in the License Renewal Application. For the reactor vessel, internals, and reactor coolant system, those evaluations are addressed in the following sections.

3.1.2.2.1 Cumulative Fatigue Damage

Analysis of cumulative fatigue damage in the reactor pressure vessel and internals; reactor coolant pumps, pressurizer; primary side of the steam generators; reactor coolant pressure boundary piping, valves, and other components; and of those steam generator secondary-side components with a fatigue analysis are TLAAs as defined in 10 CFR 54.3. TLAAs are evaluated in accordance with 10 CFR 54.21(c)(1).

[3.1.1.001] Reactor coolant pressure boundary closure bolting (RPV head studs) are designed to ASME Class 1, with a fatigue analysis. Section 4.3.2 describes the evaluation of these TLAAs for reactor vessel closure studs.

[3.1.1.002] The Callaway replacement steam generator tube bundles are designed to ASME III Class 1, with fatigue and wear analyses. Section 4.3.2.3 describes the TLAA evaluation of the tube fatigue analysis and Section 4.7.9 describes the TLAA evaluation of the tube wear analysis.

[3.1.1.003] Callaway reactor vessel internals are designed to ASME III, Subsection NG, with fatigue analyses. Section 4.3.3 describes the evaluation of these TLAAs.

[3.1.1.004] Not applicable. This is a Westinghouse vessel with no support skirt, so the applicable NUREG-1801 line was not used.

[3.1.1.005] Reactor coolant pressure boundary closure bolting (pump, valve, and pressurizer and steam generator manway and port bolting), reactor vessel inlet and outlet nozzle supports, and pressurizer vessel supports, support skirts and flanges are designed to ASME Class 1, with a fatigue analysis. The steam generator primary and secondary shells, integral supports, manways, nozzles, and bolting have a Class 1 fatigue analysis. The pressurizer relief tank is not an ASME III Class 1 component, nor is it designed to other fatigue or cyclic design rules, and therefore has no fatigue TLAA.

Section 4.3.2 describes the evaluation of these TLAAs for the reactor coolant pump and its closure bolting; the pressurizer closure bolting and its support skirt; the Class 1 valves; and the Class 1 piping and piping components.

Section 4.3.2.3 describes the evaluation of these TLAAs for steam generator primary and secondary-side pressure boundaries, feedwater nozzles and closure studs.

[3.1.1.008] The steam generator primary and secondary pressure boundaries are designed respectively to ASME III Class 1 and 2, but both the steam generator primary and secondary shells and nozzles have a Class 1 fatigue analysis.

Section 4.3.2.3 describes the evaluation of these TLAAs for steam generator primary and secondary-side pressure boundaries including the lower head, divider plate, primary and secondary manways, nozzles and safe ends.

[3.1.1.009] Reactor coolant pressure boundary piping, reactor coolant pumps, and the pressurizer are designed to ASME III Class 1, with fatigue analyses.

Section 4.3.2 describes the evaluation of these TLAAs for the reactor coolant pumps; the pressurizer vessel, penetrations, manways, nozzles, safe ends; and the reactor coolant pressure boundary piping and piping components.

Section 4.3.2.1 describes the evaluation of the TLAA for the reactor coolant pump thermal barrier flange.

Section 4.3.2.2 describes the evaluation of the TLAA for pressurizer insurge-outsurge transients.

Section 4.3.2.4 describes the evaluation of the TLAA for the pressurizer surge line thermal cycling and stratification.

Section 4.7.6 describes the evaluation of TLAAs for postulated high energy line break locations.

Section 4.7.7 describes the evaluation of the TLAAs for the leak-before-break analyses.

Section 4.3.4 describes the evaluation of TLAAs for the effects of the reactor coolant system environment on NUREG/CR-6260 piping and nozzle locations.

[3.1.1.010] The reactor vessel is designed to ASME III Class 1, with fatigue analyses.

Section 4.3.2 describes the evaluation of these TLAAs for the reactor vessel, including the shell, heads, penetrations, nozzles; and the control rod drive mechanisms (CRDM), core exit thermocouple nozzle assemblies (CETNA), and canopy seals.

Section 4.3.4 describes the evaluation of TLAAs for the effects of the reactor coolant system environment on NUREG/CR-6260 reactor pressure vessel (RPV) head to shell junction and RPV nozzle locations.

Section 4.7.2 describes the evaluation of TLAAs for the cold leg elbow-to-safe end weld in service inspection flaw analysis.

Section 4.7.2 describes the evaluation of TLAAs for the inservice inspection corrosion analysis of RPV underclad flaws.

3.1.2.2.2 Loss of Material due to General, Pitting, and Crevice Corrosion

3.1.2.2.2.1 PWR steam generator upper and lower shell and transition cone exposed to secondary feedwater and steam

The existing program relies on control of water chemistry to mitigate corrosion and Inservice Inspection to detect loss of material. Augmented inspection is recommended for Westinghouse Model 44 and 51 steam generators, where a high stress region exists at the shell to transition cone weld, if general and pitting corrosion of the shell is known to exist. The steam generators at Callaway have been replaced with Areva Model 73/19T, so the augmented inspection is not applicable.

3.1.2.2.2.2 PWR steam generator shell assembly exposed to secondary feedwater and steam

Further evaluation of the effectiveness of the Water Chemistry program (B2.1.2) is required for applicants that have replaced only the bottom part of their steam generators, generating a cut in the middle of the transition cone, and consequently a new transition cone closure weld. The replacement steam generators at Callaway did not require a cut and associated field weld in the middle of the steam generator transition cone; therefore, further evaluation is not required.

3.1.2.2.3 Loss of Fracture Toughness due to Neutron Irradiation Embrittlement

3.1.2.2.3.1 Loss of Fracture Toughness due to Neutron Irradiation Embrittlement – TLAA

Recent coupon examinations demonstrated that adequate adjusted reference temperature, upper shelf energy, and pressurized thermal shock screening temperature margin will remain at the end of a 60-year period of extended operation; and therefore that subsequent revisions to pressure-temperature limits will provide adequate operating margin, without the use of special methods. Section 4.2.0 describes the evaluation of these neutron embrittlement TLAAs.

Loss of fracture toughness for the reactor pressure vessel shell and nozzles is managed by the Reactor Vessel Surveillance program (B2.1.17).

3.1.2.2.3.2 Loss of Fracture Toughness due to Neutron Irradiation Embrittlement – Reactor Vessel Surveillance program

The Reactor Vessel Surveillance program (B2.1.17) manages loss of fracture toughness due to neutron irradiation embrittlement in the reactor vessel beltline shell, nozzles, and welds exposed to reactor coolant and neutron flux.

3.1.2.2.3.3 Ductility – Reduction in Fracture Toughness

Reduction in fracture toughness is a plant-specific TLAA for Babcock and Wilcox reactor internals and is not applicable to Callaway which has Westinghouse reactor internals.

3.1.2.2.4 Cracking due to Stress Corrosion Cracking and Intergranular Stress Corrosion Cracking

3.1.2.2.4.1 BWR top head enclosure vessel flange leak detection lines

Not applicable to Callaway, applicable to BWR only

3.1.2.2.4.2 BWR isolation condenser components exposed to reactor coolant

Not applicable to Callaway, applicable to BWR only

3.1.2.2.5 Crack Growth due to Cyclic Loading

An analysis of crack growth of underclad flaws in reactor vessel forgings due to cyclic loading to qualify them for the current licensed operating period would be a TLAA. This phenomenon has been addressed in the Callaway vessel by weld cladding processes designed to avoid these defects.

No underclad cracks have been detected or analyzed for the Callaway vessel, in the absence of which there are no TLAAs. Section 4.7.4 describes the absence of a TLAA for underclad cracking.

3.1.2.2.6 Cracking due to Stress Corrosion Cracking

3.1.2.2.6.1 PWR stainless steel reactor vessel flange leak detection lines and Bottom Mounted Instrument Guide Tubes

Water Chemistry program (B2.1.2), augmented by ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program (B2.1.1), manages cracking due to stress corrosion cracking for stainless steel BMI guide tube (flux thimble guide tubes from the bottom of vessel to seal table) in a reactor coolant environment. The Callaway reactor vessel flange leak detection line is made of nickel-alloy with a normal operation environment of air with borated water leakage. ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program (B2.1.1) manages cracking due to stress corrosion cracking for reactor vessel flange leak detection line.

3.1.2.2.6.2 CASS reactor coolant system piping and components exposed to reactor coolant

The carbon contents for reactor coolant system fittings and piping pieces do not meet the NUREG-0313 criterion of less than 0.035 percent based on the Certified Material Test Reports of Callaway CASS piping components. Cracking due to SCC for CASS reactor coolant system piping components exposed to reactor coolant is managed by the Water Chemistry program (B2.1.2) augmented by the ASME Section XI Inservice Inspection program (B2.1.1).

Callaway has determined that the molybdenum and ferrite values are below the thermal aging embrittlement screening threshold. Therefore, these CASS reactor coolant piping components are not susceptible to the aging effect of thermal aging embrittlement and it is not required to include flaw evaluation methodology for these CASS components.

3.1.2.2.7 Cracking due to Cyclic Loading

Not applicable to Callaway, applicable to BWR only.

3.1.2.2.8 Loss of Material due to Erosion

Not applicable. Callaway steam generators do not have feedwater impingement plates, so the applicable NUREG-1801 line was not used.

3.1.2.2.9 Cracking due to Stress Corrosion Cracking and Irradiation-Assisted Stress Corrosion Cracking

PWR Vessel Internals (B2.1.6) examines one hundred percent of the volume/area of each accessible stainless steel and nickel alloy reactor vessel internals primary and expansion inspection category component that is subject to cracking. The minimum examination coverage for primary and expansion inspection categories is 75 percent of the component's total (accessible plus inaccessible) inspection area/volume be examined or, when addressing a set of like components (e.g., bolting), that the inspection examine a minimum sample size of 75 percent of the total population of like components.

If defects are discovered in the 75 percent sample size, the information will be entered into corrective action program to evaluate the results of the examination to ensure the intended functions are maintained until the next scheduled examination.

3.1.2.2.10 Loss of Fracture Toughness due to Neutron Irradiation Embrittlement; Change in Dimension due to Void Swelling; Loss of Preload due to Stress Relaxation; or Loss of Material due to Wear

PWR Vessel Internals (B2.1.6) examines one hundred percent of the volume/area of each accessible stainless steel and nickel alloy reactor vessel internals primary and expansion inspection category component that is subject to loss of fracture toughness, changes in dimension, loss of preload, or loss of material. The minimum examination coverage for primary and expansion inspection categories is 75 percent of the component's total (accessible plus inaccessible) inspection area/volume be examined or, when addressing a set of like components (e.g., bolting), that the inspection examine a minimum sample size of 75 percent of the total population of like components.

If defects are discovered in the 75 percent sample size, the information will be entered into corrective action program to evaluate the results of the examination to ensure the intended functions are maintained until the next scheduled examination.

3.1.2.2.11 Cracking due to Primary Water Stress Corrosion Cracking

3.1.2.2.11.1 Primary water stress corrosion cracking in steam generator divider plate assemblies

Callaway replacement steam generator divider plate assemblies are fabricated of Alloy 690. The divider plate to primary head and tubesheet junctions are welded with Alloy 152 weld materials. The tubesheet cladding is Alloy 182 and the primary head cladding is stainless steel. There is a concern regarding potential failure at the divider plate welds to primary head and tubesheet cladding and Callaway commits to perform one of the following three resolution options:

(1) Perform an inspection of each steam generator to assess the condition of the divider plate welds. The examination technique(s) will be capable of detecting primary water stress corrosion cracking (PWSCC) in the divider plate welds.

OR

(2) Perform an analytical evaluation of the steam generator divider plate welds in order to establish a technical basis which concludes that the steam generator reactor coolant system pressure boundary is adequately maintained with the presence of steam generator divider plate weld cracking.

OR

(3) If results of industry and NRC studies and operating experience document that potential failure of the steam generator reactor coolant system pressure boundary due to PWSCC cracking of steam generator divider plate welds is not a credible concern, this commitment will be revised to reflect that conclusion.

3.1.2.2.11.2 Primary water stress corrosion cracking in steam generator nickel alloy tube-to-tubesheet welds

The material of steam generator tubesheet cladding is Alloy 182. The tubes are made of Alloy 690 and are secured to the tubesheet by means of tube to tubesheet leaktight weld and tube expansion. There is a concern regarding potential failure of primary-to-secondary pressure boundary due to primary water stress corrosion cracking (PWSCC) cracking of tube-to-tubesheet welds. Callaway commits to perform one of the following two resolution options:

(1) Perform a one-time inspection of a representative number of tube-to-tubesheet welds in each steam generator to determine if PWSCC cracking is present. If weld cracking is identified, the condition will be resolved through repair or engineering evaluation to justify continued service, as appropriate, and an ongoing monitoring program will be established to perform routine tube-to-tubesheet weld inspections for the remaining life of the steam generators.

OR

(2) Perform an analytical evaluation of the steam generator tube-to-tubesheet welds in order to establish a technical basis which concludes that the structural integrity of the steam generator tube-to-tubesheet interface is adequately maintained with the presence of tube-to-tubesheet weld cracking. Establish a technical basis which concludes that the steam generator tube-to-tubesheet welds are not required to perform a reactor coolant pressure boundary function.

3.1.2.2.12 Cracking due to Fatigue

Not applicable. This item is only applicable to Combustion Engineering core support barrel assembly. Callaway has Westinghouse design core barrel assembly. Further evaluation of cumulative fatigue damage due to fatigue for the reactor internals is addressed in Section 3.1.2.2.1.

3.1.2.2.13 Cracking due to Stress Corrosion Cracking and Fatigue

Not applicable. This item is only applicable to nickel-alloy control rod guide tube assemblies and guide tube support pins. Callaway control rod guide tube assemblies and guide tube support pins are made of stainless steel.

3.1.2.2.14 Loss of Material due to Wear

Not applicable. This item is only applicable to nickel-alloy control rod guide tube assemblies and guide tube support pins. Callaway control rod guide tube assemblies and guide tube support pins are made of stainless steel. Zircaloy-4 incore instrumentation lower thimble tubes are not applicable to Callaway.

3.1.2.2.15 Quality Assurance for Aging Management of Nonsafety-Related Components

Quality Assurance Program and Administrative Controls are discussed in Section B1.3, *Quality Assurance Program and Administrative Controls*.

3.1.2.3 Time-Limited Aging Analyses

The Time-Limited Aging Analyses identified below are associated with the Reactor Vessel, Internals, and Reactor Coolant System components. The section of Chapter 4, *Time-Limited Aging Analyses* that contains the TLAA review results is indicated in parenthesis.

- Cumulative Fatigue Damage (Section 4.3, *Metal Fatigue*; and Section 4.7.6, *High Energy Line Break Postulation Based on Fatigue Cumulative Usage Factors*)
- Loss of Fracture Toughness due to Neutron Embrittlement (Section 4.2, *Reactor Vessel Neutron Embrittlement Analysis*)
- Fatigue Crack Growth (Section 4.7.2, *In-Service Flaw Analyses that Demonstrate Structural Integrity for 40 years*; Section 4.7.5, *Reactor Coolant Pump Flywheel Fatigue Crack Growth Analysis*; and Section 4.7.7, *Fatigue Crack Growth Assessment in Support of a Fracture Mechanics Analysis for the Leak-Before-Break (LBB) Elimination of Dynamic Effects of Piping Failures*)
- Corrosion (Section 4.7.3, *Corrosion Analysis of the Reactor Vessel Cladding Indications*)
- Loss of Material Due to Wear and Fretting (Section 4.7.9, *Replacement Steam Generator Tube Wear*)

3.1.3 Conclusions

The Reactor Vessel, Internals and Reactor Coolant System component types that are subject to AMR have been evaluated. The aging management programs selected to manage the aging effects for the Reactor Vessel, Internals, and Reactor Coolant System component types are identified in the summary Tables and in Section 3.1.2.1.

A description of these aging management programs is provided in Appendix B, *Aging Management Programs*, along with a demonstration that the identified aging effects will be managed for the period of extended operation.

Therefore, based on the demonstration provided in Appendix B, *Aging Management Programs*, the effects of aging associated with the Reactor Vessel, Internals and Reactor Coolant System component types will be adequately managed so that there is reasonable assurance that the intended functions will be maintained consistent with the current licensing basis during the period of extended operation.

Table 3.1-1 Summary of Aging Management Programs in Chapter IV of NUREG-1801 for Reactor Vessel, Internals, and Reactor Coolant System

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1.001	High strength, low-alloy steel top head closure stud assembly exposed to air with potential for reactor coolant leakage	Cumulative fatigue damage due to fatigue	Fatigue is a TLAA evaluated for the period of extended operation (See SRP, Sec 4.3 Metal Fatigue, for acceptable methods to comply with 10 CFR 54.21(c)(1))	Yes, TLAA	Fatigue of metal components is a TLAA. See further evaluation in Section 3.1.2.2.1
3.1.1.002	Nickel alloy tubes and sleeves exposed to reactor coolant and secondary feedwater/steam	Cumulative fatigue damage due to fatigue	Fatigue is a TLAA evaluated for the period of extended operation (See SRP, Sec 4.3 Metal Fatigue, for acceptable methods to comply with 10 CFR 54.21(c)(1))	Yes, TLAA	Fatigue of metal components is a TLAA. See further evaluation in Section 3.1.2.2.1.
3.1.1.003	Stainless steel or nickel alloy reactor vessel internal components exposed to reactor coolant and neutron flux	Cumulative fatigue damage due to fatigue	Fatigue is a TLAA evaluated for the period of extended operation (See SRP, Sec 4.3 Metal Fatigue, for acceptable methods to comply with 10 CFR 54.21(c)(1))	Yes, TLAA	Fatigue of metal components is a TLAA. See further evaluation in Section 3.1.2.2.1.
3.1.1.004	Steel pressure vessel support skirt and attachment welds	Cumulative fatigue damage due to fatigue	Fatigue is a TLAA evaluated for the period of extended operation (See SRP, Sec 4.3 Metal Fatigue, for acceptable methods to comply with 10 CFR 54.21(c)(1))	Yes, TLAA	Not Applicable. This is a Westinghouse vessel with no support skirt, so the applicable NUREG-1801 line was not used. See further evaluation in Section 3.1.2.2.1

Table 3.1-1 Summary of Aging Management Programs in Chapter IV of NUREG-1801 for Reactor Vessel, Internals, and Reactor Coolant System (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1.005	Steel, stainless steel, or steel (with stainless steel or nickel alloy cladding) steam generator components, pressurizer relief tank components or piping components or bolting	Cumulative fatigue damage due to fatigue	Fatigue is a TLAA evaluated for the period of extended operation (See SRP, Sec 4.3 Metal Fatigue, for acceptable methods to comply with 10 CFR 54.21(c)(1))	Yes, TLAA	Fatigue of metal components is a TLAA. See further evaluation in Section 3.1.2.2.1.
3.1.1.006					Not applicable - BWR only
3.1.1.007					Not applicable - BWR only
3.1.1.008	Steel (with or without nickel-alloy or stainless steel cladding), or stainless steel; or nickel alloy steam generator components exposed to reactor coolant	Cumulative fatigue damage due to fatigue	Fatigue is a TLAA evaluated for the period of extended operation, and for Class 1 components environmental effects on fatigue are to be addressed. (See SRP, Sec 4.3 Metal Fatigue, for acceptable methods to comply with 10 CFR 54.21(c)(1))	Yes, TLAA	Fatigue of metal components is a TLAA. See further evaluation in Section 3.1.2.2.1.

Table 3.1-1 Summary of Aging Management Programs in Chapter IV of NUREG-1801 for Reactor Vessel, Internals, and Reactor Coolant System (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1.009	Steel (with or without nickel-alloy or stainless steel cladding), stainless steel; nickel alloy RCPB piping; flanges; nozzles & safe ends; pressurizer shell heads & welds; heater sheaths & sleeves; penetrations; thermal sleeves exposed to reactor coolant	Cumulative fatigue damage due to fatigue	Fatigue is a TLAA evaluated for the period of extended operation, and for Class 1 components environmental effects on fatigue are to be addressed. (See SRP, Sec 4.3 Metal Fatigue, for acceptable methods to comply with 10 CFR 54.21(c)(1))	Yes, TLAA	Fatigue of metal components is a TLAA. See further evaluation in Section 3.1.2.2.1.

Table 3.1-1 Summary of Aging Management Programs in Chapter IV of NUREG-1801 for Reactor Vessel, Internals, and Reactor Coolant System (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1.010	Steel (with or without nickel-alloy or stainless steel cladding), stainless steel; nickel alloy reactor vessel flanges; nozzles; penetrations; pressure housings; safe ends; thermal sleeves; vessel shells, heads and welds exposed to reactor coolant	Cumulative fatigue damage due to fatigue	Fatigue is a TLAA evaluated for the period of extended operation, and for Class 1 components environmental effects on fatigue are to be addressed. (See SRP, Sec 4.3 Metal Fatigue, for acceptable methods to comply with 10 CFR 54.21(c)(1))	Yes, TLAA	Fatigue of metal components is a TLAA. See further evaluation in Section 3.1.2.2.1.
3.1.1.011					Not applicable - BWR only
3.1.1.012	Steel steam generator components: upper and lower shells, transition cone; new transition cone closure weld exposed to secondary feedwater or steam	Loss of material due to general, pitting, and crevice corrosion	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) for ASME components and Water Chemistry (B2.1.2), and, for Westinghouse Model 44 and 51 S/G, if corrosion of the shell is found, additional inspection procedures are developed	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. See further evaluation in Section 3.1.2.2.2.1 and Section 3.1.2.2.2.2.

Table 3.1-1 Summary of Aging Management Programs in Chapter IV of NUREG-1801 for Reactor Vessel, Internals, and Reactor Coolant System (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1.013	Steel (with or without stainless steel cladding) reactor vessel beltline shell, nozzles, and welds exposed to reactor coolant and neutron flux	Loss of fracture toughness due to neutron irradiation embrittlement	TLAA is to be evaluated in accordance with Appendix G of 10 CFR Part 50 and RG 1.99. The applicant may choose to demonstrate that the materials of the nozzles are not controlling for the TLAA evaluations	Yes, TLAA	Loss of fracture toughness due to neutron irradiation embrittlement is a TLAA. See further evaluation in Section 3.1.2.2.3.1.
3.1.1.014	Steel (with or without cladding) reactor vessel beltline shell, nozzles, and welds; safety injection nozzles	Loss of fracture toughness due to neutron irradiation embrittlement	Reactor Vessel Surveillance (B2.1.17)	Yes, plant specific or integrated surveillance program	Consistent with NUREG-1801. See further evaluation in Section 3.1.2.2.3.2.
3.1.1.015	Stainless steel and nickel alloy reactor vessel internal components exposed to reactor coolant and neutron flux	Reduction in ductility and fracture toughness due to neutron irradiation	Ductility - Reduction in Fracture Toughness is a TLAA to be evaluated for the period of extended operation. See the SRP, Section 4.7, Other Plant-Specific TLAAs, for acceptable methods for meeting the requirements of 10 CFR 54.21(c)(1).	Yes, TLAA	Reduction in fracture toughness is a TLAA. See further evaluation in Section 3.1.2.2.3.3.
3.1.1.016					Not applicable - BWR only

Table 3.1-1 Summary of Aging Management Programs in Chapter IV of NUREG-1801 for Reactor Vessel, Internals, and Reactor Coolant System (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1.017					Not applicable - BWR only
3.1.1.018	Reactor vessel shell fabricated of SA508-Cl 2 forgings clad with stainless steel using a high-heat-input welding process exposed to reactor coolant	Crack growth due to cyclic loading	Growth of intergranular separations is a TLAA evaluated for the period of extended operation. The Standard Review Plan, Section 4.7, Other Plant-Specific Time-Limited Aging Analysis, provides guidance for meeting the requirements of 10 CFR 54.21(c).	Yes, TLAA	Growth of intergranular separations is a TLAA. See further evaluation in Section 3.1.2.2.5.

Table 3.1-1 Summary of Aging Management Programs in Chapter IV of NUREG-1801 for Reactor Vessel, Internals, and Reactor Coolant System (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1.019	Stainless steel reactor vessel closure head flange leak detection line and bottom-mounted instrument guide tubes (external to reactor vessel)	Cracking due to stress corrosion cracking	A plant-specific aging management program is to be evaluated	Yes, plant-specific	Consistent with NUREG-1801. The plant-specific aging management program(s) used to manage the aging for stainless steel BMI guide tube include: ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) for Class 1 components and Water Chemistry (B2.1.2). Callaway reactor vessel flange leak detection line is made of nickel-alloy. ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) manages cracking due to stress corrosion cracking for reactor vessel flange leak detection line. See further evaluation in Section 3.1.2.2.6.1.

Table 3.1-1 Summary of Aging Management Programs in Chapter IV of NUREG-1801 for Reactor Vessel, Internals, and Reactor Coolant System (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1.020	Cast austenitic stainless steel Class 1 piping, piping components, and piping elements exposed to reactor coolant	Cracking due to stress corrosion cracking	Water Chemistry (B2.1.2) and, for CASS components that do not meet the NUREG-0313 guidelines, a plant specific aging management program	Yes, plant-specific	Consistent with NUREG-1801. The plant-specific aging management program(s) used to manage the aging include: Water Chemistry (B2.1.2) and ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1). See further evaluation in Section 3.1.2.2.6.2.
3.1.1.021					Not applicable - BWR only
3.1.1.022	Steel steam generator feedwater impingement plate and support exposed to secondary feedwater	Loss of material due to erosion	A plant-specific aging management program is to be evaluated	Yes, plant-specific	Not applicable. Callaway steam generators do not have feedwater impingement plates, so the applicable NUREG-1801 line was not used. See further evaluation in Section 3.1.2.2.8.

Table 3.1-1 Summary of Aging Management Programs in Chapter IV of NUREG-1801 for Reactor Vessel, Internals, and Reactor Coolant System (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1.023	Stainless steel or nickel alloy PWR reactor vessel internal components (inaccessible locations) exposed to reactor coolant and neutron flux	Cracking due to stress corrosion cracking, and irradiation-assisted stress corrosion cracking	PWR Vessel Internals (B2.1.6), and Water Chemistry (B2.1.2)	Yes, if accessible Primary, Expansion or Existing program components indicate aging effects that need management	PWR Vessel Internals (B2.1.6) defines the minimum examination coverage criteria for accessible stainless steel and nickel alloy reactor vessel internals primary and expansion inspection category components that are subject to cracking. See further evaluation in Section 3.1.2.2.9.
3.1.1.024	Stainless steel or nickel alloy PWR reactor vessel internal components (inaccessible locations) exposed to reactor coolant and neutron flux	Loss of fracture toughness due to neutron irradiation embrittlement; or changes in dimension due to void swelling; or loss of preload due to thermal and irradiation enhanced stress relaxation; or loss of material due to wear	PWR Vessel Internals (B2.1.6)	Yes, if accessible Primary, Expansion or Existing program components indicate aging effects that need management	PWR Vessel Internals (B2.1.6) defines the minimum examination coverage criteria for accessible stainless steel and nickel alloy reactor vessel internals primary and expansion inspection category components that are subject to loss of fracture toughness, changes in dimension, loss of preload, or loss of material. See further evaluation in Section 3.1.2.2.10.

Table 3.1-1 Summary of Aging Management Programs in Chapter IV of NUREG-1801 for Reactor Vessel, Internals, and Reactor Coolant System (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1.025	Steel (with nickel-alloy cladding) or nickel alloy steam generator primary side components: divider plate and tube-to-tube sheet welds exposed to reactor coolant	Cracking due to primary water stress corrosion cracking	Water Chemistry (B2.1.2)	Yes, plant-specific	Callaway replacement steam generator divider plate assemblies are fabricated of Alloy 690. The divider plate to primary head and tubesheet junctions are welded with Alloy 152 weld materials. The tubesheet cladding is Alloy 182 and the primary head cladding is stainless steel. The tubes are secured to the tubesheet by means of tube-to-tubesheet leaktight weld and tube expansion. See Sections 3.1.2.2.11.1 and 3.1.2.2.11.2 for the commitments to verify the integrity of the welds.

Table 3.1-1 Summary of Aging Management Programs in Chapter IV of NUREG-1801 for Reactor Vessel, Internals, and Reactor Coolant System (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1.026	Stainless steel Combustion Engineering core support barrel assembly: lower flange weld exposed to reactor coolant and neutron flux; Upper internals assembly: fuel alignment plate (applicable to plants with core shrouds assembled with full height shroud plates) exposed to reactor coolant and neutron flux; Lower support structure: core support plate (applicable to plants with a core support plate) exposed to reactor coolant and neutron flux	Cracking due to fatigue	PWR Vessel Internals (B2.1.6), and Water Chemistry (B2.1.2), if fatigue life cannot be confirmed by TLAA	Yes, evaluate to determine the potential locations and extent of fatigue cracking	Not applicable. This item is only applicable to Combustion Engineering core support barrel assembly. Callaway has Westinghouse design core barrel assembly. See further evaluation in Section 3.1.2.2.12.

Table 3.1-1 Summary of Aging Management Programs in Chapter IV of NUREG-1801 for Reactor Vessel, Internals, and Reactor Coolant System (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1.027	Nickel alloy Westinghouse control rod guide tube assemblies, guide tube support pins exposed to reactor coolant and neutron flux	Cracking due to stress corrosion cracking and fatigue	A plant-specific aging management program is to be evaluated	Yes, plant-specific	Not applicable. This item is only applicable to nickel-alloy control rod guide tube assemblies and guide tube support pins. Callaway control rod guide tube assemblies and guide tube support pins are made of stainless steel. See further evaluation in Section 3.1.2.2.13.
3.1.1.028	Nickel alloy Westinghouse control rod guide tube assemblies, guide tube support pins, and Zircaloy-4 Combustion Engineering incore instrumentation thimble tubes exposed to reactor coolant and neutron flux	Loss of material due to wear	A plant-specific aging management program is to be evaluated	Yes, plant-specific	Not applicable. This item is only applicable to nickel alloy control rod guide tube assemblies and guide tube support pins. Callaway control rod guide tube assemblies and guide tube support pins are made of stainless steel. Zircaloy-4 incore instrumentation lower thimble tubes are not applicable to Callaway. See further evaluation in Section 3.1.2.2.14.
3.1.1.029					Not applicable - BWR only

Table 3.1-1 Summary of Aging Management Programs in Chapter IV of NUREG-1801 for Reactor Vessel, Internals, and Reactor Coolant System (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1.030					Not applicable - BWR only
3.1.1.031					Not applicable - BWR only
3.1.1.032	Stainless steel, nickel alloy, or CASS reactor vessel internals, core support structure, exposed to reactor coolant and neutron flux	Cracking, or loss of material due to wear	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) for ASME components	No	Consistent with NUREG-1801.
3.1.1.033	Stainless steel, steel with stainless steel cladding Class 1 reactor coolant pressure boundary components exposed to reactor coolant	Cracking due to stress corrosion cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) for ASME components and Water Chemistry (B2.1.2)	No	Consistent with NUREG-1801.

Table 3.1-1 Summary of Aging Management Programs in Chapter IV of NUREG-1801 for Reactor Vessel, Internals, and Reactor Coolant System (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1.034	Stainless steel, steel with stainless steel cladding pressurizer relief tank (tank shell and heads, flanges, nozzles) exposed to treated borated water >60°C (>140°F)	Cracking due to stress corrosion cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) for ASME components and Water Chemistry (B2.1.2)	No	Not applicable. Callaway pressurizer relief tank components are not safety related and are not designed as ASME Code components, so the applicable NUREG-1801 line was not used.
3.1.1.035	Stainless steel, steel with stainless steel cladding reactor coolant system cold leg, hot leg, surge line, and spray line piping and fittings exposed to reactor coolant	Cracking due to cyclic loading	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) for Class 1 components	No	Consistent with NUREG-1801.
3.1.1.036	Steel, stainless steel pressurizer integral support exposed to air with metal temperature up to 288°C (550°F)	Cracking due to cyclic loading	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) for Class 1 components	No	Consistent with NUREG-1801.

Table 3.1-1 Summary of Aging Management Programs in Chapter IV of NUREG-1801 for Reactor Vessel, Internals, and Reactor Coolant System (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1.037	Steel reactor vessel flange	Loss of material due to wear	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) for Class 1 components	No	Consistent with NUREG-1801.
3.1.1.038	Cast austenitic stainless steel Class 1 pump casings, and valve bodies and bonnets exposed to reactor coolant >250 deg-C (>482 deg-F)	Loss of fracture toughness due to thermal aging embrittlement	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) for Class 1 components. For pump casings and valve bodies, screening for susceptibility to thermal aging is not necessary.	No	Consistent with NUREG-1801.
3.1.1.039	Steel, stainless steel, or steel with stainless steel cladding Class 1 piping, fittings and branch connections < NPS 4 exposed to reactor coolant	Cracking due to stress corrosion cracking, intergranular stress corrosion cracking (for stainless steel only), and thermal, mechanical, and vibratory loading	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) for Class 1 components, Water Chemistry (B2.1.2), and One-Time Inspection of ASME Code Class 1 Small-bore Piping (B2.1.20)	No	Consistent with NUREG-1801.

Table 3.1-1 Summary of Aging Management Programs in Chapter IV of NUREG-1801 for Reactor Vessel, Internals, and Reactor Coolant System (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1.040	Steel with stainless steel or nickel alloy cladding; or stainless steel pressurizer components exposed to reactor coolant	Cracking due to cyclic loading	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) for Class 1 components, and Water Chemistry (B2.1.2)	No	Consistent with NUREG-1801.
3.1.1.040a	Nickel alloy core support pads; core guide lugs exposed to reactor coolant	Cracking due to primary water stress corrosion cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) for Class 1 components and Water Chemistry (B2.1.2)	No	Consistent with NUREG-1801.
3.1.1.041					Not applicable - BWR only

Table 3.1-1 Summary of Aging Management Programs in Chapter IV of NUREG-1801 for Reactor Vessel, Internals, and Reactor Coolant System (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1.042	Steel with stainless steel or nickel alloy cladding or stainless steel primary side components; steam generator upper and lower heads, and tube sheet weld; or pressurizer components exposed to reactor coolant	Cracking due to stress corrosion cracking, primary water stress corrosion cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) for Class 1 components and Water Chemistry (B2.1.2)	No	Consistent with NUREG-1801.
3.1.1.043					Not applicable - BWR only

Table 3.1-1 Summary of Aging Management Programs in Chapter IV of NUREG-1801 for Reactor Vessel, Internals, and Reactor Coolant System (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1.044	Steel steam generator secondary manways and handholds (cover only) exposed to air with leaking secondary-side water and/or steam	Loss of material due to erosion	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) for Class 2 components	No	Not applicable. The covers of Callaway steam generator secondary manway, handhole and inspection ports are equipped with stainless steel gasket inserts. The aging effect due to erosion by the secondary side water or steam leak to the covers is not applicable. This item is applicable to once-through steam generators. Callaway has recirculating steam generators, not once-through steam generators, so the applicable NUREG-1801 line was not used.
3.1.1.045	Nickel alloy and steel with nickel-alloy cladding reactor coolant pressure boundary components exposed to reactor coolant	Cracking due to primary water stress corrosion cracking	ASME Section XI ISI, IWB, IWC & IWD (B2.1.1), and Water Chemistry (B2.1.2), and, for nickel-alloy, Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-induced Corrosion in RCPB Components (PWRs Only) (B2.1.5)	No	Consistent with NUREG-1801.

Table 3.1-1 Summary of Aging Management Programs in Chapter IV of NUREG-1801 for Reactor Vessel, Internals, and Reactor Coolant System (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1.046	Stainless steel, nickel-alloy, nickel-alloy welds and/or buttering control rod drive head penetration pressure housing or nozzles safe ends and welds (inlet, outlet, safety injection) exposed to reactor coolant	Cracking due to stress corrosion cracking, primary water stress corrosion cracking	ASME Section XI ISI, IWB, IWC & IWD (B2.1.1), and Water Chemistry (B2.1.2), and for nickel-alloy, Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in RCPB Components (PWRs only) (B2.1.5)	No	Consistent with NUREG-1801.
3.1.1.047	Stainless steel, nickel-alloy control rod drive head penetration pressure housing exposed to reactor coolant	Cracking due to stress corrosion cracking, primary water stress corrosion cracking	ASME Section XI ISI, IWB, IWC & IWD (B2.1.1), and Water Chemistry (B2.1.2)	No	Consistent with NUREG-1801.

Table 3.1-1 Summary of Aging Management Programs in Chapter IV of NUREG-1801 for Reactor Vessel, Internals, and Reactor Coolant System (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1.048	Steel external surfaces: reactor vessel top head, reactor vessel bottom head, reactor coolant pressure boundary piping or components adjacent to dissimilar metal (Alloy 82/182) welds exposed to air with borated water leakage	Loss of material due to boric acid corrosion	Boric Acid Corrosion (B2.1.4), and Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in RCPB Components (PWRs only) (B2.1.5)	No	Consistent with NUREG-1801.
3.1.1.049	Steel reactor coolant pressure boundary external surfaces or closure bolting exposed to air with borated water leakage	Loss of material due to boric acid corrosion	Boric Acid Corrosion (B2.1.4)	No	Consistent with NUREG-1801.

Table 3.1-1 Summary of Aging Management Programs in Chapter IV of NUREG-1801 for Reactor Vessel, Internals, and Reactor Coolant System (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1.050	Cast austenitic stainless steel Class 1 piping, piping component, and piping elements and control rod drive pressure housings exposed to reactor coolant >250 deg-C (>482 deg-F)	Loss of fracture toughness due to thermal aging embrittlement	Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)	No	Portions of the Callaway reactor coolant loops are constructed of cast austenitic stainless steel. The straight piping pieces are centrifugally cast and the fittings are statically cast. The molybdenum and ferrite values for these fittings and piping pieces are below the thermal aging significance threshold. Therefore, thermal aging of Callaway cast austenitic stainless steel reactor coolant piping is not a concern. The control rod drive pressure housings are made of stainless steel. Therefore, the applicable NUREG-1801 lines were not used.
3.1.1.051	Stainless steel or nickel-alloy Babcock & Wilcox reactor internal components exposed to reactor coolant and neutron flux	Cracking due to stress corrosion cracking, irradiation-assisted stress corrosion cracking, or fatigue	PWR Vessel Internals (B2.1.6), and Water Chemistry (B2.1.2)	No	Not applicable - for Babcock & Wilcox reactor internal components only.

Table 3.1-1 Summary of Aging Management Programs in Chapter IV of NUREG-1801 for Reactor Vessel, Internals, and Reactor Coolant System (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1.052	Stainless steel or nickel-alloy Combustion Engineering reactor internal components exposed to reactor coolant and neutron flux	Cracking due to stress corrosion cracking, irradiation-assisted stress corrosion cracking, or fatigue	PWR Vessel Internals (B2.1.6), and Water Chemistry (B2.1.2)	No	Not applicable - for Combustion Engineering reactor internal components only.
3.1.1.053	Stainless steel or nickel-alloy Westinghouse reactor internal components exposed to reactor coolant and neutron flux	Cracking due to stress corrosion cracking, irradiation-assisted stress corrosion cracking, or fatigue	PWR Vessel Internals (B2.1.6), and Water Chemistry (B2.1.2)	No	Consistent with NUREG-1801.
3.1.1.054	Stainless steel bottom mounted instrument system flux thimble tubes (with or without chrome plating) exposed to reactor coolant and neutron flux	Loss of material due to wear	PWR Vessel Internals (B2.1.6), and Flux Thimble Tube Inspection (B2.1.22)	No	Consistent with NUREG-1801.

Table 3.1-1 Summary of Aging Management Programs in Chapter IV of NUREG-1801 for Reactor Vessel, Internals, and Reactor Coolant System (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1.055	Stainless steel thermal shield assembly, thermal shield flexures exposed to reactor coolant and neutron flux	Cracking due to fatigue; Loss of material due to wear	PWR Vessel Internals (B2.1.6)	No	Not applicable. Callaway reactor internals have neutron shield panels instead of thermal shield assembly. Callaway reactor internals do not have thermal shield flexures. The applicable NUREG-1801 line was not used.
3.1.1.056	Stainless steel or nickel-alloy Combustion Engineering reactor internal components exposed to reactor coolant and neutron flux	Loss of fracture toughness due to neutron irradiation embrittlement; or changes in dimension due to void swelling; or loss of preload due to thermal and irradiation enhanced stress relaxation; or loss of material due to wear	PWR Vessel Internals (B2.1.6)	No	Not applicable - for Combustion Engineering reactor internal components only.
3.1.1.058	Stainless steel or nickel-alloy Babcock & Wilcox reactor internal components exposed to reactor coolant and neutron flux	Loss of fracture toughness due to neutron irradiation embrittlement; or changes in dimension due to void swelling; or loss of preload due to thermal and irradiation enhanced stress relaxation; or loss of material due to wear	PWR Vessel Internals (B2.1.6)	No	Not applicable - for Babcock & Wilcox reactor internal components only.

Table 3.1-1 Summary of Aging Management Programs in Chapter IV of NUREG-1801 for Reactor Vessel, Internals, and Reactor Coolant System (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1.059	Stainless steel or nickel-alloy Westinghouse reactor internal components exposed to reactor coolant and neutron flux	Loss of fracture toughness due to neutron irradiation embrittlement; or changes in dimension due to void swelling; or loss of preload due to thermal and irradiation enhanced stress relaxation; or loss of material due to wear	PWR Vessel Internals (B2.1.6)	No	Consistent with NUREG-1801.
3.1.1.060					Not applicable - BWR only
3.1.1.061	Steel steam generator steam nozzle and safe end, feedwater nozzle and safe end, AFW nozzles and safe ends exposed to secondary feedwater/steam	Wall thinning due to flow-accelerated corrosion	Flow-Accelerated Corrosion (B2.1.7)	No	Consistent with NUREG-1801.

Table 3.1-1 Summary of Aging Management Programs in Chapter IV of NUREG-1801 for Reactor Vessel, Internals, and Reactor Coolant System (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1.062	High-strength, low alloy steel, or stainless steel closure bolting; stainless steel control rod drive head penetration flange bolting exposed to air with reactor coolant leakage	Cracking due to stress corrosion cracking	Bolting Integrity (B2.1.8)	No	Consistent with NUREG-1801.
3.1.1.063					Not applicable - BWR only
3.1.1.064	Steel closure bolting exposed to air – indoor uncontrolled	Loss of material due to general, pitting, and crevice corrosion	Bolting Integrity (B2.1.8)	No	Not applicable. Callaway has no in-scope steel closure bolting evaluated with the environment of air – indoor uncontrolled in the reactor coolant system, so the applicable NUREG-1801 line was not used. The steel closure bolting in the reactor coolant system is evaluated with the environment of air with borated water leakage.

Table 3.1-1 Summary of Aging Management Programs in Chapter IV of NUREG-1801 for Reactor Vessel, Internals, and Reactor Coolant System (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1.065	Stainless steel control rod drive head penetration flange bolting exposed to air with reactor coolant leakage	Loss of material due to wear	Bolting Integrity (B2.1.8)	No	Not applicable. Callaway has the stainless steel control rod drive head penetration flanges that are seal welded instead of bolted, so the applicable NUREG-1801 line was not used.
3.1.1.066	High-strength, low alloy steel, or stainless steel closure bolting; stainless steel control rod drive head penetration flange bolting exposed to air with reactor coolant leakage	Loss of preload due to thermal effects, gasket creep, and self-loosening	Bolting Integrity (B2.1.8)	No	Consistent with NUREG-1801.
3.1.1.067	Steel or stainless steel closure bolting exposed to air – indoor with potential for reactor coolant leakage	Loss of preload due to thermal effects, gasket creep, and self-loosening	Bolting Integrity (B2.1.8)	No	Consistent with NUREG-1801.

Table 3.1-1 Summary of Aging Management Programs in Chapter IV of NUREG-1801 for Reactor Vessel, Internals, and Reactor Coolant System (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1.068	Nickel alloy steam generator tubes exposed to secondary feedwater or steam	Changes in dimension ("denting") due to corrosion of carbon steel tube support plate	Steam Generators (B2.1.9), and Water Chemistry (B2.1.2)	No	Not applicable. Callaway steam generators do not contain steel tube support plates and the aging effect of denting due to corrosion of steel tube support plate is not applicable.
3.1.1.069	Nickel alloy steam generator tubes and sleeves exposed to secondary feedwater or steam	Cracking due to outer diameter stress corrosion cracking and intergranular attack	Steam Generators (B2.1.9), and Water Chemistry (B2.1.2)	No	Consistent with NUREG-1801.
3.1.1.070	Nickel alloy steam generator tubes, repair sleeves, and tube plugs exposed to reactor coolant	Cracking due to primary water stress corrosion cracking	Steam Generators (B2.1.9), and Water Chemistry (B2.1.2)	No	Consistent with NUREG-1801.
3.1.1.071	Steel, chrome plated steel, stainless steel, nickel alloy steam generator U-bend supports including anti-vibration bars exposed to secondary feedwater or steam	Cracking due to stress corrosion cracking or other mechanism(s); loss of material due general (steel only), pitting, and crevice corrosion	Steam Generators (B2.1.9), and Water Chemistry (B2.1.2)	No	Consistent with NUREG-1801.

Table 3.1-1 Summary of Aging Management Programs in Chapter IV of NUREG-1801 for Reactor Vessel, Internals, and Reactor Coolant System (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1.072	Steel steam generator tube support plate, tube bundle wrapper, supports and mounting hardware exposed to secondary feedwater or steam	Loss of material due to erosion, general, pitting, and crevice corrosion, ligament cracking due to corrosion	Steam Generators (B2.1.9), and Water Chemistry (B2.1.2)	No	Consistent with NUREG-1801.
3.1.1.073	Nickel alloy steam generator tubes and sleeves exposed to phosphate chemistry in secondary feedwater or steam	Loss of material due to wastage and pitting corrosion	Steam Generators (B2.1.9), and Water Chemistry (B2.1.2)	No	Not applicable. Callaway does not use phosphate chemistry. The Callaway steam generators use all volatile treatment, so the applicable NUREG-1801 line was not used.
3.1.1.074	Steel steam generator upper assembly and separators including feedwater inlet ring and support exposed to secondary feedwater or steam	Wall thinning due to flow-accelerated corrosion	Steam Generators (B2.1.9), and Water Chemistry (B2.1.2)	No	Consistent with NUREG-1801.

Table 3.1-1 Summary of Aging Management Programs in Chapter IV of NUREG-1801 for Reactor Vessel, Internals, and Reactor Coolant System (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1.075	Steel steam generator tube support lattice bars exposed to secondary feedwater or steam	Wall thinning due to flow-accelerated corrosion and general corrosion	Steam Generators (B2.1.9), and Water Chemistry (B2.1.2)	No	Not applicable. Callaway steam generators do not contain lattice bars, so the applicable NUREG-1801 line was not used.
3.1.1.076	Steel, chrome plated steel, stainless steel, nickel alloy steam generator U-bend supports including anti-vibration bars exposed to secondary feedwater or steam	Loss of material due to fretting	Steam Generators (B2.1.9)	No	Consistent with NUREG-1801.
3.1.1.077	Nickel alloy steam generator tubes and sleeves exposed to secondary feedwater or steam	Loss of material due to wear and fretting	Steam Generators (B2.1.9)	No	Consistent with NUREG-1801.

Table 3.1-1 Summary of Aging Management Programs in Chapter IV of NUREG-1801 for Reactor Vessel, Internals, and Reactor Coolant System (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1.078	Nickel alloy steam generator components such as, secondary side nozzles (vent, drain, and instrumentation) exposed to secondary feedwater or steam	Cracking due to stress corrosion cracking	Water Chemistry (B2.1.2), and One-Time Inspection (B2.1.18) or ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) for ASME components.	No	Not applicable. Callaway has recirculating steam generators, not once-through steam generators, so the applicable NUREG-1801 line was not used.
3.1.1.079					Not applicable - BWR only
3.1.1.080	Stainless steel or steel with stainless steel cladding pressurizer relief tank: tank shell and heads, flanges, nozzles (none-ASME Section XI components) exposed to treated borated water >60°C (>140°F)	Cracking due to stress corrosion cracking	Water Chemistry (B2.1.2), and One-Time Inspection (B2.1.18)	No	Consistent with NUREG-1801.
3.1.1.081	Stainless steel pressurizer spray head exposed to reactor coolant	Cracking due to stress corrosion cracking	Water Chemistry (B2.1.2), and One-Time Inspection (B2.1.18)	No	Consistent with NUREG-1801.

Table 3.1-1 Summary of Aging Management Programs in Chapter IV of NUREG-1801 for Reactor Vessel, Internals, and Reactor Coolant System (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1.082	Nickel alloy pressurizer spray head exposed to reactor coolant	Cracking due to stress corrosion cracking, primary water stress corrosion cracking	Water Chemistry (B2.1.2), and One-Time Inspection (B2.1.18)	No	Not applicable. Callaway has stainless steel pressurizer spray head, so the applicable NUREG-1801 line was not used.
3.1.1.083	Steel steam generator shell assembly exposed to secondary feedwater or steam	Loss of material due to general, pitting, and crevice corrosion	Water Chemistry (B2.1.2), and One-Time Inspection (B2.1.18)	No	Not applicable. Callaway used the NUREG-1800, Table 3.1-1, line 3.1.1.012 to evaluate the steel steam generator shell assembly exposed to secondary feedwater or steam instead of the NUREG-1800, Table 3.1-1, line 3.1.1.083. The applicable NUREG-1801 line was not used.
3.1.1.084					Not applicable - BWR only
3.1.1.085					Not applicable - BWR only
3.1.1.086	Stainless steel steam generator primary side divider plate exposed to reactor coolant	Cracking due to stress corrosion cracking	Water Chemistry (B2.1.2)	No	Not applicable. The primary side divider plates of Callaway steam generators are made of nickel alloy, so the applicable NUREG-1801 line was not used.

Table 3.1-1 Summary of Aging Management Programs in Chapter IV of NUREG-1801 for Reactor Vessel, Internals, and Reactor Coolant System (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1.087	Stainless steel or nickel-alloy PWR reactor internal components exposed to reactor coolant and neutron flux	Loss of material due to pitting and crevice corrosion	Water Chemistry (B2.1.2)	No	Consistent with NUREG-1801.
3.1.1.088	Stainless steel; steel with nickel-alloy or stainless steel cladding; and nickel-alloy reactor coolant pressure boundary components exposed to reactor coolant	Loss of material due to pitting and crevice corrosion	Water Chemistry (B2.1.2)	No	Consistent with NUREG-1801.
3.1.1.089	Steel piping, piping components, and piping elements exposed to closed cycle cooling water	Loss of material due to general, pitting, and crevice corrosion	Closed Treated Water Systems (B2.1.11)	No	Consistent with NUREG-1801.
3.1.1.090	Copper alloy piping, piping components, and piping elements exposed to closed cycle cooling water	Loss of material due to pitting, crevice, and galvanic corrosion	Closed Treated Water Systems (B2.1.11)	No	Consistent with NUREG-1801.

Table 3.1-1 Summary of Aging Management Programs in Chapter IV of NUREG-1801 for Reactor Vessel, Internals, and Reactor Coolant System (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1.091					Not applicable - BWR only
3.1.1.092	High-strength low alloy steel closure head stud assembly exposed to air with potential for reactor coolant leakage	Cracking due to stress corrosion cracking; loss of material due to general, pitting, and crevice corrosion, or wear (PWR)	Reactor Head Closure Stud Bolting (B2.1.3)	No	Consistent with NUREG-1801.
3.1.1.093	Copper alloy >15% Zn or > 8% Al piping, piping components, and piping elements exposed to closed cycle cooling water	Loss of material due to selective leaching	Selective Leaching (B2.1.19)	No	Not applicable. Callaway has no in-scope piping, piping components, or piping elements in the reactor coolant system with copper alloy (>15% Zn or > 8% Al) that are exposed to closed cycle cooling water, so the applicable NUREG-1801 line was not used.
3.1.1.094					Not applicable - BWR only
3.1.1.095					Not applicable - BWR only
3.1.1.096					Not applicable - BWR only
3.1.1.097					Not applicable - BWR only

Table 3.1-1 Summary of Aging Management Programs in Chapter IV of NUREG-1801 for Reactor Vessel, Internals, and Reactor Coolant System (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1.098					Not applicable - BWR only
3.1.1.099					Not applicable - BWR only
3.1.1.100					Not applicable - BWR only
3.1.1.101					Not applicable - BWR only
3.1.1.102					Not applicable - BWR only
3.1.1.103					Not applicable - BWR only
3.1.1.104					Not applicable - BWR only
3.1.1.105	Steel piping, piping components and piping element exposed to concrete	None	None, provided 1) attributes of the concrete are consistent with ACI 318 or ACI 349 (low water-to-cement ratio, low permeability, and adequate air entrainment) as cited in NUREG-1557, and 2) plant OE indicates no degradation of the concrete	No, if conditions are met.	Not applicable. The Callaway reactor vessel, internals, and reactor coolant systems have no in-scope steel piping, piping components or piping elements embedded in concrete, so the applicable NUREG-1801 line was not used.

Table 3.1-1 Summary of Aging Management Programs in Chapter IV of NUREG-1801 for Reactor Vessel, Internals, and Reactor Coolant System (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.1.1.106	Nickel alloy piping, piping components and piping element exposed to air – indoor, uncontrolled, or air with borated water leakage	None	None	NA - No AEM or AMP	Consistent with NUREG-1801.
3.1.1.107	Stainless steel piping, piping components and piping element exposed to gas, concrete, air with borated water leakage, air – indoors, uncontrolled	None	None	NA - No AEM or AMP	Consistent with NUREG-1801.

Table 3.1.2-1 Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Reactor Vessel and Internals

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
RV BMI Guide Tube	PB	Stainless Steel	Borated Water Leakage (Ext)	None	None	IV.E.RP-05	3.1.1.107	A
RV BMI Guide Tube	PB	Stainless Steel	Reactor Coolant (Int)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	IV.A2.R-219	3.1.1.010	C
RV BMI Guide Tube	PB	Stainless Steel	Reactor Coolant (Int)	Loss of material	Water Chemistry (B2.1.2)	IV.A2.RP-28	3.1.1.088	C
RV BMI Guide Tube	PB	Stainless Steel	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) for Class 1 components and Water Chemistry (B2.1.2)	IV.A2.RP-154	3.1.1.019	E, 2
RV BMI Nozzle and Welds	PB	Nickel Alloys	Borated Water Leakage (Ext)	None	None	IV.E.RP-378	3.1.1.106	A
RV BMI Nozzle and Welds	PB	Nickel Alloys	Reactor Coolant (Int)	Loss of material	Water Chemistry (B2.1.2)	IV.A2.RP-28	3.1.1.088	A

Table 3.1.2-1 Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Reactor Vessel and Internals (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
RV BMI Nozzle and Welds	PB	Nickel Alloys	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1), Water Chemistry (B2.1.2) and Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components (PWRs only) (B2.1.5)	IV.A2.RP-59	3.1.1.045	A
RV Closure Head	PB	Carbon Steel with Stainless Steel Cladding	Borated Water Leakage (Ext)	Loss of material	Boric Acid Corrosion (B2.1.4) and Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in RCPB Components (PWRs Only) (B2.1.5)	IV.A2.RP-379	3.1.1.048	A

Table 3.1.2-1 Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Reactor Vessel and Internals (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
RV Closure Head	PB	Carbon Steel with Stainless Steel Cladding	Reactor Coolant (Int)	Loss of material	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) for Class 1 components	IV.A2.R-87	3.1.1.037	A
RV Closure Head	PB	Carbon Steel with Stainless Steel Cladding	Reactor Coolant (Int)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	IV.A2.R-219	3.1.1.010	A
RV Closure Head	PB	Carbon Steel with Stainless Steel Cladding	Reactor Coolant (Int)	Loss of material	Water Chemistry (B2.1.2)	IV.A2.RP-28	3.1.1.088	A

Table 3.1.2-1 Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Reactor Vessel and Internals (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
RV Closure Head	PB	Carbon Steel with Stainless Steel Cladding	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1), Water Chemistry (B2.1.2) and Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components (B2.1.5) for nickel alloy	IV.A2.RP-234	3.1.1.046	C
RV Closure Head Bolts	PB	High Strength Low Alloy Steel (Bolting)	Borated Water Leakage (Ext)	Loss of material	Boric Acid Corrosion (B2.1.4)	IV.A2.R-17	3.1.1.049	A
RV Closure Head Bolts	PB	High Strength Low Alloy Steel (Bolting)	Borated Water Leakage (Ext)	Cracking	Reactor Head Closure Stud Bolting (B2.1.3)	IV.A2.RP-52	3.1.1.092	A

Table 3.1.2-1 Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Reactor Vessel and Internals (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
RV Closure Head Bolts	PB	High Strength Low Alloy Steel (Bolting)	Borated Water Leakage (Ext)	Loss of material	Reactor Head Closure Stud Bolting (B2.1.3)	IV.A2.RP-53	3.1.1.092	A
RV Closure Head Bolts	PB	High Strength Low Alloy Steel (Bolting)	Borated Water Leakage (Ext)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	IV.A2.RP-54	3.1.1.001	A
RV Control Rod Drive Head Penetration (Flange and Plug)	PB	Stainless Steel	Borated Water Leakage (Ext)	None	None	IV.E.RP-05	3.1.1.107	A
RV Control Rod Drive Head Penetration (Flange and Plug)	PB	Stainless Steel	Reactor Coolant (Int)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	IV.A2.R-219	3.1.1.010	A

Table 3.1.2-1 Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Reactor Vessel and Internals (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
RV Control Rod Drive Head Penetration (Flange and Plug)	PB	Stainless Steel	Reactor Coolant (Int)	Loss of material	Water Chemistry (B2.1.2)	IV.A2.RP-28	3.1.1.088	A
RV Control Rod Drive Head Penetration (Flange and Plug)	PB	Stainless Steel	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) for Class 1 components and Water Chemistry (B2.1.2)	IV.A2.RP-55	3.1.1.047	C
RV Control Rod Drive Head Penetration (Nozzle and Welds)	PB	Nickel Alloys	Borated Water Leakage (Ext)	None	None	IV.E.RP-378	3.1.1.106	A
RV Control Rod Drive Head Penetration (Nozzle and Welds)	PB	Nickel Alloys	Reactor Coolant (Int)	Loss of material	Water Chemistry (B2.1.2)	IV.A2.RP-28	3.1.1.088	A

Table 3.1.2-1 Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Reactor Vessel and Internals (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
RV Control Rod Drive Head Penetration (Nozzle and Welds)	PB	Nickel Alloys	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1), Water Chemistry (B2.1.2) and Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components (PWRs only) (B2.1.5)	IV.A2.RP-186	3.1.1.045	A
RV Control Rod Drive Housing	PB	Stainless Steel	Borated Water Leakage (Ext)	None	None	IV.E.RP-05	3.1.1.107	A
RV Control Rod Drive Housing	PB	Stainless Steel	Reactor Coolant (Int)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	IV.A2.R-219	3.1.1.010	A
RV Control Rod Drive Housing	PB	Stainless Steel	Reactor Coolant (Int)	Loss of material	Water Chemistry (B2.1.2)	IV.A2.RP-28	3.1.1.088	A

Table 3.1.2-1 Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Reactor Vessel and Internals (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
RV Control Rod Drive Housing	PB	Stainless Steel	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) for Class 1 components and Water Chemistry (B2.1.2)	IV.A2.RP-55	3.1.1.047	A
RV Control Rod Drive Thermal Sleeve	SH	Stainless Steel	Reactor Coolant (Ext)	Loss of material	Water Chemistry (B2.1.2)	IV.A2.RP-28	3.1.1.088	C
RV Control Rod Drive Thermal Sleeve	SH	Stainless Steel	Reactor Coolant (Ext)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	IV.C2.RP-41	3.1.1.081	C
RV Core Support Lugs	SS	Nickel Alloys	Reactor Coolant (Ext)	Loss of material	Water Chemistry (B2.1.2)	IV.A2.RP-28	3.1.1.088	C
RV Core Support Lugs	SS	Nickel Alloys	Reactor Coolant (Ext)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) for Class 1 components and Water Chemistry (B2.1.2)	IV.A2.RP-57	3.1.1.040a	A

Table 3.1.2-1 Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Reactor Vessel and Internals (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
RV Core Support Lugs	SS	Stainless Steel	Reactor Coolant (Ext)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	IV.A2.R-219	3.1.1.010	C
RV Flange Leak Monitoring Tube	PB	Nickel Alloys	Borated Water Leakage (Ext)	None	None	IV.E.RP-378	3.1.1.106	A
RV Flange Leak Monitoring Tube	PB	Nickel Alloys	Borated Water Leakage (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	None	None	F, 1
RV Head Vent Nozzle, Pipe and Welds	PB	Nickel Alloys	Borated Water Leakage (Ext)	None	None	IV.E.RP-378	3.1.1.106	A

Table 3.1.2-1 Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Reactor Vessel and Internals (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
RV Head Vent Nozzle, Pipe and Welds	PB	Nickel Alloys	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1), Water Chemistry (B2.1.2) and Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components (PWRs only) (B2.1.5)	IV.A2.R-90	3.1.1.045	A
RV Head Vent Nozzle, Pipe and Welds	PB	Nickel Alloys	Reactor Coolant (Int)	Loss of material	Water Chemistry (B2.1.2)	IV.A2.RP-28	3.1.1.088	A
RV Inlet and Outlet Nozzles	PB	Carbon Steel with Stainless Steel Cladding	Borated Water Leakage (Ext)	Loss of material	Boric Acid Corrosion (B2.1.4)	IV.A2.R-17	3.1.1.049	A
RV Inlet and Outlet Nozzles	PB	Carbon Steel with Stainless Steel Cladding	Reactor Coolant (Int)	Loss of fracture toughness	Time-Limited Aging Analysis evaluated for the period of extended operation	IV.A2.R-81	3.1.1.013	A

Table 3.1.2-1 Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Reactor Vessel and Internals (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
RV Inlet and Outlet Nozzles	PB	Carbon Steel with Stainless Steel Cladding	Reactor Coolant (Int)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	IV.A2.R-219	3.1.1.010	A
RV Inlet and Outlet Nozzles	PB	Carbon Steel with Stainless Steel Cladding	Reactor Coolant (Int)	Loss of material	Water Chemistry (B2.1.2)	IV.A2.RP-28	3.1.1.088	A
RV Inlet and Outlet Nozzles	PB	Carbon Steel with Stainless Steel Cladding	Reactor Coolant (Int)	Loss of fracture toughness	Reactor Vessel Surveillance (B2.1.17)	IV.A2.RP-228	3.1.1.014	A

Table 3.1.2-1 Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Reactor Vessel and Internals (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
RV Inlet and Outlet Nozzles	PB	Carbon Steel with Stainless Steel Cladding	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1), Water Chemistry (B2.1.2) and Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components (B2.1.5) for nickel alloy	IV.A2.RP-234	3.1.1.046	C
RV Nozzle Safe Ends	PB	Stainless Steel	Borated Water Leakage (Ext)	None	None	IV.E.RP-05	3.1.1.107	A
RV Nozzle Safe Ends	PB	Stainless Steel	Reactor Coolant (Int)	Loss of material	Water Chemistry (B2.1.2)	IV.A2.RP-28	3.1.1.088	A

Table 3.1.2-1 Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Reactor Vessel and Internals (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
RV Nozzle Safe Ends	PB	Stainless Steel	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1), Water Chemistry (B2.1.2) and Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components (B2.1.5) for nickel alloy	IV.A2.RP-234	3.1.1.046	A
RV Nozzle Safe Ends Welds	PB	Nickel Alloys	Borated Water Leakage (Ext)	None	None	IV.E.RP-378	3.1.1.106	A
RV Nozzle Safe Ends Welds	PB	Nickel Alloys	Reactor Coolant (Int)	Loss of material	Water Chemistry (B2.1.2)	IV.A2.RP-28	3.1.1.088	A

Table 3.1.2-1 Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Reactor Vessel and Internals (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
RV Nozzle Safe Ends Welds	PB	Nickel Alloys	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1), Water Chemistry (B2.1.2) and Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components (B2.1.5) for nickel alloy	IV.A2.RP-234	3.1.1.046	A
RV Nozzle Support Pads	SS	Carbon Steel	Borated Water Leakage (Ext)	Loss of material	Boric Acid Corrosion (B2.1.4)	IV.A2.R-17	3.1.1.049	A
RV Nozzle Support Pads	SS	Carbon Steel	Borated Water Leakage (Ext)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	IV.C2.R-18	3.1.1.005	A

Table 3.1.2-1 Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Reactor Vessel and Internals (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
RV Shell Bottom Head	PB	Carbon Steel with Stainless Steel Cladding	Borated Water Leakage (Ext)	Loss of material	Boric Acid Corrosion (B2.1.4) and Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in RCPB Components (PWRs Only) (B2.1.5)	IV.A2.RP-379	3.1.1.048	A
RV Shell Bottom Head	PB	Carbon Steel with Stainless Steel Cladding	Reactor Coolant (Int)	Loss of material	Water Chemistry (B2.1.2)	IV.A2.RP-28	3.1.1.088	A
RV Shell Bottom Head	PB	Carbon Steel with Stainless Steel Cladding	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1), Water Chemistry (B2.1.2) and Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components (B2.1.5) for nickel alloy	IV.A2.RP-234	3.1.1.046	C

Table 3.1.2-1 Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Reactor Vessel and Internals (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
RV Upper, Intermediate, Lower Shell and Welds	PB	Carbon Steel with Stainless Steel Cladding	Borated Water Leakage (Ext)	Loss of material	Boric Acid Corrosion (B2.1.4)	IV.A2.R-17	3.1.1.049	A
RV Upper, Intermediate, Lower Shell and Welds	PB	Carbon Steel with Stainless Steel Cladding	Reactor Coolant (Int)	Loss of fracture toughness	Time-Limited Aging Analysis evaluated for the period of extended operation	IV.A2.R-84	3.1.1.013	A
RV Upper, Intermediate, Lower Shell and Welds	PB	Carbon Steel with Stainless Steel Cladding	Reactor Coolant (Int)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	IV.A2.R-219	3.1.1.010	A
RV Upper, Intermediate, Lower Shell and Welds	PB	Carbon Steel with Stainless Steel Cladding	Reactor Coolant (Int)	Loss of material	Water Chemistry (B2.1.2)	IV.A2.RP-28	3.1.1.088	A
RV Upper, Intermediate, Lower Shell and Welds	PB	Carbon Steel with Stainless Steel Cladding	Reactor Coolant (Int)	Loss of fracture toughness	Reactor Vessel Surveillance (B2.1.17)	IV.A2.RP-229	3.1.1.014	A

Table 3.1.2-1 Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Reactor Vessel and Internals (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
RV Upper, Intermediate, Lower Shell and Welds	PB	Carbon Steel with Stainless Steel Cladding	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1), Water Chemistry (B2.1.2) and Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components (B2.1.5) for nickel alloy	IV.A2.RP-234	3.1.1.046	C
RV Vessel Flange	PB	Carbon Steel with Stainless Steel Cladding	Borated Water Leakage (Ext)	Loss of material	Boric Acid Corrosion (B2.1.4)	IV.A2.R-17	3.1.1.049	A
RV Vessel Flange	PB	Carbon Steel with Stainless Steel Cladding	Reactor Coolant (Int)	Loss of material	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) for Class 1 components	IV.A2.R-87	3.1.1.037	A

Table 3.1.2-1 Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Reactor Vessel and Internals (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
RV Vessel Flange	PB	Carbon Steel with Stainless Steel Cladding	Reactor Coolant (Int)	Loss of material	Water Chemistry (B2.1.2)	IV.A2.RP-28	3.1.1.088	A
RV Vessel Flange	PB	Carbon Steel with Stainless Steel Cladding	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1), Water Chemistry (B2.1.2) and Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components (B2.1.5) for nickel alloy	IV.A2.RP-234	3.1.1.046	C
RVI Baffle-Edge Bolting	SS	Stainless Steel	Reactor Coolant (Ext)	Loss of material	Water Chemistry (B2.1.2)	IV.B2.RP-24	3.1.1.087	A

Table 3.1.2-1 Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Reactor Vessel and Internals (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
RVI Baffle-Edge Bolting	SS	Stainless Steel	Reactor Coolant (Ext)	Cracking	Water Chemistry (B2.1.2) and PWR Vessel Internals (B2.1.6) (Primary Components - No Expansion Components)	IV.B2.RP-275	3.1.1.053	A
RVI Baffle-Edge Bolting	SS	Stainless Steel	Reactor Coolant (Ext)	Loss of fracture toughness, Change in dimension, and Loss of preload	PWR Vessel Internals (B2.1.6) (Primary Components - No Expansion Components)	IV.B2.RP-354	3.1.1.059	A
RVI Baffle-Former Assembly	DF, SLD, SS	Stainless Steel	Reactor Coolant (Ext)	Loss of material	Water Chemistry (B2.1.2)	IV.B2.RP-24	3.1.1.087	A
RVI Baffle-Former Assembly	DF, SLD, SS	Stainless Steel	Reactor Coolant (Ext)	Change in dimension	PWR Vessel Internals (B2.1.6) (Primary Components - No Expansion Components)	IV.B2.RP-270	3.1.1.059	A
RVI Baffle-Former Assembly Bolting	SS	Stainless Steel	Reactor Coolant (Ext)	Loss of material	Water Chemistry (B2.1.2)	IV.B2.RP-24	3.1.1.087	A

Table 3.1.2-1 Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Reactor Vessel and Internals (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
RVI Baffle-Former Assembly Bolting	SS	Stainless Steel	Reactor Coolant (Ext)	Cracking	Water Chemistry (B2.1.2) and PWR Vessel Internals (B2.1.6) (Primary Components - Requires Expansion Components)	IV.B2.RP-271	3.1.1.053	A
RVI Baffle-Former Assembly Bolting	SS	Stainless Steel	Reactor Coolant (Ext)	Loss of fracture toughness, Change in dimension, and Loss of preload	PWR Vessel Internals (B2.1.6) (Primary Components - Requires Expansion Components)	IV.B2.RP-272	3.1.1.059	A
RVI Baffle-Former Assembly Bolting	SS	Stainless Steel	Reactor Coolant (Ext)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	IV.B2.RP-303	3.1.1.003	A
RVI BMI Flux Thimble	PB	Stainless Steel	Borated Water Leakage (Int)	None	None	IV.E.RP-05	3.1.1.107	A
RVI BMI Flux Thimble	PB	Stainless Steel	Reactor Coolant (Ext)	Loss of material	Water Chemistry (B2.1.2)	IV.B2.RP-24	3.1.1.087	A

Table 3.1.2-1 Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Reactor Vessel and Internals (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
RVI BMI Flux Thimble	PB	Stainless Steel	Reactor Coolant (Ext)	Loss of material	PWR Vessel Internals (B2.1.6) (Existing Program Components - No Expansion Components) and Flux Thimble Tube Inspection (B2.1.22)	IV.B2.RP-284	3.1.1.054	A
RVI Control Rod Guide Tube Assembly	SS	Stainless Steel	Reactor Coolant (Ext)	Loss of material	Water Chemistry (B2.1.2)	IV.B2.RP-24	3.1.1.087	A
RVI Control Rod Guide Tube Assembly	SS	Stainless Steel	Reactor Coolant (Ext)	Loss of fracture toughness	PWR Vessel Internals (B2.1.6) (Primary Components - Requires Expansion Components)	IV.B2.RP-297	3.1.1.059	A
RVI Control Rod Guide Tube Assembly	SS	Stainless Steel	Reactor Coolant (Ext)	Cracking	Water Chemistry (B2.1.2) and PWR Vessel Internals (B2.1.6) (Primary Components - Requires Expansion Components)	IV.B2.RP-298	3.1.1.053	A
RVI Control Rod Guide Tube Assembly	SS	Stainless Steel	Reactor Coolant (Ext)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	IV.B2.RP-303	3.1.1.003	A

Table 3.1.2-1 Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Reactor Vessel and Internals (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
RVI Control Rod Guide Tube Bolting	SS	Stainless Steel	Reactor Coolant (Ext)	Loss of material	Water Chemistry (B2.1.2)	IV.B2.RP-24	3.1.1.087	A
RVI Control Rod Guide Tube Bolting	SS	Stainless Steel	Reactor Coolant (Ext)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.B2.RP-382	3.1.1.032	A
RVI Control Rod Guide Tube Guide Plates	SS	Stainless Steel	Reactor Coolant (Ext)	Loss of material	Water Chemistry (B2.1.2)	IV.B2.RP-24	3.1.1.087	A
RVI Control Rod Guide Tube Guide Plates	SS	Stainless Steel	Reactor Coolant (Ext)	Loss of material	PWR Vessel Internals (B2.1.6) (Primary Components - Requires Expansion Components)	IV.B2.RP-296	3.1.1.059	A
RVI Control Rod Guide Tube Support Pins	SS	Stainless Steel	Reactor Coolant (Ext)	Loss of material	Water Chemistry (B2.1.2)	IV.B2.RP-24	3.1.1.087	A
RVI Control Rod Guide Tube Support Pins	SS	Stainless Steel	Reactor Coolant (Ext)	Cracking	Water Chemistry (B2.1.2) and PWR Vessel Internals (B2.1.6) (Existing Program Components - No Expansion Components)	IV.B2.RP-346	3.1.1.053	C

Table 3.1.2-1 Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Reactor Vessel and Internals (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
RVI Control Rod Guide Tube Support Pins	SS	Stainless Steel	Reactor Coolant (Ext)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.B2.RP-382	3.1.1.032	A
RVI Core Barrel	DF, SLD, SS	Stainless Steel	Reactor Coolant (Ext)	Loss of material	Water Chemistry (B2.1.2)	IV.B2.RP-24	3.1.1.087	A
RVI Core Barrel	DF, SLD, SS	Stainless Steel	Reactor Coolant (Ext)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.B2.RP-382	3.1.1.032	A
RVI Core Barrel Assembly	DF, SLD, SS	Stainless Steel	Reactor Coolant (Ext)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	IV.B2.RP-303	3.1.1.003	A
RVI Core Barrel Assembly-Former Bolting	SS	Stainless Steel	Reactor Coolant (Ext)	Loss of material	Water Chemistry (B2.1.2)	IV.B2.RP-24	3.1.1.087	A
RVI Core Barrel Assembly-Former Bolting	SS	Stainless Steel	Reactor Coolant (Ext)	Cracking	Water Chemistry (B2.1.2) and PWR Vessel Internals (B2.1.6) (Expansion Components)	IV.B2.RP-273	3.1.1.053	A

Table 3.1.2-1 Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Reactor Vessel and Internals (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
RVI Core Barrel Assembly-Former Bolting	SS	Stainless Steel	Reactor Coolant (Ext)	Loss of fracture toughness, Change in dimension, and Loss of preload	PWR Vessel Internals (B2.1.6) (Expansion Components)	IV.B2.RP-274	3.1.1.059	A
RVI Core Barrel Flanges	DF, SLD, SS	Stainless Steel	Reactor Coolant (Ext)	Loss of material	Water Chemistry (B2.1.2)	IV.B2.RP-24	3.1.1.087	A
RVI Core Barrel Flanges	DF, SLD, SS	Stainless Steel	Reactor Coolant (Ext)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.B2.RP-382	3.1.1.032	A
RVI Core Barrel Outlet Nozzles	DF, SLD, SS	Stainless Steel	Reactor Coolant (Ext)	Loss of material	Water Chemistry (B2.1.2)	IV.B2.RP-24	3.1.1.087	A
RVI Core Barrel Outlet Nozzles	DF, SLD, SS	Stainless Steel	Reactor Coolant (Ext)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.B2.RP-382	3.1.1.032	A
RVI Core Barrel Welds and Flange Welds	DF, SLD, SS	Stainless Steel	Reactor Coolant (Ext)	Loss of material	Water Chemistry (B2.1.2)	IV.B2.RP-24	3.1.1.087	A

Table 3.1.2-1 Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Reactor Vessel and Internals (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
RVI Core Barrel Welds and Flange Welds	DF, SLD, SS	Stainless Steel	Reactor Coolant (Ext)	Cracking	Water Chemistry (B2.1.2) and PWR Vessel Internals (B2.1.6) (Primary Components - Requires Expansion Components)	IV.B2.RP-276	3.1.1.053	C, 3
RVI Core Barrel Welds and Flange Welds	DF, SLD, SS	Stainless Steel	Reactor Coolant (Ext)	Loss of fracture toughness	PWR Vessel Internals (B2.1.6) (Primary Components - Requires Expansion Components)	IV.B2.RP-297	3.1.1.059	C, 3
RVI Head/Vessel Alignment Pins	SS	Stainless Steel	Reactor Coolant (Ext)	Loss of material	Water Chemistry (B2.1.2)	IV.B2.RP-24	3.1.1.087	A
RVI Head/Vessel Alignment Pins	SS	Stainless Steel	Reactor Coolant (Ext)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.B2.RP-382	3.1.1.032	A
RVI Hold Down Spring	SS	Stainless Steel	Reactor Coolant (Ext)	Loss of material	Water Chemistry (B2.1.2)	IV.B2.RP-24	3.1.1.087	A
RVI Hold Down Spring	SS	Stainless Steel	Reactor Coolant (Ext)	Loss of preload and Loss of material	PWR Vessel Internals (B2.1.6) (Primary Components - No Expansion Components)	IV.B2.RP-300	3.1.1.059	A

Table 3.1.2-1 Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Reactor Vessel and Internals (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
RVI Hold Down Spring	SS	Stainless Steel	Reactor Coolant (Ext)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	IV.B2.RP-303	3.1.1.003	A
RVI Hold Down Spring	SS	Stainless Steel	Reactor Coolant (Ext)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.B2.RP-382	3.1.1.032	A
RVI ICI Support Structure Bolting	SS	Stainless Steel	Reactor Coolant (Ext)	Loss of material	Water Chemistry (B2.1.2)	IV.B2.RP-24	3.1.1.087	A
RVI ICI Support Structure Bolting	SS	Stainless Steel	Reactor Coolant (Ext)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.B2.RP-382	3.1.1.032	A
RVI ICI Support Structure-BMI Instr Column	SS	Stainless Steel	Reactor Coolant (Ext)	Loss of material	Water Chemistry (B2.1.2)	IV.B2.RP-24	3.1.1.087	A
RVI ICI Support Structure-BMI Instr Column	SS	Stainless Steel	Reactor Coolant (Ext)	Loss of fracture toughness	PWR Vessel Internals (B2.1.6) (Expansion Components)	IV.B2.RP-292	3.1.1.059	A

Table 3.1.2-1 Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Reactor Vessel and Internals (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
RVI ICI Support Structure-BMI Instr Column	SS	Stainless Steel	Reactor Coolant (Ext)	Cracking	Water Chemistry (B2.1.2) and PWR Vessel Internals (B2.1.6) (Expansion Components)	IV.B2.RP-293	3.1.1.053	A
RVI ICI Support Structures (Exit Thermocouple)	SS	Stainless Steel	Reactor Coolant (Ext)	Loss of material	Water Chemistry (B2.1.2)	IV.B2.RP-24	3.1.1.087	A
RVI ICI Support Structures (Exit Thermocouple)	SS	Stainless Steel	Reactor Coolant (Ext)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.B2.RP-382	3.1.1.032	A
RVI ICI Support Structure-Upper/Lower Tie Plates	SS	Stainless Steel	Reactor Coolant (Ext)	Loss of material	Water Chemistry (B2.1.2)	IV.B2.RP-24	3.1.1.087	A
RVI ICI Support Structure-Upper/Lower Tie Plates	SS	Stainless Steel	Reactor Coolant (Ext)	Loss of fracture toughness	PWR Vessel Internals (B2.1.6) (Expansion Components)	IV.B2.RP-292	3.1.1.059	C

Table 3.1.2-1 Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Reactor Vessel and Internals (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
RVI ICI Support Structure-Upper/Lower Tie Plates	SS	Stainless Steel	Reactor Coolant (Ext)	Cracking	Water Chemistry (B2.1.2) and PWR Vessel Internals (B2.1.6) (Expansion Components)	IV.B2.RP-293	3.1.1.053	C
RVI Irradiation Specimen Basket	SS	Stainless Steel	Reactor Coolant (Ext)	Loss of material	Water Chemistry (B2.1.2)	IV.B2.RP-24	3.1.1.087	A
RVI Irradiation Specimen Basket	SS	Stainless Steel	Reactor Coolant (Ext)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.B2.RP-382	3.1.1.032	A
RVI Lower Core Plate	DF, SS	Stainless Steel	Reactor Coolant (Ext)	Loss of material	Water Chemistry (B2.1.2)	IV.B2.RP-24	3.1.1.087	A
RVI Lower Core Plate	DF, SS	Stainless Steel	Reactor Coolant (Ext)	Loss of fracture toughness and Loss of material	PWR Vessel Internals (B2.1.6) (Existing Program Components - No Expansion Components)	IV.B2.RP-288	3.1.1.059	A
RVI Lower Core Plate	DF, SS	Stainless Steel	Reactor Coolant (Ext)	Cracking	Water Chemistry (B2.1.2) and PWR Vessel Internals (B2.1.6) (Existing Program Components - No Expansion Components)	IV.B2.RP-289	3.1.1.053	A

Table 3.1.2-1 Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Reactor Vessel and Internals (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
RVI Lower Core Plate	DF, SS	Stainless Steel	Reactor Coolant (Ext)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	IV.B2.RP-303	3.1.1.003	A
RVI Lower Core Support Column Bodies	SS	Stainless Steel	Reactor Coolant (Ext)	Loss of material	Water Chemistry (B2.1.2)	IV.B2.RP-24	3.1.1.087	A
RVI Lower Core Support Column Bodies	SS	Stainless Steel	Reactor Coolant (Ext)	Cracking	Water Chemistry (B2.1.2) and PWR Vessel Internals (B2.1.6) (Expansion Components)	IV.B2.RP-294	3.1.1.053	A
RVI Lower Core Support Column Bodies	SS	Stainless Steel	Reactor Coolant (Ext)	Loss of fracture toughness	PWR Vessel Internals (B2.1.6) (Expansion Components)	IV.B2.RP-295	3.1.1.059	A
RVI Lower Core Support Column Bolting	SS	Stainless Steel	Reactor Coolant (Ext)	Loss of material	Water Chemistry (B2.1.2)	IV.B2.RP-24	3.1.1.087	A
RVI Lower Core Support Column Bolting	SS	Stainless Steel	Reactor Coolant (Ext)	Cracking	Water Chemistry (B2.1.2) and PWR Vessel Internals (B2.1.6) (Expansion Components)	IV.B2.RP-286	3.1.1.053	A

Table 3.1.2-1 Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Reactor Vessel and Internals (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
RVI Lower Core Support Column Bolting	SS	Stainless Steel	Reactor Coolant (Ext)	Loss of fracture toughness and Loss of preload	PWR Vessel Internals (B2.1.6) (Expansion Components)	IV.B2.RP-287	3.1.1.059	A
RVI Lower Core Support Column Bolting	SS	Stainless Steel	Reactor Coolant (Ext)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	IV.B2.RP-303	3.1.1.003	A
RVI Lower Core Support-Clevis Insert Bolting	SS	Nickel Alloys	Reactor Coolant (Ext)	Loss of material	Water Chemistry (B2.1.2)	IV.B2.RP-24	3.1.1.087	A
RVI Lower Core Support-Clevis Insert Bolting	SS	Nickel Alloys	Reactor Coolant (Ext)	Loss of material	PWR Vessel Internals (B2.1.6) (Existing Program Components - No Expansion Components)	IV.B2.RP-285	3.1.1.059	A
RVI Lower Core Support-Clevis Insert Bolting	SS	Nickel Alloys	Reactor Coolant (Ext)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.B2.RP-382	3.1.1.032	A
RVI Lower Core Support-Core Support Forging	SS	Stainless Steel	Reactor Coolant (Ext)	Loss of material	Water Chemistry (B2.1.2)	IV.B2.RP-24	3.1.1.087	A

Table 3.1.2-1 Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Reactor Vessel and Internals (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
RVI Lower Core Support-Core Support Forging	SS	Stainless Steel	Reactor Coolant (Ext)	Loss of fracture toughness	PWR Vessel Internals (B2.1.6) (Expansion Components)	IV.B2.RP-292	3.1.1.059	C, 4
RVI Lower Core Support-Core Support Forging	SS	Stainless Steel	Reactor Coolant (Ext)	Cracking	Water Chemistry (B2.1.2) and PWR Vessel Internals (B2.1.6) (Expansion Components)	IV.B2.RP-293	3.1.1.053	C, 4
RVI Lower Core Support-Energy Absorber Assembly	SS	Stainless Steel	Reactor Coolant (Ext)	Loss of material	Water Chemistry (B2.1.2)	IV.B2.RP-24	3.1.1.087	A
RVI Lower Core Support-Energy Absorber Assembly	SS	Stainless Steel	Reactor Coolant (Ext)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.B2.RP-382	3.1.1.032	A
RVI Neutron Shield Panel	SLD	Stainless Steel	Reactor Coolant (Ext)	Loss of material	Water Chemistry (B2.1.2)	IV.B2.RP-24	3.1.1.087	A
RVI Neutron Shield Panel	SLD	Stainless Steel	Reactor Coolant (Ext)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	IV.B2.RP-303	3.1.1.003	A

Table 3.1.2-1 Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Reactor Vessel and Internals (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
RVI Neutron Shield Panel	SLD	Stainless Steel	Reactor Coolant (Ext)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.B2.RP-382	3.1.1.032	A
RVI Radial Support Keys and Clevis Inserts	SS	Nickel Alloys	Reactor Coolant (Ext)	Loss of material	Water Chemistry (B2.1.2)	IV.B2.RP-24	3.1.1.087	A
RVI Radial Support Keys and Clevis Inserts	SS	Nickel Alloys	Reactor Coolant (Ext)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	IV.B2.RP-303	3.1.1.003	A
RVI Radial Support Keys and Clevis Inserts	SS	Nickel Alloys	Reactor Coolant (Ext)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.B2.RP-382	3.1.1.032	A
RVI Upper Core Plate Guide Pins	SS	Stainless Steel	Reactor Coolant (Ext)	Loss of material	Water Chemistry (B2.1.2)	IV.B2.RP-24	3.1.1.087	A
RVI Upper Core Plate Guide Pins	SS	Stainless Steel	Reactor Coolant (Ext)	Loss of material	PWR Vessel Internals (B2.1.6) (Existing Program Components - No Expansion Components)	IV.B2.RP-299	3.1.1.059	A

Table 3.1.2-1 Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Reactor Vessel and Internals (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
RVI Upper Core Plate Guide Pins	SS	Stainless Steel	Reactor Coolant (Ext)	Cracking	Water Chemistry (B2.1.2) and PWR Vessel Internals (B2.1.6) (Existing Program Components - No Expansion Components)	IV.B2.RP-301	3.1.1.053	A
RVI Upper Core Support Structure	SS	Stainless Steel	Reactor Coolant (Ext)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	IV.B2.RP-303	3.1.1.003	A
RVI Upper Core Support-Top Support Plate	SS	Stainless Steel	Reactor Coolant (Ext)	Loss of material	Water Chemistry (B2.1.2)	IV.B2.RP-24	3.1.1.087	A
RVI Upper Core Support-Top Support Plate	SS	Stainless Steel	Reactor Coolant (Ext)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.B2.RP-382	3.1.1.032	A
RVI Upper Core Support-Upper Core Plate	SS	Stainless Steel	Reactor Coolant (Ext)	Loss of material	Water Chemistry (B2.1.2)	IV.B2.RP-24	3.1.1.087	A
RVI Upper Core Support-Upper Core Plate	SS	Stainless Steel	Reactor Coolant (Ext)	Loss of fracture toughness	PWR Vessel Internals (B2.1.6) (Expansion Components)	IV.B2.RP-292	3.1.1.059	C, 4

Table 3.1.2-1 Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Reactor Vessel and Internals (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
RVI Upper Core Support-Upper Core Plate	SS	Stainless Steel	Reactor Coolant (Ext)	Cracking	Water Chemistry (B2.1.2) and PWR Vessel Internals (B2.1.6) (Expansion Components)	IV.B2.RP-293	3.1.1.053	C, 4
RVI Upper Core Support-Upper Support Column	SS	Stainless Steel	Reactor Coolant (Ext)	Loss of material	Water Chemistry (B2.1.2)	IV.B2.RP-24	3.1.1.087	A
RVI Upper Core Support-Upper Support Column	SS	Stainless Steel	Reactor Coolant (Ext)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.B2.RP-382	3.1.1.032	A
RVI Upper Support Column Bolting	SS	Stainless Steel	Reactor Coolant (Ext)	Loss of material	Water Chemistry (B2.1.2)	IV.B2.RP-24	3.1.1.087	A
RVI Upper Support Column Bolting	SS	Stainless Steel	Reactor Coolant (Ext)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.B2.RP-382	3.1.1.032	A
Seal Table	PB	Stainless Steel	Borated Water Leakage (Ext)	None	None	IV.E.RP-05	3.1.1.107	C

Notes for Table 3.1.2-1:

Standard Notes:

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

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

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

F Material not in NUREG-1801 for this component.

Plant Specific Notes:

1 NUREG-1801 does not address cracking of the nickel-alloy reactor vessel flange leak monitoring tube with an internal environment of reactor coolant leakage. The ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program (B2.1.1) manages the cracking of the nickel-alloy reactor vessel flange leak monitoring tube with an internal environment of reactor coolant leakage.

2 The plant-specific aging management programs used to manage the cracking for stainless steel BMI guide tubes are ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) for Class 1 components and Water Chemistry (B2.1.2).

3 The MRP-227 Safety Evaluation specifies that the upper and lower core barrel welds and lower core barrel flange welds need to be made primary components for IASCC and neutron embrittlement. The reactor vessel internal core barrel welds & flange welds component includes all core barrel welds (upper core barrel flange weld, lower core barrel flange weld, and upper and lower core barrel welds). The reactor vessel internal core barrel welds and flange welds component is managed as an MRP-227 primary component and linked to reactor vessel internal lower core support column bodies as an expansion component.

4 This reactor vessel internal expansion component is linked to the MRP-227 primary component of control rod guide tube lower flange weld, as specified in MRP-227 Safety Evaluation section 4.1, Limitations and Conditions.

Table 3.1.2-2 Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Reactor Coolant System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Class 1 Piping < NPS 4	PB	Stainless Steel	Borated Water Leakage (Ext)	None	None	IV.E.RP-05	3.1.1.107	A
Class 1 Piping < NPS 4	PB	Stainless Steel	Reactor Coolant (Int)	Loss of material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1.088	A
Class 1 Piping < NPS 4	PB	Stainless Steel	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) for Class 1 components and Water Chemistry (B2.1.2) and One-Time Inspection of ASME Code Class 1 Small-Bore Piping (B2.1.20)	IV.C2.RP-235	3.1.1.039	A
Closure Bolting	LBS, PB, SIA	Carbon Steel	Borated Water Leakage (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	IV.C2.R-12	3.1.1.066	A
Closure Bolting	PB	Carbon Steel	Borated Water Leakage (Ext)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	IV.C2.R-18	3.1.1.005	A
Closure Bolting	LBS, PB, SIA	Carbon Steel	Borated Water Leakage (Ext)	Loss of material	Boric Acid Corrosion (B2.1.4)	IV.C2.RP-167	3.1.1.049	A
Closure Bolting	LBS, PB, SIA	Stainless Steel	Borated Water Leakage (Ext)	Cracking	Bolting Integrity (B2.1.8)	IV.C2.R-11	3.1.1.062	A
Closure Bolting	LBS, PB, SIA	Stainless Steel	Borated Water Leakage (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	IV.C2.R-12	3.1.1.066	A

Table 3.1.2-2 Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Reactor Coolant System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Flow Element	LBS	Stainless Steel	Borated Water Leakage (Ext)	None	None	IV.E.RP-05	3.1.1.107	A
Flow Element	PB	Stainless Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	V.A.EP-95	3.2.1.031	A
Flow Element	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	IV.E.RP-04	3.1.1.107	A
Flow Element	LBS	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	V.D1.E-12	3.2.1.020	E, 2
Flow Element	LBS	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	V.D1.EP-41	3.2.1.022	E, 2
Heat Exchanger (RCP Bearing Oil Cooler)	PB	Copper Alloy	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	IV.C2.RP-222	3.1.1.090	C
Heat Exchanger (RCP Bearing Oil Cooler)	PB	Copper Alloy	Lubricating Oil (Ext)	Loss of material	Lubricating Oil Analysis (B2.1.24) and One-Time Inspection (B2.1.18)	V.D1.EP-76	3.2.1.050	C
Heat Exchanger (RCP Motor Air Cooler)	PB	Copper Alloy	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	IV.C2.RP-222	3.1.1.090	C

Table 3.1.2-2 Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Reactor Coolant System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Heat Exchanger (RCP Motor Air Cooler)	PB	Copper Alloy	Plant Indoor Air (Ext)	None	None	V.F.EP-10	3.2.1.057	C
Heat Exchanger (RCP Thermal Barrier Cooler)	HT, PB	Stainless Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	V.D1.EP-93	3.2.1.031	A
Heat Exchanger (RCP Thermal Barrier Cooler)	HT, PB	Stainless Steel	Closed Cycle Cooling Water (Int)	Reduction of heat transfer	Closed Treated Water Systems (B2.1.11)	V.D1.EP-96	3.2.1.033	A
Heat Exchanger (RCP Thermal Barrier Cooler)	HT, PB	Stainless Steel	Treated Borated Water (Ext)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	V.D1.E-12	3.2.1.020	E, 2
Heat Exchanger (RCP Thermal Barrier Cooler)	HT, PB	Stainless Steel	Treated Borated Water (Ext)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	V.D1.EP-41	3.2.1.022	E, 2
Instrument Bellows	PB	Stainless Steel	Borated Water Leakage (Ext)	None	None	IV.E.RP-05	3.1.1.107	A
Instrument Bellows	PB	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	V.D1.E-12	3.2.1.020	E, 2

Table 3.1.2-2 Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Reactor Coolant System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Instrument Bellows	PB	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	V.D1.EP-41	3.2.1.022	E, 2
Piping	LBS, PB	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	IV.C2.RP-221	3.1.1.089	A
Piping	LBS, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	V.E.E-44	3.2.1.040	A
Piping	LBS, PB, SIA	Stainless Steel	Borated Water Leakage (Ext)	None	None	IV.E.RP-05	3.1.1.107	A
Piping	PB	Stainless Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	V.A.EP-95	3.2.1.031	A
Piping	PB	Stainless Steel	Closed Cycle Cooling Water (Int)	Cracking	Closed Treated Water Systems (B2.1.11)	V.A.EP-98	3.2.1.028	A
Piping	LBS, SIA	Stainless Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	V.A.EP-81	3.2.1.048	B
Piping	PB	Stainless Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	V.D1.EP-81	3.2.1.048	B

Table 3.1.2-2 Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Reactor Coolant System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Piping	LBS	Stainless Steel	Demineralized Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	V.C.EP-63	3.2.1.018	C
Piping	PB, SIA	Stainless Steel	Dry Gas (Int)	None	None	IV.E.RP-07	3.1.1.107	A
Piping	LBS, PB, SIA	Stainless Steel	Plant Indoor Air (Ext)	None	None	IV.E.RP-04	3.1.1.107	A
Piping	PB	Stainless Steel	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) for Class 1 components and Water Chemistry (B2.1.2)	IV.C2.R-30	3.1.1.033	A
Piping	PB	Stainless Steel	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) for Class 1 components	IV.C2.R-56	3.1.1.035	A
Piping	PB	Stainless Steel	Reactor Coolant (Int)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	IV.C2.R-223	3.1.1.009	A
Piping	PB	Stainless Steel	Reactor Coolant (Int)	Loss of material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1.088	A

Table 3.1.2-2 Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Reactor Coolant System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Piping	PB	Stainless Steel	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) for Class 1 components and Water Chemistry (B2.1.2)	IV.C2.RP-344	3.1.1.033	A
Piping	LBS, PB, SIA	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	V.D1.E-12	3.2.1.020	E, 2
Piping	LBS, PB, SIA	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	V.D1.EP-41	3.2.1.022	E, 2
Piping	PB	Stainless Steel Cast Austenitic	Borated Water Leakage (Ext)	None	None	IV.E.RP-05	3.1.1.107	A
Piping	PB	Stainless Steel Cast Austenitic	Reactor Coolant (Int)	Cracking	Water Chemistry (B2.1.2) and ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.C2.R-05	3.1.1.020	E, 1
Piping	PB	Stainless Steel Cast Austenitic	Reactor Coolant (Int)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	IV.C2.R-223	3.1.1.009	A

Table 3.1.2-2 Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Reactor Coolant System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Piping	PB	Stainless Steel Cast Austenitic	Reactor Coolant (Int)	Loss of material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1.088	A
Pump	PB	Stainless Steel	Reactor Coolant (Int)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	IV.C2.R-223	3.1.1.009	A
Pump	PB	Stainless Steel Cast Austenitic	Borated Water Leakage (Ext)	None	None	IV.E.RP-05	3.1.1.107	A
Pump	PB	Stainless Steel Cast Austenitic	Reactor Coolant (Int)	Loss of fracture toughness	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) for Class 1 components	IV.C2.R-08	3.1.1.038	A
Pump	PB	Stainless Steel Cast Austenitic	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) for Class 1 components and Water Chemistry (B2.1.2)	IV.C2.R-09	3.1.1.033	A
Pump	PB	Stainless Steel Cast Austenitic	Reactor Coolant (Int)	Loss of material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1.088	A

Table 3.1.2-2 Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Reactor Coolant System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Rupture Disc	LBS	Stainless Steel	Borated Water Leakage (Ext)	None	None	IV.E.RP-05	3.1.1.107	A
Rupture Disc	LBS	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	V.D1.E-12	3.2.1.020	E, 2
Rupture Disc	LBS	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	V.D1.EP-41	3.2.1.022	E, 2
Solenoid Valve	PB	Stainless Steel	Borated Water Leakage (Ext)	None	None	IV.E.RP-05	3.1.1.107	A
Solenoid Valve	PB	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	V.D1.E-12	3.2.1.020	E, 2
Solenoid Valve	PB	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	V.D1.EP-41	3.2.1.022	E, 2
Tank	LBS, SIA	Stainless Steel	Borated Water Leakage (Ext)	None	None	IV.E.RP-05	3.1.1.107	C
Tank	SIA	Stainless Steel	Dry Gas (Int)	None	None	IV.E.RP-07	3.1.1.107	C
Tank	SIA	Stainless Steel	Plant Indoor Air (Ext)	None	None	IV.E.RP-04	3.1.1.107	C
Tank	LBS, SIA	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	IV.C2.RP-383	3.1.1.080	A

Table 3.1.2-2 Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Reactor Coolant System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Tank	LBS, SIA	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	V.D1.EP-41	3.2.1.022	E, 2
Tubing	PB	Stainless Steel	Borated Water Leakage (Ext)	None	None	IV.E.RP-05	3.1.1.107	A
Tubing	PB	Stainless Steel	Demineralized Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	V.C.EP-63	3.2.1.018	C
Tubing	PB	Stainless Steel	Dry Gas (Int)	None	None	IV.E.RP-07	3.1.1.107	A
Tubing	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	IV.E.RP-04	3.1.1.107	A
Tubing	PB	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	V.D1.E-12	3.2.1.020	E, 2
Tubing	PB	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	V.D1.EP-41	3.2.1.022	E, 2
Valve	PB	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	IV.C2.RP-221	3.1.1.089	A
Valve	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	V.E.E-44	3.2.1.040	A
Valve	LBS, PB, SIA	Stainless Steel	Borated Water Leakage (Ext)	None	None	IV.E.RP-05	3.1.1.107	A

Table 3.1.2-2 Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Reactor Coolant System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Valve	PB	Stainless Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	V.A.EP-95	3.2.1.031	A
Valve	PB	Stainless Steel	Closed Cycle Cooling Water (Int)	Cracking	Closed Treated Water Systems (B2.1.11)	V.A.EP-98	3.2.1.028	A
Valve	PB	Stainless Steel	Demineralized Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	V.C.EP-63	3.2.1.018	C
Valve	PB, SIA	Stainless Steel	Dry Gas (Int)	None	None	IV.E.RP-07	3.1.1.107	A
Valve	PB, SIA	Stainless Steel	Plant Indoor Air (Ext)	None	None	IV.E.RP-04	3.1.1.107	A
Valve	PB	Stainless Steel	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) for Class 1 components and Water Chemistry (B2.1.2)	IV.C2.R-09	3.1.1.033	A
Valve	PB	Stainless Steel	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) for Class 1 components and Water Chemistry (B2.1.2)	IV.C2.R-30	3.1.1.033	A

Table 3.1.2-2 Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Reactor Coolant System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Valve	PB	Stainless Steel	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) for Class 1 components	IV.C2.R-56	3.1.1.035	A
Valve	PB	Stainless Steel	Reactor Coolant (Int)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	IV.C2.R-223	3.1.1.009	A
Valve	PB	Stainless Steel	Reactor Coolant (Int)	Loss of material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1.088	A
Valve	LBS, PB, SIA	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	V.D1.E-12	3.2.1.020	E, 2
Valve	LBS, PB, SIA	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	V.D1.EP-41	3.2.1.022	E, 2

Notes for Table 3.1.2-2:

Standard Notes:

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

B Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.

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

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

Plant Specific Notes:

1 Water Chemistry (B2.1.2) and ASME Section XI, Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) are used to manage this aging effect for cast austenitic stainless steel (CASS) components.

2 The One-Time Inspection program (B2.1.18) is used to verify the effectiveness of the Water Chemistry program (B2.1.2) to manage these aging effects.

Table 3.1.2-3 Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Pressurizer

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Closure Bolting	PB	Carbon Steel	Borated Water Leakage (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	IV.C2.R-12	3.1.1.066	A
Closure Bolting	PB	Carbon Steel	Borated Water Leakage (Ext)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	IV.C2.R-18	3.1.1.005	A
Closure Bolting	PB	Carbon Steel	Borated Water Leakage (Ext)	Loss of material	Boric Acid Corrosion (B2.1.4)	IV.C2.RP-167	3.1.1.049	A
PZR Heater Support Plate	SS	Stainless Steel	Reactor Coolant (Ext)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) for Class 1 components and Water Chemistry (B2.1.2)	IV.C2.R-58	3.1.1.040	A
PZR Heater Support Plate	SS	Stainless Steel	Reactor Coolant (Ext)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) for Class 1 components and Water Chemistry (B2.1.2)	IV.C2.R-217	3.1.1.033	A
PZR Heater Support Plate	SS	Stainless Steel	Reactor Coolant (Ext)	Loss of material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1.088	C
PZR Heater Well Nozzle	PB	Stainless Steel	Borated Water Leakage (Ext)	None	None	IV.E.RP-05	3.1.1.107	C

Table 3.1.2-3 Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Pressurizer (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
PZR Heater Well Nozzle	PB	Stainless Steel	Reactor Coolant (Ext)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) for Class 1 components and Water Chemistry (B2.1.2)	IV.C2.R-58	3.1.1.040	A
PZR Heater Well Nozzle	PB	Stainless Steel	Reactor Coolant (Ext)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) for Class 1 components and Water Chemistry (B2.1.2)	IV.C2.R-217	3.1.1.033	A
PZR Heater Well Nozzle	PB	Stainless Steel	Reactor Coolant (Ext)	Loss of material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1.088	A
PZR Heater Well Nozzle	PB	Stainless Steel	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) for Class 1 components and Water Chemistry (B2.1.2)	IV.C2.R-58	3.1.1.040	A

Table 3.1.2-3 Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Pressurizer (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
PZR Heater Well Nozzle	PB	Stainless Steel	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) for Class 1 components and Water Chemistry (B2.1.2)	IV.C2.R-217	3.1.1.033	A
PZR Heater Well Nozzle	PB	Stainless Steel	Reactor Coolant (Int)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	IV.C2.R-223	3.1.1.009	A
PZR Heater Well Nozzle	PB	Stainless Steel	Reactor Coolant (Int)	Loss of material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1.088	A
PZR Instrument Penetrations	PB	Stainless Steel	Borated Water Leakage (Ext)	None	None	IV.E.RP-05	3.1.1.107	C
PZR Instrument Penetrations	PB	Stainless Steel	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) for Class 1 components and Water Chemistry (B2.1.2)	IV.C2.R-25	3.1.1.042	A

Table 3.1.2-3 Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Pressurizer (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
PZR Instrument Penetrations	PB	Stainless Steel	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) for Class 1 components and Water Chemistry (B2.1.2)	IV.C2.R-58	3.1.1.040	A
PZR Instrument Penetrations	PB	Stainless Steel	Reactor Coolant (Int)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	IV.C2.R-223	3.1.1.009	A
PZR Instrument Penetrations	PB	Stainless Steel	Reactor Coolant (Int)	Loss of material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1.088	A
PZR Manways and Covers	PB	Carbon Steel with Stainless Steel Cladding	Borated Water Leakage (Ext)	Loss of material	Boric Acid Corrosion (B2.1.4)	IV.C2.R-17	3.1.1.049	A
PZR Manways and Covers	PB	Carbon Steel with Stainless Steel Cladding	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) for Class 1 components and Water Chemistry (B2.1.2)	IV.C2.R-25	3.1.1.042	A

Table 3.1.2-3 Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Pressurizer (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
PZR Manways and Covers	PB	Carbon Steel with Stainless Steel Cladding	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) for Class 1 components and Water Chemistry (B2.1.2)	IV.C2.R-58	3.1.1.040	A
PZR Manways and Covers	PB	Carbon Steel with Stainless Steel Cladding	Reactor Coolant (Int)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	IV.C2.R-223	3.1.1.009	A
PZR Manways and Covers	PB	Carbon Steel with Stainless Steel Cladding	Reactor Coolant (Int)	Loss of material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1.088	C
PZR Safe Ends	PB	Nickel-Alloys	Borated Water Leakage (Ext)	None	None	IV.E.RP-378	3.1.1.106	A
PZR Safe Ends	PB	Nickel-Alloys	Reactor Coolant (Int)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	IV.C2.R-223	3.1.1.009	A
PZR Safe Ends	PB	Nickel-Alloys	Reactor Coolant (Int)	Loss of material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1.088	A

Table 3.1.2-3 Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Pressurizer (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
PZR Safe Ends	PB	Nickel-Alloys	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1), Water Chemistry (B2.1.2), and Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components (PWRs only) (B2.1.5)	IV.C2.RP-156	3.1.1.045	A
PZR Safe Ends	PB	Stainless Steel	Reactor Coolant (Ext)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) for Class 1 components and Water Chemistry (B2.1.2)	IV.C2.R-25	3.1.1.042	A

Table 3.1.2-3 Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Pressurizer (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
PZR Safe Ends	PB	Stainless Steel	Reactor Coolant (Ext)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) for Class 1 components and Water Chemistry (B2.1.2)	IV.C2.R-58	3.1.1.040	A
PZR Safe Ends	PB	Stainless Steel	Reactor Coolant (Ext)	Loss of material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1.088	A
PZR Safety Nozzles	PB	Carbon Steel with Stainless Steel Cladding	Borated Water Leakage (Ext)	Loss of material	Boric Acid Corrosion (B2.1.4)	IV.C2.R-17	3.1.1.049	A
PZR Safety Nozzles	PB	Carbon Steel with Stainless Steel Cladding	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) for Class 1 components and Water Chemistry (B2.1.2)	IV.C2.R-25	3.1.1.042	A

Table 3.1.2-3 Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Pressurizer (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
PZR Safety Nozzles	PB	Carbon Steel with Stainless Steel Cladding	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) for Class 1 components and Water Chemistry (B2.1.2)	IV.C2.R-58	3.1.1.040	A
PZR Safety Nozzles	PB	Carbon Steel with Stainless Steel Cladding	Reactor Coolant (Int)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	IV.C2.R-223	3.1.1.009	A
PZR Safety Nozzles	PB	Carbon Steel with Stainless Steel Cladding	Reactor Coolant (Int)	Loss of material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1.088	A
PZR Seismic Lugs	SS	Carbon Steel	Borated Water Leakage (Ext)	Loss of material	Boric Acid Corrosion (B2.1.4)	IV.C2.R-17	3.1.1.049	A
PZR Seismic Lugs	SS	Carbon Steel	Borated Water Leakage (Ext)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	IV.C2.R-18	3.1.1.005	A

Table 3.1.2-3 Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Pressurizer (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
PZR Seismic Lugs	SS	Carbon Steel	Borated Water Leakage (Ext)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) for Class 1 components	IV.C2.R-19	3.1.1.036	A
PZR Shell and Head	PB	Carbon Steel with Stainless Steel Cladding	Borated Water Leakage (Ext)	Loss of material	Boric Acid Corrosion (B2.1.4)	IV.C2.R-17	3.1.1.049	A
PZR Shell and Head	PB	Carbon Steel with Stainless Steel Cladding	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) for Class 1 components and Water Chemistry (B2.1.2)	IV.C2.R-25	3.1.1.042	A
PZR Shell and Head	PB	Carbon Steel with Stainless Steel Cladding	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) for Class 1 components and Water Chemistry (B2.1.2)	IV.C2.R-58	3.1.1.040	A

Table 3.1.2-3 Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Pressurizer (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
PZR Shell and Head	PB	Carbon Steel with Stainless Steel Cladding	Reactor Coolant (Int)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	IV.C2.R-223	3.1.1.009	A
PZR Shell and Head	PB	Carbon Steel with Stainless Steel Cladding	Reactor Coolant (Int)	Loss of material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1.088	A
PZR Spray Head	SP	Stainless Steel	Reactor Coolant (Ext)	Loss of material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1.088	C
PZR Spray Head	SP	Stainless Steel	Reactor Coolant (Ext)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	IV.C2.RP-41	3.1.1.081	A
PZR Support Skirt and Flange	SS	Carbon Steel	Borated Water Leakage (Ext)	Loss of material	Boric Acid Corrosion (B2.1.4)	IV.C2.R-17	3.1.1.049	A
PZR Support Skirt and Flange	PB	Carbon Steel	Borated Water Leakage (Ext)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	IV.C2.R-18	3.1.1.005	A

Table 3.1.2-3 Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Pressurizer (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
PZR Support Skirt and Flange	SS	Carbon Steel	Borated Water Leakage (Ext)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) for Class 1 components	IV.C2.R-19	3.1.1.036	A
PZR Surge and Spray Nozzles with Thermal Sleeves	PB, SH	Carbon Steel with Stainless Steel Cladding	Borated Water Leakage (Ext)	Loss of material	Boric Acid Corrosion (B2.1.4)	IV.C2.R-17	3.1.1.049	A
PZR Surge and Spray Nozzles with Thermal Sleeves	PB, SH	Carbon Steel with Stainless Steel Cladding	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) for Class 1 components and Water Chemistry (B2.1.2)	IV.C2.R-25	3.1.1.042	A
PZR Surge and Spray Nozzles with Thermal Sleeves	PB, SH	Carbon Steel with Stainless Steel Cladding	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) for Class 1 components and Water Chemistry (B2.1.2)	IV.C2.R-58	3.1.1.040	A

Table 3.1.2-3 Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Pressurizer (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
PZR Surge and Spray Nozzles with Thermal Sleeves	PB, SH	Carbon Steel with Stainless Steel Cladding	Reactor Coolant (Int)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	IV.C2.R-223	3.1.1.009	A
PZR Surge and Spray Nozzles with Thermal Sleeves	PB, SH	Carbon Steel with Stainless Steel Cladding	Reactor Coolant (Int)	Loss of material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1.088	A

Notes for Table 3.1.2-3:

Standard Notes:

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

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

Plant Specific Notes:

None

Table 3.1.2-4 Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Steam Generators

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
SG Closure Bolting	PB	Carbon Steel	Borated Water Leakage (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	IV.C2.R-12	3.1.1.066	A
SG Closure Bolting	PB	Carbon Steel	Borated Water Leakage (Ext)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	IV.C2.R-18	3.1.1.005	A
SG Closure Bolting	PB	Carbon Steel	Borated Water Leakage (Ext)	Loss of material	Boric Acid Corrosion (B2.1.4)	IV.D1.R-17	3.1.1.049	A
SG Closure Bolting	PB	Carbon Steel	Plant Indoor Air (Ext)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	IV.C2.R-18	3.1.1.005	A
SG Closure Bolting	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	IV.D1.RP-46	3.1.1.067	A
SG Closure Bolting	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.8)	V.E.EP-70	3.2.1.013	A
SG Divider Plate	DF	Nickel-Alloys	Reactor Coolant (Ext)	Loss of material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1.088	C
SG Divider Plate	DF	Nickel-Alloys	Reactor Coolant (Ext)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	IV.D1.R-221	3.1.1.008	C
SG Divider Plate	DF	Nickel-Alloys	Reactor Coolant (Ext)	Cracking	Water Chemistry (B2.1.2) and cracking verification inspection	IV.D1.RP-367	3.1.1.025	E, 2

Table 3.1.2-4 Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Steam Generators (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
SG Feedwater Ring and J-Tube	SS	Stainless Steel	Secondary Water (Ext)	Loss of material	Steam Generators (B2.1.9) and Water Chemistry (B2.1.2)	IV.D1.RP-226	3.1.1.071	C
SG Feedwater Ring and J-Tube	SS	Stainless Steel	Secondary Water (Ext)	Cracking	Steam Generators (B2.1.9) and Water Chemistry (B2.1.2)	IV.D1.RP-384	3.1.1.071	C
SG Internal Structures	SS	Carbon Steel	Secondary Water (Ext)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	IV.D1.R-33	3.1.1.005	A
SG Internal Structures	SS	Carbon Steel	Secondary Water (Ext)	Loss of material	Steam Generators (B2.1.9) and Water Chemistry (B2.1.2)	IV.D1.RP-161	3.1.1.072	A
SG Internal Structures	SS	Stainless Steel	Secondary Water (Ext)	Loss of material	Steam Generators (B2.1.9)	IV.D1.RP-225	3.1.1.076	A
SG Internal Structures	SS	Stainless Steel	Secondary Water (Ext)	Loss of material	Steam Generators (B2.1.9)and Water Chemistry (B2.1.2)	IV.D1.RP-226	3.1.1.071	A
SG Internal Structures	SS	Stainless Steel	Secondary Water (Ext)	Cracking	Steam Generators (B2.1.9) and Water Chemistry (B2.1.2)	IV.D1.RP-384	3.1.1.071	A
SG Moisture Separators	SS	Carbon Steel	Secondary Water (Ext)	Wall thinning	Steam Generators (B2.1.9) and Water Chemistry (B2.1.2)	IV.D1.RP-49	3.1.1.074	A

Table 3.1.2-4 Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Steam Generators (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
SG Moisture Separators	SS	Carbon Steel	Secondary Water (Ext)	Loss of material	Steam Generators (B2.1.9) and Water Chemistry (B2.1.2)	IV.D1.RP-161	3.1.1.072	C
SG Moisture Separators	SS	Stainless Steel	Secondary Water (Ext)	Loss of material	Steam Generators (B2.1.9) and Water Chemistry (B2.1.2)	IV.D1.RP-226	3.1.1.071	C
SG Moisture Separators	SS	Stainless Steel	Secondary Water (Ext)	Cracking	Steam Generators (B2.1.9) and Water Chemistry (B2.1.2)	IV.D1.RP-384	3.1.1.071	C
SG Primary Head	PB	Carbon Steel with Stainless Steel Cladding	Borated Water Leakage (Ext)	Loss of material	Boric Acid Corrosion (B2.1.4)	IV.D1.R-17	3.1.1.049	A
SG Primary Head	PB	Carbon Steel with Stainless Steel Cladding	Reactor Coolant (Int)	Loss of material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1.088	A
SG Primary Head	PB	Carbon Steel with Stainless Steel Cladding	Reactor Coolant (Int)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	IV.D1.R-221	3.1.1.008	A

Table 3.1.2-4 Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Steam Generators (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
SG Primary Head	PB	Carbon Steel with Stainless Steel Cladding	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) for Class 1 components and Water Chemistry (B2.1.2)	IV.D1.RP-232	3.1.1.033	A
SG Primary Manway Covers	PB	Carbon Steel	Borated Water Leakage (Ext)	Loss of material	Boric Acid Corrosion (B2.1.4)	IV.D1.R-17	3.1.1.049	A
SG Primary Manway Covers	PB	Carbon Steel	Borated Water Leakage (Ext)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	IV.C2.R-18	3.1.1.005	A
SG Primary Manway Covers	PB	Stainless Steel	Reactor Coolant (Ext)	Loss of material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1.088	C
SG Primary Manway Covers	PB	Stainless Steel	Reactor Coolant (Int)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	IV.D1.R-221	3.1.1.008	A
SG Primary Manway Covers	PB	Stainless Steel	Reactor Coolant (Ext)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	IV.C2.R-18	3.1.1.005	A

Table 3.1.2-4 Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Steam Generators (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
SG Primary Manway Covers	PB	Stainless Steel	Reactor Coolant (Ext)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) for Class 1 components and Water Chemistry (B2.1.2)	IV.D1.RP-232	3.1.1.033	A, 3
SG Primary Nozzles and Safe Ends	PB	Carbon Steel with Stainless Steel Cladding	Borated Water Leakage (Ext)	Loss of material	Boric Acid Corrosion (B2.1.4)	IV.D1.R-17	3.1.1.049	A
SG Primary Nozzles and Safe Ends	PB	Carbon Steel with Stainless Steel Cladding	Reactor Coolant (Int)	Loss of material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1.088	A
SG Primary Nozzles and Safe Ends	PB	Carbon Steel with Stainless Steel Cladding	Reactor Coolant (Int)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	IV.D1.R-221	3.1.1.008	A

Table 3.1.2-4 Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Steam Generators (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
SG Primary Nozzles and Safe Ends	PB	Carbon Steel with Stainless Steel Cladding	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) for Class 1 components and Water Chemistry (B2.1.2)	IV.D1.RP-232	3.1.1.033	A
SG Primary Nozzles and Safe Ends	PB	Nickel-Alloys	Borated Water Leakage (Ext)	None	None	IV.E.RP-378	3.1.1.106	A
SG Primary Nozzles and Safe Ends	PB	Nickel-Alloys	Reactor Coolant (Int)	Loss of material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1.088	A
SG Primary Nozzles and Safe Ends	PB	Nickel-Alloys	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1), Water Chemistry (B2.1.2), and Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components (PWRs only) (B2.1.5)	IV.D1.RP-36	3.1.1.045	A

Table 3.1.2-4 Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Steam Generators (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
SG Primary Nozzles and Safe Ends	PB	Stainless Steel	Borated Water Leakage (Ext)	None	None	IV.E.RP-05	3.1.1.107	C
SG Primary Nozzles and Safe Ends	PB	Stainless Steel	Reactor Coolant (Int)	Loss of material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1.088	A
SG Primary Nozzles and Safe Ends	PB	Stainless Steel	Reactor Coolant (Int)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	IV.D1.R-221	3.1.1.008	A
SG Primary Nozzles and Safe Ends	PB	Stainless Steel	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) for Class 1 components and Water Chemistry (B2.1.2)	IV.D1.RP-232	3.1.1.033	A
SG Secondary Nozzles	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	V.E.E-44	3.2.1.040	A
SG Secondary Nozzles	PB	Carbon Steel	Secondary Water (Int)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	IV.D1.R-33	3.1.1.005	A

Table 3.1.2-4 Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Steam Generators (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
SG Secondary Nozzles	PB	Carbon Steel	Secondary Water (Int)	Wall thinning	Flow-Accelerated Corrosion (B2.1.7)	IV.D1.R-37	3.1.1.061	A
SG Secondary Nozzles	PB	Carbon Steel	Secondary Water (Int)	Loss of material	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) for Class 2 components and Water Chemistry (B2.1.2) and NRC IN 90-04 to be addressed for Westinghouse Model 44 and 51 Steam Generators	IV.D1.RP-368	3.1.1.012	C
SG Secondary Nozzles	TH	Nickel-Alloys	Secondary Water (Ext)	Loss of material	Steam Generators (B2.1.9) and Water Chemistry (B2.1.2)	IV.D1.RP-226	3.1.1.071	C
SG Secondary Nozzles	TH	Nickel-Alloys	Secondary Water (Ext)	Cracking	Steam Generators (B2.1.9) and Water Chemistry (B2.1.2)	IV.D1.RP-384	3.1.1.071	C
SG Secondary Shell	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	V.E.E-44	3.2.1.040	A
SG Secondary Shell	PB	Carbon Steel	Secondary Water (Int)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	IV.D1.R-33	3.1.1.005	A

Table 3.1.2-4 Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Steam Generators (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
SG Secondary Shell	PB	Carbon Steel	Secondary Water (Int)	Loss of material	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) for Class 2 components and Water Chemistry (B2.1.2) and NRC IN 90-04 to be addressed for Westinghouse Model 44 and 51 Steam Generators	IV.D1.RP-368	3.1.1.012	A
SG Secondary Side Access Covers	PB	Carbon Steel	Plant Indoor Air (Ext)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	IV.C2.R-18	3.1.1.005	A
SG Secondary Side Access Covers	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	V.E.E-44	3.2.1.040	A
SG Secondary Side Access Covers	PB	Stainless Steel	Secondary Water (Ext)	Loss of material	Steam Generators (B2.1.9) and Water Chemistry (B2.1.2)	IV.D1.RP-226	3.1.1.071	C, 3
SG Secondary Side Access Covers	PB	Stainless Steel	Secondary Water (Ext)	Cracking	Steam Generators (B2.1.9) and Water Chemistry (B2.1.2)	IV.D1.RP-384	3.1.1.071	C

Table 3.1.2-4 Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Steam Generators (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
SG Secondary Side Access Covers	PB	Stainless Steel	Secondary Water (Int)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	IV.D1.R-33	3.1.1.005	A
SG Support Ring	SS	Carbon Steel	Borated Water Leakage (Ext)	Loss of material	Boric Acid Corrosion (B2.1.4)	IV.D1.R-17	3.1.1.049	A
SG Tube Plugs	PB	Nickel-Alloys	Reactor Coolant (Ext)	Loss of material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1.088	C
SG Tube Plugs	PB	Nickel-Alloys	Reactor Coolant (Ext)	Cracking	Steam Generators (B2.1.9) and Water Chemistry (B2.1.2)	IV.D1.R-40	3.1.1.070	A
SG Tube Support Plates	SS	Stainless Steel	Secondary Water (Ext)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	IV.D1.R-33	3.1.1.005	C
SG Tube Support Plates	SS	Stainless Steel	Secondary Water (Ext)	Loss of material	Steam Generators (B2.1.9)	IV.D1.RP-225	3.1.1.076	C
SG Tube Support Plates	SS	Stainless Steel	Secondary Water (Ext)	Loss of material	Steam Generators (B2.1.9) and Water Chemistry (B2.1.2)	IV.D1.RP-226	3.1.1.071	C
SG Tube Support Plates	SS	Stainless Steel	Secondary Water (Ext)	Cracking	Steam Generators (B2.1.9) and Water Chemistry (B2.1.2)	IV.D1.RP-384	3.1.1.071	C
SG Tubes	HT, PB	Nickel-Alloys	Reactor Coolant (Int)	Loss of material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1.088	C

Table 3.1.2-4 Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Steam Generators (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
SG Tubes	HT, PB	Nickel-Alloys	Reactor Coolant (Int)	Cracking	Steam Generators (B2.1.9) and Water Chemistry (B2.1.2)	IV.D1.R-44	3.1.1.070	A
SG Tubes	HT, PB	Nickel-Alloys	Reactor Coolant (Int)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	IV.D1.R-46	3.1.1.002	A
SG Tubes	HT, PB	Nickel-Alloys	Secondary Water (Ext)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	IV.D1.R-46	3.1.1.002	A
SG Tubes	HT, PB	Nickel-Alloys	Secondary Water (Ext)	Cracking	Steam Generators (B2.1.9) and Water Chemistry (B2.1.2)	IV.D1.R-47	3.1.1.069	A
SG Tubes	HT, PB	Nickel-Alloys	Secondary Water (Ext)	Cracking	Steam Generators (B2.1.9) and Water Chemistry (B2.1.2)	IV.D1.R-48	3.1.1.069	A
SG Tubes	HT, PB	Nickel-Alloys	Secondary Water (Ext)	Loss of material	Steam Generators (B2.1.9) and Water Chemistry (B2.1.2)	IV.D1.RP-226	3.1.1.071	C
SG Tubes	HT, PB	Nickel-Alloys	Secondary Water (Ext)	Loss of material	Steam Generators (B2.1.9)	IV.D1.RP-233	3.1.1.077	A
SG Tubes	HT, PB	Nickel-Alloys	Secondary Water (Ext)	Loss of material	Time-Limited Aging Analysis evaluated for the period of extended operation	None	None	H, 4

Table 3.1.2-4 Reactor Vessel, Internals, and Reactor Coolant System – Summary of Aging Management Evaluation – Steam Generators (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
SG Tubesheet	PB	Carbon Steel	Secondary Water (Ext)	Loss of material	Steam Generators (B2.1.9) and Water Chemistry (B2.1.2)	IV.D1.RP-161	3.1.1.072	C
SG Tubesheet	PB	Nickel-Alloys	Reactor Coolant (Ext)	Loss of material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1.088	C
SG Tubesheet	PB	Nickel-Alloys	Reactor Coolant (Ext)	Cracking	Water Chemistry (B2.1.2) and cracking verification inspection	IV.D1.RP-385	3.1.1.025	E, 1

Notes for Table 3.1.2-4:

Standard Notes:

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

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

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

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

Plant Specific Notes:

1 The tubesheets in the replacement steam generators installed at Callaway are clad with Alloy 182. The tubes are secured to the tubesheet by means of tube-to-tubesheet leaktight weld and tube expansion. See Section 3.1.2.2.11.2 for the commitment to verify the integrity of the welds.

2. The divider plates in the replacement steam generators installed at Callaway are made of Alloy 690. The divider plate to primary head and tubesheet junctions are welded with Alloy 152 weld materials. See Section 3.1.2.2.11.1 for the commitment to verify the integrity of the welds.

3 Steam generator primary manway, secondary manway, handhole, and inspection ports are equipped with stainless steel gasket inserts.

4. This TLAA is applicable to the steam generator tube wear TLAA. Section 4.7.9 describes the evaluation of the TLAA for loss of material due to wear and fretting of steam generator tubes.

3.2 AGING MANAGEMENT OF ENGINEERED SAFETY FEATURES

3.2.1 Introduction

Section 3.2 provides the results of the aging management reviews (AMRs) for those component types identified in Section 2.3.2, *Engineered Safety Features*, subject to AMR. These systems are described in the following sections:

- Containment Spray System (Section 2.3.2.1)
- Containment Integrated Leak Rate Testing System (Section 2.3.2.2)
- Containment Hydrogen Control System (Section 2.3.2.3)
- Containment Purge System (Section 2.3.2.4)
- High Pressure Coolant Injection System (Section 2.3.2.5)
- Residual Heat Removal System (Section 2.3.2.6)

Table 3.2-1, *Summary of Aging Management Programs in Chapter V of NUREG-1801 for Engineered Safety Features*, provides the summary of the programs evaluated in NUREG-1801 that are applicable to the component types in this section. Table 3.2-1 uses the format of Table 1 described in Section 3.0, *Aging Management Review*.

3.2.2 Results

The following tables summarize the results of the AMR for the systems in the Engineered Safety Features area:

- Table 3.2.2-1, *Engineered Safety Features – Summary of Aging Management Evaluation – Containment Spray System*
- Table 3.2.2-2, *Engineered Safety Features – Summary of Aging Management Evaluation – Containment Integrated Leak Rate Testing System*
- Table 3.2.2-3, *Engineered Safety Features – Summary of Aging Management Evaluation – Containment Hydrogen Control System*
- Table 3.2.2-4, *Engineered Safety Features – Summary of Aging Management Evaluation – Containment Purge System*
- Table 3.2.2-5, *Engineered Safety Features – Summary of Aging Management Evaluation – High Pressure Coolant Injection System*
- Table 3.2.2-6, *Engineered Safety Features – Summary of Aging Management Evaluation – Residual Heat Removal System*

These tables use the format of Table 2 discussed in Section 3.0, *Aging Management Review*.

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

The materials from which the component types are fabricated, the environments to which they are exposed, the potential aging effects requiring management, and the aging management programs used to manage these aging effects are provided for each of the above systems in the following sections.

3.2.2.1.1 Containment Spray System

Materials

The materials of construction for the containment spray system component types are:

- Carbon Steel
- Stainless Steel

Environment

The containment spray system component types are exposed to the following environments:

- Borated Water Leakage
- Condensation
- Plant Indoor Air
- Treated Borated Water

Aging Effects Requiring Management

The following containment spray system aging effects require management:

- Loss of material
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for the containment spray system component types:

- Bolting Integrity (B2.1.8)
- External Surfaces Monitoring of Mechanical Components (B2.1.21)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)
- One-Time Inspection (B2.1.18)

- Water Chemistry (B2.1.2)

3.2.2.1.2 Containment Integrated Leak Rate Testing System

Materials

The material of construction for the containment integrated leak rate testing system component types is:

- Carbon Steel

Environment

The containment integrated leak rate testing system components are exposed to the following environments:

- Closed Cycle Cooling Water
- Condensation
- Plant Indoor Air

Aging Effects Requiring Management

The following containment integrated leak rate testing system aging effects require management:

- Loss of material
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for the containment integrated leak rate testing system component types:

- Bolting Integrity (B2.1.8)
- Closed Treated Water Systems (B2.1.11)
- External Surfaces Monitoring of Mechanical Components (B2.1.21)
- Inspection of Internal Surfaces In Miscellaneous Piping And Ducting Components (B2.1.23)

3.2.2.1.3 Containment Hydrogen Control System

Materials

The materials of construction for the containment hydrogen control system component types are:

- Carbon Steel
- Stainless Steel

Environment

The containment hydrogen control system component types are exposed to the following environments:

- Condensation
- Dry Gas
- Plant Indoor Air

Aging Effects Requiring Management

The following containment hydrogen control system aging effects require management:

- Loss of material
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for the containment hydrogen control system component types:

- Bolting Integrity (B2.1.8)
- External Surfaces Monitoring of Mechanical Components (B2.1.21)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)

3.2.2.1.4 Containment Purge System

Materials

The materials of construction for the containment purge system component types is:

- Aluminum
- Carbon Steel

- Carbon Steel (Galvanized)
- Cast Iron (Gray Cast Iron)
- Copper Alloy
- Elastomer
- Stainless Steel

Environment

The containment purge system component types are exposed to the following environments:

- Closed Cycle Cooling Water
- Condensation
- Plant Indoor Air
- Ventilation Atmosphere
- Waste Water

Aging Effects Requiring Management

The following containment purge system aging effects require management:

- Hardening and loss of strength
- Loss of material
- Loss of preload
- Reduction of heat transfer

Aging Management Programs

The following aging management programs manage the aging effects for the containment purge system component types:

- Bolting Integrity (B2.1.8)
- Closed Treated Water Systems (B2.1.11)
- External Surfaces Monitoring of Mechanical Components (B2.1.21)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)
- Selective Leaching (B2.1.19)

3.2.2.1.5 High Pressure Coolant Injection System

Materials

The materials of construction for the high pressure coolant injection system component types are:

- Carbon Steel
- Carbon Steel with Stainless Steel Cladding
- Copper Alloy
- Stainless Steel

Environment

The high pressure coolant injection system components are exposed to the following environments:

- Atmosphere/ Weather
- Borated Water Leakage
- Buried
- Closed Cycle Cooling Water
- Concrete
- Condensation
- Demineralized Water
- Dry Gas
- Lubricating Oil
- Plant Indoor Air
- Reactor Coolant
- Steam
- Treated Borated Water

Aging Effects Requiring Management

The following high pressure coolant injection system aging effects require management:

- Cracking
- Loss of material
- Loss of preload

- Reduction of heat transfer
- Wall thinning

Aging Management Programs

The following aging management programs manage the aging effects for the high pressure coolant injection system component types:

- Aboveground Metallic Tanks (B2.1.15)
- ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)
- Bolting Integrity (B2.1.8)
- Boric Acid Corrosion (B2.1.4)
- Buried and Underground Piping and Tanks (B2.1.25)
- Closed Treated Water Systems (B2.1.11)
- External Surfaces Monitoring of Mechanical Components (B2.1.21)
- Flow-Accelerated Corrosion (B2.1.7)
- Inspection of Internal Surfaces In Miscellaneous Piping And Ducting Components (B2.1.23)
- Lubricating Oil Analysis (B2.1.24)
- One-Time Inspection (B2.1.18)
- One-Time Inspection of ASME Code Class 1 Small-Bore Piping (B2.1.20)
- Water Chemistry (B2.1.2)

3.2.2.1.6 Residual Heat Removal System

Materials

The materials of construction for the residual heat removal system component types are:

- Aluminum
- Carbon Steel
- Copper Alloy
- Insulation Calcium Silicate
- Stainless Steel

Environment

The residual heat removal system component types are exposed to the following environments:

- Borated Water Leakage
- Closed Cycle Cooling Water
- Condensation
- Plant Indoor Air
- Reactor Coolant
- Treated Borated Water

Aging Effects Requiring Management

The following residual heat removal system aging effects require management:

- Cracking
- Loss of material
- Loss of preload
- Reduction of heat transfer

Aging Management Programs

The following aging management programs manage the aging effects for the residual heat removal system component types:

- ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)
- Bolting Integrity (B2.1.8)
- Boric Acid Corrosion (B2.1.4)
- Closed Treated Water Systems (B2.1.11)
- External Surfaces Monitoring of Mechanical Components (B2.1.21)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)
- One-Time Inspection (B2.1.18)
- Water Chemistry (B2.1.2)

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

NUREG-1801 provides the basis for identifying those programs that warrant further evaluation. For the engineered safety features, those evaluations are addressed in the following sections.

3.2.2.2.1 Cumulative Fatigue Damage

[3.2.1.01] Callaway piping outside the reactor coolant pressure boundary is designed to ASME III Class 2, Class 3, and ANSI B31.1, all of which require a reduction in the allowable secondary stress range if more than 7,000 full-range thermal cycles are expected in a design lifetime. Section 4.3.5 describes the evaluation of these cyclic design TLAAs.

A survey of the emergency core cooling system discovered no piping components with fatigue analyses or designed for a finite number of load cycles, other than the piping described above.

3.2.2.2.2 Loss of Material due to Cladding Breach

Not applicable. Callaway has no in-scope steel with stainless steel cladding pump casing exposed to treated borated water in the emergency core cooling system, so the applicable NUREG-1801 line was not used.

3.2.2.2.3 Loss of Material due to Pitting and Crevice Corrosion

3.2.2.2.3.1 Partially encased stainless steel tanks exposed to raw water

Not applicable. Callaway has no in-scope stainless steel tanks exposed to raw water in the emergency core cooling system, so the applicable NUREG-1801 line was not used.

3.2.2.2.3.2 Stainless steel piping, components, and tanks exposed to outdoor air.

Loss of material due to pitting and crevice corrosion could occur for stainless steel piping, piping components, piping elements, and tanks exposed to outdoor air. With exception of RWST, the External Surfaces Monitoring of Mechanical Components program (B2.1.21) manages the loss of material from pitting and crevice corrosion for stainless steel external surfaces exposed to outdoor environment. The RWST external surface is managed by the Aboveground Metallic Tanks program (B2.1.15).

3.2.2.2.4 Loss of Material due to Erosion

Loss of material due to erosion could occur in the stainless steel high pressure coolant injection (HPCI) pump miniflow recirculation orifice exposed to treated borated water. The plant-specific aging management programs used to manage the aging include Water Chemistry program (B2.1.2) and One-Time Inspection program (B2.1.18).

3.2.2.2.5 Loss of Material due to General Corrosion and Fouling that Leads to Corrosion

Not applicable to Callaway, applicable to BWR only.

3.2.2.2.6 Cracking due to Stress Corrosion Cracking

Cracking due to stress corrosion cracking could occur for stainless steel piping, piping components, piping elements and tanks exposed to outdoor air. With exception of RWST, the External Surfaces Monitoring of Mechanical Components program (B2.1.21) manages the cracking from stress corrosion cracking for stainless steel external surfaces exposed to outdoor environment. The RWST external surface is managed by the Aboveground Metallic Tanks program (B2.1.15).

3.2.2.2.7 Quality Assurance for Aging Management of Nonsafety-Related Components

Quality Assurance Program and Administrative Controls are discussed in Section B1.3, *Quality Assurance Program and Administrative Controls*.

3.2.2.3 Time-Limited Aging Analyses

The Time-Limited Aging Analyses identified below are associated with the engineered safety features component types. The section of Chapter 4, *Time-Limited Aging Analyses* that contains the TLAA review results is indicated in parenthesis.

- Cumulative Fatigue Damage (Section 4.3, *Metal Fatigue*)

3.2.3 Conclusions

The engineered safety features component types that are subject to AMR have been evaluated. The aging management programs selected to manage the aging effects for the engineered safety features component types are identified in the summary Tables and in Section 3.2.2.1.

A description of these aging management programs is provided in Appendix B, *Aging Management Programs*, along with a demonstration that the identified aging effects will be managed for the period of extended operation.

Therefore, based on the demonstration provided in Appendix B, *Aging Management Programs*, the effects of aging associated with the engineered safety features component types will be adequately managed so that there is reasonable assurance that the intended functions will be maintained consistent with the current licensing basis during the period of extended operation.

Table 3.2-1 Summary of Aging Management Programs in Chapter V of NUREG-1801 for Engineered Safety Features

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.2.1.001	Stainless steel, Steel Piping, piping components, and piping elements exposed to Treated water (borated)	Cumulative fatigue damage due to fatigue	Fatigue is a time-limited aging analysis (TLAA) to be evaluated for the period of extended operation. See the SRP, Section 4.3 Metal Fatigue, for acceptable methods for meeting the requirements of 10 CFR 54.21(c)(1).	Yes, TLAA	Fatigue of metal components is a TLAA. See further evaluation in Section 3.2.2.2.1.
3.2.1.002	Steel (with stainless steel cladding) Pump casings exposed to Treated water (borated)	Loss of material due to cladding breach	A plant-specific aging management program is to be evaluated Reference NRC Information Notice 94-63, *Boric Acid Corrosion of Charging Pump Casings Caused by Cladding Cracks*.	Yes, verify that plant-specific program addresses clad breach	Not applicable. Callaway has no in-scope steel with stainless steel cladding pump casing exposed to treated borated water in the emergency core cooling system, so the applicable NUREG-1801 line was not used. See further evaluation in Section 3.2.2.2.2.
3.2.1.003	Stainless steel Partially-encased tanks with breached moisture barrier exposed to Raw water	Loss of material due to pitting and crevice corrosion	A plant-specific aging management program is to be evaluated for pitting and crevice corrosion of tank bottom because moisture and water can egress under the tank due to cracking of the perimeter seal from weathering.	Yes, plant-specific	Not applicable. Callaway has no in-scope stainless steel tanks exposed to raw water in the emergency core cooling system, so the applicable NUREG-1801 line was not used. See further evaluation in Section 3.2.2.2.3.1.

Table 3.2-1 Summary of Aging Management Programs in Chapter V of NUREG-1801 for Engineered Safety Features (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.2.1.004	Stainless steel Piping, piping components, and piping elements; tanks exposed to Air – outdoor	Loss of material due to pitting and crevice corrosion	External Surfaces Monitoring of Mechanical Components (B2.1.21)	Yes, environmental conditions need to be evaluated	Loss of material due to pitting and crevice corrosion could occur for stainless steel piping, piping components, piping elements, and tanks exposed to outdoor air. With exception of RWST, the External Surfaces Monitoring of Mechanical Components program (B2.1.21) manages the loss of material from pitting and crevice corrosion for stainless steel external surfaces exposed to outdoor environment. The RWST external surface is managed by the Aboveground Metallic Tanks program (B2.1.15). See further evaluation in Section 3.2.2.2.3.2.

Table 3.2-1 Summary of Aging Management Programs in Chapter V of NUREG-1801 for Engineered Safety Features (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.2.1.005	Stainless steel Orifice (miniflow recirculation) exposed to Treated water (borated)	Loss of material due to erosion	A plant-specific aging management program is to be evaluated for erosion of the orifice due to extended use of the centrifugal HPSI pump for normal charging. See LER 50-275/94-023 for evidence of erosion.	Yes, plant-specific	Consistent with NUREG-1801. The plant-specific aging management program(s) used to manage the aging include: Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18). See further evaluation in Section 3.2.2.2.4.
3.2.1.006					Not applicable - BWR only

Table 3.2-1 Summary of Aging Management Programs in Chapter V of NUREG-1801 for Engineered Safety Features (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.2.1.007	Stainless steel Piping, piping components, and piping elements; tanks exposed to Air – outdoor	Cracking due to stress corrosion cracking	External Surfaces Monitoring of Mechanical Components (B2.1.21)	Yes, environmental conditions need to be evaluated	Cracking due to stress corrosion cracking could occur for stainless steel piping, piping components, piping elements and tanks exposed to outdoor air. With exception of RWST, the External Surfaces Monitoring of Mechanical Components program (B2.1.21) manages the cracking from stress corrosion cracking for stainless steel external surfaces exposed to outdoor environment. The RWST external surface is managed by the Aboveground Metallic Tanks program (B2.1.15). See further evaluation in Section 3.2.2.2.6.
3.2.1.008	Aluminum, Copper alloy (>15% Zn or >8% Al) Piping, piping components, and piping elements exposed to Air with borated water leakage	Loss of material due to boric acid corrosion	Boric Acid Corrosion (B2.1.4)	No	Not applicable. Callaway has no in-scope aluminum, copper alloy piping, piping components, or piping elements that are exposed to the environment of air with borated water for aging evaluations in the emergency core cooling system, so the applicable NUREG-1801 line was not used.

Table 3.2-1 Summary of Aging Management Programs in Chapter V of NUREG-1801 for Engineered Safety Features (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.2.1.009	Steel External surfaces, Bolting exposed to Air with borated water leakage	Loss of material due to boric acid corrosion	Boric Acid Corrosion (B2.1.4)	No	Consistent with NUREG-1801.
3.2.1.010	Cast austenitic stainless steel Piping, piping components, and piping elements exposed to Treated water (borated) >250°C (>482°F), Treated water >250°C (>482°F)	Loss of fracture toughness due to thermal aging embrittlement	Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)	No	Not applicable. Callaway has no in-scope cast austenitic stainless steel piping, piping components, or piping elements in the emergency core cooling system, so the applicable NUREG-1801 line was not used.
3.2.1.011					Not applicable - BWR only
3.2.1.012	Steel, high-strength Closure bolting exposed to Air with steam or water leakage	Cracking due to cyclic loading, stress corrosion cracking	Bolting Integrity (B2.1.8)	No	Not applicable. Callaway has no in-scope high-strength steel closure bolting in the engineered safety features systems, so the applicable NUREG-1801 line was not used.

Table 3.2-1 Summary of Aging Management Programs in Chapter V of NUREG-1801 for Engineered Safety Features (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.2.1.013	Steel; stainless steel Bolting, Closure bolting exposed to Air – outdoor (External), Air – indoor, uncontrolled (External)	Loss of material due to general (steel only), pitting, and crevice corrosion	Bolting Integrity (B2.1.8)	No	Consistent with NUREG-1801.

Table 3.2-1 Summary of Aging Management Programs in Chapter V of NUREG-1801 for Engineered Safety Features (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.2.1.014	Steel Closure bolting exposed to Air with steam or water leakage	Loss of material due to general corrosion	Bolting Integrity (B2.1.8)	No	Not applicable. The plant indoor air environment is used to evaluate closure bolting. NUREG-1800, Table 3.2-1, line 3.2.1.013 is used to evaluate steel closure bolting exposed to an air-indoor uncontrolled environment instead of the NUREG-1800, Table 3.2-1, line 3.2.1.014. NUREG-1800, Table 3.2-1 lines 3.2.1.013, and 3.2.1.014 both manage loss of material due to general (steel only), pitting, and crevice corrosion for steel closure bolting using the Bolting Integrity program (B2.1.8). Steam or water leakage is considered to be event driven and requires corrective action consistent with the Bolting Integrity program. Therefore, a plant indoor air environment (NUREG-1801 item V.E.EP-70) was used rather than an air with steam or water leakage environment.

Table 3.2-1 Summary of Aging Management Programs in Chapter V of NUREG-1801 for Engineered Safety Features (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.2.1.015	Copper alloy, Nickel alloy, Steel; stainless steel, Stainless steel, Steel; stainless steel Bolting, Closure bolting exposed to Any environment, Air – outdoor (External), Raw water, Treated borated water, Fuel oil, Treated water, Air – indoor, uncontrolled (External)	Loss of preload due to thermal effects, gasket creep, and self-loosening	Bolting Integrity (B2.1.8)	No	Consistent with NUREG-1801.
3.2.1.016	Steel Containment isolation piping and components (Internal surfaces), Piping, piping components, and piping elements exposed to Treated water	Loss of material due to general, pitting, and crevice corrosion	Water Chemistry (B2.1.2), and One-Time Inspection (B2.1.18)	No	Not applicable. The containment isolation components were evaluated in the systems in which the components were found to have the function of containment integrity, so the applicable NUREG-1801 line was not used.
3.2.1.017					Not applicable - BWR only

Table 3.2-1 Summary of Aging Management Programs in Chapter V of NUREG-1801 for Engineered Safety Features (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.2.1.018	Stainless steel Containment isolation piping and components (Internal surfaces) exposed to Treated water	Loss of material due to pitting and crevice corrosion	Water Chemistry (B2.1.2), and One-Time Inspection (B2.1.18)	No	Consistent with NUREG-1801.
3.2.1.019	Stainless steel Heat exchanger tubes exposed to Treated water	Reduction of heat transfer due to fouling	Water Chemistry (B2.1.2), and One-Time Inspection (B2.1.18)	No	Not applicable. Callaway has no in-scope stainless steel heat exchanger tubes exposed to treated water in the containment spray system, so the applicable NUREG-1801 line was not used.
3.2.1.020	Stainless steel Piping, piping components, and piping elements; tanks exposed to Treated water (borated) >60°C (>140°F)	Cracking due to stress corrosion cracking	Water Chemistry (B2.1.2)	No	Consistent with NUREG-1801 for material, environment, and aging effect, but a different aging management program. Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18) are credited.

Table 3.2-1 Summary of Aging Management Programs in Chapter V of NUREG-1801 for Engineered Safety Features (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.2.1.021	Steel (with stainless steel or nickel-alloy cladding) Safety injection tank (accumulator) exposed to Treated water (borated) >60°C (>140°F)	Cracking due to stress corrosion cracking	Water Chemistry (B2.1.2)	No	Not applicable. The temperature of the safety injection accumulator tanks are not expected to be >140°F. Therefore, the aging effect of stress corrosion cracking is not applicable.
3.2.1.022	Stainless steel Piping, piping components, and piping elements; tanks exposed to Treated water (borated)	Loss of material due to pitting and crevice corrosion	Water Chemistry (B2.1.2)	No	Consistent with NUREG-1801 for material, environment, and aging effect, but a different aging management program. Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18) are credited.
3.2.1.023	Steel Heat exchanger components, Containment isolation piping and components (Internal surfaces) exposed to Raw water	Loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion; fouling that leads to corrosion	Open-Cycle Cooling Water System (B2.1.10)	No	Not applicable. Callaway has no in-scope steel heat exchanger components exposed to raw water in the engineered safety features systems, so the applicable NUREG-1801 lines were not used.

Table 3.2-1 Summary of Aging Management Programs in Chapter V of NUREG-1801 for Engineered Safety Features (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.2.1.024	Stainless steel Piping, piping components, and piping elements exposed to Raw water	Loss of material due to pitting, crevice, and microbiologically-influenced corrosion	Open-Cycle Cooling Water System (B2.1.10)	No	Not applicable. Callaway has no in-scope stainless steel piping, piping components, or piping elements exposed to raw water in the engineered safety features systems, so the applicable NUREG-1801 lines were not used.
3.2.1.025	Stainless steel Heat exchanger components, Containment isolation piping and components (Internal surfaces) exposed to Raw water	Loss of material due to pitting, crevice, and microbiologically-influenced corrosion; fouling that leads to corrosion	Open-Cycle Cooling Water System (B2.1.10)	No	Not applicable. Callaway has no in-scope stainless steel heat exchanger components exposed to raw water in the engineered safety features systems. The containment isolation components were evaluated in the systems in which the components were found to have the function of containment integrity, so the applicable NUREG-1801 lines were not used.
3.2.1.026					Not applicable - BWR only

Table 3.2-1 Summary of Aging Management Programs in Chapter V of NUREG-1801 for Engineered Safety Features (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.2.1.027	Stainless steel, Steel Heat exchanger tubes exposed to Raw water	Reduction of heat transfer due to fouling	Open-Cycle Cooling Water System (B2.1.10)	No	Not applicable. Callaway has no in-scope stainless steel or carbon steel heat exchanger tubes exposed to raw water in the engineered safety features systems, so the applicable NUREG-1801 lines were not used.
3.2.1.028	Stainless steel Piping, piping components, and piping elements exposed to Closed-cycle cooling water >60°C (>140°F)	Cracking due to stress corrosion cracking	Closed Treated Water Systems (B2.1.11)	No	Consistent with NUREG-1801.
3.2.1.029	Steel Piping, piping components, and piping elements exposed to Closed-cycle cooling water	Loss of material due to general, pitting, and crevice corrosion	Closed Treated Water Systems (B2.1.11)	No	Consistent with NUREG-1801.
3.2.1.030	Steel Heat exchanger components exposed to Closed-cycle cooling water	Loss of material due to general, pitting, crevice, and galvanic corrosion	Closed Treated Water Systems (B2.1.11)	No	Consistent with NUREG-1801.

Table 3.2-1 Summary of Aging Management Programs in Chapter V of NUREG-1801 for Engineered Safety Features (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.2.1.031	Stainless steel Heat exchanger components, Piping, piping components, and piping elements exposed to Closed-cycle cooling water	Loss of material due to pitting and crevice corrosion	Closed Treated Water Systems (B2.1.11)	No	Consistent with NUREG-1801.
3.2.1.032	Copper alloy Heat exchanger components, Piping, piping components, and piping elements exposed to Closed-cycle cooling water	Loss of material due to pitting, crevice, and galvanic corrosion	Closed Treated Water Systems (B2.1.11)	No	Consistent with NUREG-1801.
3.2.1.033	Copper alloy, Stainless steel Heat exchanger tubes exposed to Closed-cycle cooling water	Reduction of heat transfer due to fouling	Closed Treated Water Systems (B2.1.11)	No	Consistent with NUREG-1801.

Table 3.2-1 Summary of Aging Management Programs in Chapter V of NUREG-1801 for Engineered Safety Features (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.2.1.034	Copper alloy (>15% Zn or >8% Al) Piping, piping components, and piping elements, Heat exchanger components exposed to Closed-cycle cooling water	Loss of material due to selective leaching	Selective Leaching (B2.1.19)	No	Not applicable. Callaway has no in-scope copper alloy (>15% Zn or >8% Al) piping, piping components, piping elements, or heat exchanger components exposed to closed cycle cooling water in the engineered safety features systems, so the applicable NUREG-1801 lines were not used.
3.2.1.035	Gray cast iron Motor cooler exposed to Treated water	Loss of material due to selective leaching	Selective Leaching (B2.1.19)	No	Not applicable. Callaway has no in-scope gray cast iron motor cooler exposed to treated water in the engineered safety features systems, so the applicable NUREG-1801 lines were not used.
3.2.1.036	Gray cast iron Piping, piping components, and piping elements exposed to Closed-cycle cooling water	Loss of material due to selective leaching	Selective Leaching (B2.1.19)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Selective Leaching (B2.1.19)

Table 3.2-1 Summary of Aging Management Programs in Chapter V of NUREG-1801 for Engineered Safety Features (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.2.1.037	Gray cast iron Piping, piping components, and piping elements exposed to Soil	Loss of material due to selective leaching	Selective Leaching (B2.1.19)	No	Not applicable. Callaway has no in-scope gray cast iron piping, piping components or piping elements exposed to soil in the emergency core cooling system, so the applicable NUREG-1801 line was not used.
3.2.1.038					Not applicable - BWR only
3.2.1.039	Steel Containment isolation piping and components (External surfaces) exposed to Condensation (External)	Loss of material due to general corrosion	External Surfaces Monitoring of Mechanical Components (B2.1.21)	No	Not applicable. Callaway has no steel containment isolation piping and components exposed to condensation (external) in Engineered Safety Features systems.
3.2.1.040	Steel Ducting, piping, and components (External surfaces), Ducting, closure bolting, Containment isolation piping and components (External surfaces) exposed to Air – indoor, uncontrolled (External)	Loss of material due to general corrosion	External Surfaces Monitoring of Mechanical Components (B2.1.21)	No	Consistent with NUREG-1801.

Table 3.2-1 Summary of Aging Management Programs in Chapter V of NUREG-1801 for Engineered Safety Features (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.2.1.041	Steel External surfaces exposed to Air – outdoor (External)	Loss of material due to general corrosion	External Surfaces Monitoring of Mechanical Components (B2.1.21)	No	Consistent with NUREG-1801.
3.2.1.042	Aluminum Piping, piping components, and piping elements exposed to Air - outdoor	Loss of material due to pitting and crevice corrosion	External Surfaces Monitoring of Mechanical Components (B2.1.21)	No	Not applicable. Callaway has no in-scope aluminum piping, piping components, or piping elements exposed to air - outdoor in the engineered safety features systems, so the applicable NUREG-1801 lines were not used.
3.2.1.043					Not applicable - BWR only
3.2.1.044	Steel Piping and components (Internal surfaces), Ducting and components (Internal surfaces) exposed to Air – indoor, uncontrolled (Internal)	Loss of material due to general corrosion	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)

Table 3.2-1 Summary of Aging Management Programs in Chapter V of NUREG-1801 for Engineered Safety Features (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.2.1.045	Steel Encapsulation components exposed to Air – indoor, uncontrolled (Internal)	Loss of material due to general, pitting, and crevice corrosion	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	No	Not applicable. The steel encapsulation piping is evaluated with internal environment of borated water leakage and is addressed in line 3.2.1.047.
3.2.1.046					Not applicable - BWR only
3.2.1.047	Steel Encapsulation components exposed to Air with borated water leakage (Internal)	Loss of material due to general, pitting, crevice, and boric acid corrosion	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23).
3.2.1.048	Stainless steel Piping, piping components, and piping elements (Internal surfaces); tanks exposed to Condensation (Internal)	Loss of material due to pitting and crevice corrosion	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)

Table 3.2-1 Summary of Aging Management Programs in Chapter V of NUREG-1801 for Engineered Safety Features (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.2.1.049	Steel Piping, piping components, and piping elements exposed to Lubricating oil	Loss of material due to general, pitting, and crevice corrosion	Lubricating Oil Analysis (B2.1.24), and One-Time Inspection (B2.1.18)	No	Consistent with NUREG-1801.
3.2.1.050	Copper alloy, Stainless steel Piping, piping components, and piping elements exposed to Lubricating oil	Loss of material due to pitting and crevice corrosion	Lubricating Oil Analysis (B2.1.24), and One-Time Inspection (B2.1.18)	No	Consistent with NUREG-1801.
3.2.1.051	Steel, Copper alloy, Stainless steel Heat exchanger tubes exposed to Lubricating oil	Reduction of heat transfer due to fouling	Lubricating Oil Analysis (B2.1.24), and One-Time Inspection (B2.1.18)	No	Consistent with NUREG-1801.
3.2.1.052	Steel (with coating or wrapping) Piping, piping components, and piping elements exposed to Soil or Concrete	Loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion	Buried and Underground Piping and Tanks (B2.1.25)	No	Not applicable - BWR only.

Table 3.2-1 Summary of Aging Management Programs in Chapter V of NUREG-1801 for Engineered Safety Features (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.2.1.053	Stainless steel Piping, piping components, and piping elements exposed to Soil or Concrete	Loss of material due to pitting and crevice corrosion	Buried and Underground Piping and Tanks (B2.1.25)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Buried and Underground Piping and Tanks (B2.1.25)
3.2.1.053a	Steel; stainless steel Underground piping, piping components, and piping elements exposed to air-indoor uncontrolled or condensation (external)	Loss of material due to general (steel only), pitting and crevice corrosion	Buried and Underground Piping and Tanks (B2.1.25)	No	Not applicable. Callaway has no in-scope steel or stainless steel underground piping, piping components, or piping elements exposed to air-indoor uncontrolled or condensation (external) in the emergency core cooling system, so the applicable NUREG-1801 line was not used. The accessibility for the inspections of the piping components contained within the pipe tunnel is not restricted.
3.2.1.054					Not applicable - BWR only

Table 3.2-1 Summary of Aging Management Programs in Chapter V of NUREG-1801 for Engineered Safety Features (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.2.1.055	Steel Piping, piping components, and piping elements exposed to Concrete	None	None, provided 1) attributes of the concrete are consistent with ACI 318 or ACI 349 (low water-to-cement ratio, low permeability, and adequate air entrainment) as cited in NUREG-1557, and 2) plant OE indicates no degradation of the concrete	No, if conditions are met.	Not applicable. Callaway has no in-scope steel piping, piping components, or piping elements exposed to concrete in the engineered safety features systems, so the applicable NUREG-1801 lines were not used.
3.2.1.056	Aluminum Piping, piping components, and piping elements exposed to Air – indoor, uncontrolled (Internal/External)	None	None	NA - No AEM or AMP	Consistent with NUREG-1801.
3.2.1.057	Copper alloy Piping, piping components, and piping elements exposed to Air – indoor, uncontrolled (External), Gas	None	None	NA - No AEM or AMP	Consistent with NUREG-1801.

Table 3.2-1 Summary of Aging Management Programs in Chapter V of NUREG-1801 for Engineered Safety Features (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.2.1.058	Copper alloy (≤15% Zn and ≤8% Al) Piping, piping components, and piping elements exposed to Air with borated water leakage	None	None	NA - No AEM or AMP	Not applicable. Callaway has no in-scope copper alloy (≤15% Zn and ≤8% Al) piping, piping components, or piping elements exposed to air with borated water leakage in the engineered safety features systems, so the applicable NUREG-1801 lines were not used.
3.2.1.059	Galvanized steel Ducting, piping, and components exposed to Air – indoor, controlled (External)	None	None	NA - No AEM or AMP	Not applicable. Callaway has no in-scope galvanized steel ducting or piping components exposed to air – indoor controlled (external) in the engineered safety features systems, so the applicable NUREG-1801 line was not used.

Table 3.2-1 Summary of Aging Management Programs in Chapter V of NUREG-1801 for Engineered Safety Features (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.2.1.060	Glass Piping elements exposed to Air – indoor, uncontrolled (External), Lubricating oil, Raw water, Treated water, Treated water (borated), Air with borated water leakage, Condensation (Internal/External), Gas, Closed-cycle cooling water, Air – outdoor	None	None	NA - No AEM or AMP	Not applicable. Callaway has no in-scope glass piping elements in the engineered safety features systems, so the applicable NUREG-1801 lines were not used.
3.2.1.061	Nickel alloy Piping, piping components, and piping elements exposed to Air – indoor, uncontrolled (External)	None	None	NA - No AEM or AMP	Not applicable. Callaway has no in-scope nickel alloy piping, piping components, or piping elements in the engineered safety features systems, so the applicable NUREG-1801 lines were not used.

Table 3.2-1 Summary of Aging Management Programs in Chapter V of NUREG-1801 for Engineered Safety Features (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.2.1.062	Nickel alloy Piping, piping components, and piping elements exposed to Air with borated water leakage	None	None	NA - No AEM or AMP	Not applicable. Callaway has no in-scope nickel alloy piping, piping components, or piping elements in the engineered safety features systems, so the applicable NUREG-1801 lines were not used.
3.2.1.063	Stainless steel Piping, piping components, and piping elements exposed to Air – indoor, uncontrolled (External), Air with borated water leakage, Concrete, Gas, Air – indoor, uncontrolled (Internal)	None	None	NA - No AEM or AMP	Consistent with NUREG-1801.
3.2.1.064	Steel Piping, piping components, and piping elements exposed to Air – indoor, controlled (External), Gas	None	None	NA - No AEM or AMP	Consistent with NUREG-1801.

Table 3.2.2-1 Engineered Safety Features – Summary of Aging Management Evaluation - Containment Spray System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Closure Bolting	PB	Stainless Steel	Borated Water Leakage (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	IV.C2.R-12	3.1.1.066	A
Containment Recirculation Strainer	FIL	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F.EP-18	3.2.1.063	C
Eductor	PB	Stainless Steel	Borated Water Leakage (Ext)	None	None	V.F.EP-19	3.2.1.063	A
Eductor	PB	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	V.A.EP-41	3.2.1.022	E, 1
Expansion Joint	PB	Stainless Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	V.A.EP-81	3.2.1.048	B
Expansion Joint	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F.EP-18	3.2.1.063	A
Flow Element	PB	Stainless Steel	Borated Water Leakage (Ext)	None	None	V.F.EP-19	3.2.1.063	A
Flow Element	PB	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	V.A.EP-41	3.2.1.022	E, 1
Flow Orifice	LBS	Stainless Steel	Borated Water Leakage (Ext)	None	None	V.F.EP-19	3.2.1.063	A
Flow Orifice	LBS	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	V.A.EP-41	3.2.1.022	E, 1

Table 3.2.2-1 Engineered Safety Features – Summary of Aging Management Evaluation - Containment Spray System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Piping	PB	Carbon Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	V.A.E-29	3.2.1.044	B
Piping	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	V.A.E-26	3.2.1.040	A
Piping	LBS, PB, SIA	Stainless Steel	Borated Water Leakage (Ext)	None	None	V.F.EP-19	3.2.1.063	A
Piping	DF, PB	Stainless Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	V.A.EP-81	3.2.1.048	B
Piping	DF, PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F.EP-18	3.2.1.063	A
Piping	LBS, PB, SIA	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	V.A.EP-41	3.2.1.022	E, 1
Pump	PB	Stainless Steel	Borated Water Leakage (Ext)	None	None	V.F.EP-19	3.2.1.063	A
Pump	PB	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	V.A.EP-41	3.2.1.022	E, 1

Table 3.2.2-1 Engineered Safety Features – Summary of Aging Management Evaluation - Containment Spray System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Spray Nozzle	SP	Stainless Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	V.A.EP-81	3.2.1.048	B
Spray Nozzle	SP	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F.EP-18	3.2.1.063	A
Tank	PB	Stainless Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	V.A.EP-81	3.2.1.048	B
Tank	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F.EP-18	3.2.1.063	C
TSP Basket	SS	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F.EP-18	3.2.1.063	C
Valve	LBS, PB, SIA	Stainless Steel	Borated Water Leakage (Ext)	None	None	V.F.EP-19	3.2.1.063	A
Valve	PB	Stainless Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	V.A.EP-81	3.2.1.048	B
Valve	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F.EP-18	3.2.1.063	A
Valve	LBS, PB, SIA	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	V.A.EP-41	3.2.1.022	E, 1

Notes for Table 3.2.2-1:

Standard Notes:

A	Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.
B	Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.
C	Component is different, but consistent with NUREG 1801 item for material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.
E	Consistent with NUREG-1801 for material, environment, and aging effect, but a different aging management program is credited or NUREG-1801 identifies a plant-specific aging management program.

Plant Specific Note:

1	The One-Time Inspection program (B2.1.18) is used to verify the effectiveness of the Water Chemistry program (B2.1.2) to manage these aging effects.

Table 3.2.2-2 Engineered Safety Features – Summary of Aging Management Evaluation –Containment Integrated Leak Rate Testing System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Closure Bolting	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	V.E.EP-69	3.2.1.015	A
Closure Bolting	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.8)	V.E.EP-70	3.2.1.013	A
Piping	LBS	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	V.C.EP-99	3.2.1.029	A
Piping	PB	Carbon Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	V.A.E-29	3.2.1.044	B
Piping	LBS, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	V.C.E-35	3.2.1.040	A
Valve	PB	Carbon Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	V.A.E-29	3.2.1.044	B
Valve	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	V.C.E-35	3.2.1.040	A

Notes for Table 3.2.2-2:

Standard Notes:

A	Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.
B	Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.

Plant Specific Notes:

None

Table 3.2.2-3 Engineered Safety Features – Summary of Aging Management Evaluation –Containment Hydrogen Control System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Closure Bolting	LBS, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	V.E.EP-69	3.2.1.015	A
Closure Bolting	LBS, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.8)	V.E.EP-70	3.2.1.013	A
Closure Bolting	PB	Stainless Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	V.E.EP-69	3.2.1.015	A
Closure Bolting	PB	Stainless Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.8)	V.E.EP-70	3.2.1.013	A
Flow Orifice	PB, TH	Stainless Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	V.A.EP-81	3.2.1.048	B
Flow Orifice	PB, TH	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F.EP-18	3.2.1.063	A
Heat Exchanger (Sample Cooler)	PB	Stainless Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	V.A.EP-81	3.2.1.048	D
Heat Exchanger (Sample Cooler)	PB	Stainless Steel	Dry Gas (Int)	None	None	V.F.EP-22	3.2.1.063	C

Table 3.2.2-3 Engineered Safety Features – Summary of Aging Management Evaluation –Containment Hydrogen Control System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Heat Exchanger (Sample Cooler)	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F.EP-18	3.2.1.063	C
Piping	LBS, PB, SIA	Carbon Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	V.A.E-29	3.2.1.044	B
Piping	LBS, PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	V.E.E-44	3.2.1.040	A
Piping	PB	Carbon Steel	Plant Indoor Air (Ext)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	VII.E1.A-34	3.3.1.002	A
Piping	LBS, PB, SIA	Stainless Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	V.A.EP-81	3.2.1.048	B
Piping	PB	Stainless Steel	Plant Indoor Air (Ext)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	None	None	H, 1

Table 3.2.2-3 Engineered Safety Features – Summary of Aging Management Evaluation –Containment Hydrogen Control System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Piping	LBS, PB, SIA	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F.EP-18	3.2.1.063	A
Pump	PB	Stainless Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	V.A.EP-81	3.2.1.048	B
Pump	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F.EP-18	3.2.1.063	C
Solenoid Valve	PB	Stainless Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	V.A.EP-81	3.2.1.048	B
Solenoid Valve	PB	Stainless Steel	Dry Gas (Int)	None	None	V.F.EP-22	3.2.1.063	A
Solenoid Valve	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F.EP-18	3.2.1.063	A
Tank	PB	Stainless Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	V.A.EP-81	3.2.1.048	B
Tank	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F.EP-18	3.2.1.063	C

Table 3.2.2-3 Engineered Safety Features – Summary of Aging Management Evaluation –Containment Hydrogen Control System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Tubing	LBS, PB	Stainless Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	V.A.EP-81	3.2.1.048	B
Tubing	LBS, PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F.EP-18	3.2.1.063	A
Valve	PB	Carbon Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	V.A.E-29	3.2.1.044	B
Valve	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	V.E.E-44	3.2.1.040	A
Valve	PB	Stainless Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	V.A.EP-81	3.2.1.048	B
Valve	PB	Stainless Steel	Dry Gas (Int)	None	None	V.F.EP-22	3.2.1.063	A
Valve	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F.EP-18	3.2.1.063	A

Notes for Table 3.2.2-3:

Standard Notes:

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

B Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.

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

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

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

Plant Specific Notes:

1 This TLAA is applicable to the stainless steel Containment Hydrogen Control System. Section 4.3.5 describes the evaluation of this TLAA.

Table 3.2.2-4 Engineered Safety Features – Summary of Aging Management Evaluation –Containment Purge System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Closure Bolting	LBS, PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	V.E.EP-69	3.2.1.015	A
Closure Bolting	LBS, PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.8)	V.E.EP-70	3.2.1.013	A
Closure Bolting	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.F3.A-105	3.3.1.078	A
Damper	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.F3.A-10	3.3.1.078	A
Damper	PB	Carbon Steel	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F3.A-08	3.3.1.090	B
Damper	PB	Carbon Steel (Galvanized)	Plant Indoor Air (Ext)	None	None	VII.J.AP-13	3.3.1.116	C
Damper	PB	Carbon Steel (Galvanized)	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F3.A-08	3.3.1.090	B

Table 3.2.2-4 Engineered Safety Features – Summary of Aging Management Evaluation –Containment Purge System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Ductwork	PB	Carbon Steel (Galvanized)	Plant Indoor Air (Ext)	None	None	VII.J.AP-13	3.3.1.116	C
Ductwork	PB	Carbon Steel (Galvanized)	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F3.A-08	3.3.1.090	B
Filter	FIL, PB	Stainless Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F3.AP-99	3.3.1.094	D
Filter	FIL, PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-123	3.3.1.120	C
Filter	FIL, PB	Stainless Steel	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F3.AP-99	3.3.1.094	D

Table 3.2.2-4 Engineered Safety Features – Summary of Aging Management Evaluation –Containment Purge System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Flex Connectors	PB	Elastomer	Plant Indoor Air (Ext)	Hardening and loss of strength	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.F3.AP-102	3.3.1.076	A
Flex Connectors	PB	Elastomer	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.F3.AP-113	3.3.1.082	A
Flex Connectors	PB	Elastomer	Ventilation Atmosphere (Int)	Hardening and loss of strength	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.F3.AP-102	3.3.1.076	A
Flex Connectors	PB	Elastomer	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F3.AP-103	3.3.1.096	B
Flow Orifice	SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	V.E.E-44	3.2.1.040	A

Table 3.2.2-4 Engineered Safety Features – Summary of Aging Management Evaluation –Containment Purge System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Flow Orifice	SIA	Carbon Steel	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F3.A-08	3.3.1.090	B
Heat Exchanger (Containment Purge)	LBS	Copper Alloy	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.F3.AP-203	3.3.1.046	A
Heat Exchanger (Containment Purge)	LBS	Copper Alloy	Closed Cycle Cooling Water (Int)	Reduction of heat transfer	Closed Treated Water Systems (B2.1.11)	VII.F3.AP-205	3.3.1.050	A
Heat Exchanger (Containment Purge)	LBS	Copper Alloy	Ventilation Atmosphere (Ext)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F3.AP-109	3.3.1.079	E, 1
Piping	LBS	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.F3.AP-202	3.3.1.045	A

Table 3.2.2-4 Engineered Safety Features – Summary of Aging Management Evaluation –Containment Purge System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Piping	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	V.C.E-35	3.2.1.040	A
Piping	LBS, PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	V.E.E-44	3.2.1.040	A
Piping	SIA	Carbon Steel	Plant Indoor Air (Ext)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	VII.E1.A-34	3.3.1.002	A
Piping	LBS, PB, SIA	Carbon Steel	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F3.A-08	3.3.1.090	D
Piping	LBS	Carbon Steel	Waste Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.E5.AP-281	3.3.1.091	B

Table 3.2.2-4 Engineered Safety Features – Summary of Aging Management Evaluation –Containment Purge System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Pump	PB	Aluminum	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F3.AP-142	3.3.1.092	B
Pump	PB	Aluminum	Plant Indoor Air (Ext)	None	None	VII.J.AP-135	3.3.1.113	A
Pump	PB	Aluminum	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F3.AP-142	3.3.1.092	B
Screen	SIA	Stainless Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F3.AP-99	3.3.1.094	B
Screen	SIA	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Solenoid Valve	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A

Table 3.2.2-4 Engineered Safety Features – Summary of Aging Management Evaluation –Containment Purge System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Solenoid Valve	PB	Stainless Steel	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F3.AP-99	3.3.1.094	D
Valve	LBS	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.F3.AP-202	3.3.1.045	A
Valve	LBS, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	V.E.E-44	3.2.1.040	A
Valve	LBS, SIA	Carbon Steel	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F3.A-08	3.3.1.090	D
Valve	LBS	Cast Iron (Gray Cast Iron)	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	V.C.EP-99	3.2.1.029	A
Valve	LBS	Cast Iron (Gray Cast Iron)	Closed Cycle Cooling Water (Int)	Loss of material	Selective Leaching (B2.1.19)	V.D1.EP-52	3.2.1.036	B

Table 3.2.2-4 Engineered Safety Features – Summary of Aging Management Evaluation –Containment Purge System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Valve	LBS	Cast Iron (Gray Cast Iron)	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	V.E.E-44	3.2.1.040	A
Valve	PB	Stainless Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F3.AP-99	3.3.1.094	D
Valve	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F.EP-18	3.2.1.063	A
Valve	PB	Stainless Steel	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F3.AP-99	3.3.1.094	D

Notes for Table 3.2.2-4:

Standard Notes:

A	Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.
B	Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.
C	Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.
D	Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.
E	Consistent with NUREG-1801 for material, environment, and aging effect, but a different aging management program is credited or NUREG-1801 identifies a plant-specific aging management program.

Plant Specific Notes:

1	The subject component type is enclosed within another component. Loss of material on the external surface of the subject component is managed by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program (B2.1.23).

Table 3.2.2-5 Engineered Safety Features – Summary of Aging Management Evaluation – High Pressure Coolant Injection System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Class 1 Piping < NPS 4	PB	Stainless Steel	Borated Water Leakage (Ext)	None	None	V.F.EP-19	3.2.1.063	A
Class 1 Piping < NPS 4	PB	Stainless Steel	Reactor Coolant (Int)	Loss of material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1.088	A
Class 1 Piping < NPS 4	PB	Stainless Steel	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) for Class 1 components and Water Chemistry (B2.1.2) and One-Time Inspection of ASME Code Class 1 Small-Bore Piping (B2.1.20)	IV.C2.RP-235	3.1.1.039	A
Closure Bolting	LBS, PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	V.E.EP-69	3.2.1.015	A
Closure Bolting	LBS, PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.8)	V.E.EP-70	3.2.1.013	A
Closure Bolting	LBS, PB, SIA	Stainless Steel	Borated Water Leakage (Ext)	Cracking	Bolting Integrity (B2.1.8)	IV.C2.R-11	3.1.1.062	A
Closure Bolting	LBS, PB, SIA	Stainless Steel	Borated Water Leakage (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	IV.C2.R-12	3.1.1.066	A
Filter	FIL, PB	Stainless Steel	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.24) and One-Time Inspection (B2.1.18)	V.D1.EP-80	3.2.1.050	A

Table 3.2.2-5 Engineered Safety Features – Summary of Aging Management Evaluation – High Pressure Coolant Injection System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Filter	FIL, PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F.EP-18	3.2.1.063	A
Flow Element	LBS, PB, SIA	Stainless Steel	Borated Water Leakage (Ext)	None	None	V.F.EP-19	3.2.1.063	A
Flow Element	LBS	Stainless Steel	Demineralized Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.B1.SP-87	3.4.1.016	A
Flow Element	LBS	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F.EP-18	3.2.1.063	A
Flow Element	PB	Stainless Steel	Reactor Coolant (Int)	Loss of material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1.088	A
Flow Element	PB	Stainless Steel	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) for Class 1 components and Water Chemistry (B2.1.2)	IV.C2.RP-344	3.1.1.033	A
Flow Element	LBS, PB, SIA	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	V.D1.EP-41	3.2.1.022	E, 1
Flow Orifice	PB, TH	Stainless Steel	Borated Water Leakage (Ext)	None	None	V.F.EP-19	3.2.1.063	A
Flow Orifice	PB, TH	Stainless Steel	Reactor Coolant (Int)	Loss of material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1.088	A

Table 3.2.2-5 Engineered Safety Features – Summary of Aging Management Evaluation – High Pressure Coolant Injection System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Flow Orifice	PB, TH	Stainless Steel	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) for Class 1 components and Water Chemistry (B2.1.2)	IV.C2.RP-344	3.1.1.033	A
Flow Orifice	PB, TH	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	V.D1.E-24	3.2.1.005	E, 3
Flow Orifice	PB, TH	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	V.D1.EP-41	3.2.1.022	E, 1
Heat Exchanger (Refueling Water Storage Tank)	LBS	Stainless Steel	Atmosphere/ Weather (Ext)	Cracking	External Surfaces Monitoring of Mechanical Components (B2.1.21)	V.D1.EP-103	3.2.1.007	C
Heat Exchanger (Refueling Water Storage Tank)	LBS	Stainless Steel	Atmosphere/ Weather (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	V.D1.EP-107	3.2.1.004	C
Heat Exchanger (Refueling Water Storage Tank)	LBS	Stainless Steel	Steam (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.B1.SP-98	3.4.1.011	C

Table 3.2.2-5 Engineered Safety Features – Summary of Aging Management Evaluation – High Pressure Coolant Injection System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Heat Exchanger (Refueling Water Storage Tank)	LBS	Stainless Steel	Steam (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.B1.SP-155	3.4.1.016	C
Heat Exchanger (SI Pump Lube Oil)	HT, PB	Copper Alloy	Closed Cycle Cooling Water (Int)	Reduction of heat transfer	Closed Treated Water Systems (B2.1.11)	V.A.EP-100	3.2.1.033	A
Heat Exchanger (SI Pump Lube Oil)	HT, PB	Copper Alloy	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	V.D1.EP-94	3.2.1.032	A
Heat Exchanger (SI Pump Lube Oil)	HT, PB	Copper Alloy	Lubricating Oil (Ext)	Loss of material	Lubricating Oil Analysis (B2.1.24) and One-Time Inspection (B2.1.18)	V.D1.EP-76	3.2.1.050	C
Heat Exchanger (SI Pump Lube Oil)	HT, PB	Copper Alloy	Lubricating Oil (Ext)	Reduction of heat transfer	Lubricating Oil Analysis (B2.1.24) and One-Time Inspection (B2.1.18)	V.D1.EP-78	3.2.1.051	A
Heat Exchanger (SI Pump Lube Oil)	PB	Stainless Steel	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.24) and One-Time Inspection (B2.1.18)	V.D1.EP-80	3.2.1.050	C

Table 3.2.2-5 Engineered Safety Features – Summary of Aging Management Evaluation – High Pressure Coolant Injection System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Heat Exchanger (SI Pump Lube Oil)	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F.EP-18	3.2.1.063	C
Piping	LBS	Carbon Steel	Atmosphere/ Weather (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	V.E.E-45	3.2.1.041	A
Piping	LBS, SIA	Carbon Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VIII.B1.SP-60	3.4.1.037	B
Piping	PB, SIA	Carbon Steel	Dry Gas (Int)	None	None	V.F.EP-7	3.2.1.064	A
Piping	PB	Carbon Steel	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.24) and One-Time Inspection (B2.1.18)	V.D1.EP-77	3.2.1.049	A
Piping	LBS, PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	V.E.E-44	3.2.1.040	A
Piping	LBS	Carbon Steel	Steam (Int)	Wall thinning	Flow-Accelerated Corrosion (B2.1.7)	VIII.B1.S-15	3.4.1.005	A
Piping	LBS	Carbon Steel	Steam (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.B1.SP-71	3.4.1.014	A

Table 3.2.2-5 Engineered Safety Features – Summary of Aging Management Evaluation – High Pressure Coolant Injection System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Piping	LBS, SIA	Stainless Steel	Atmosphere/ Weather (Ext)	Cracking	External Surfaces Monitoring of Mechanical Components (B2.1.21)	V.D1.EP-103	3.2.1.007	A
Piping	LBS, SIA	Stainless Steel	Atmosphere/ Weather (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	V.D1.EP-107	3.2.1.004	A
Piping	LBS, PB, SIA	Stainless Steel	Borated Water Leakage (Ext)	None	None	V.F.EP-19	3.2.1.063	A
Piping	PB	Stainless Steel	Buried (Ext)	Loss of material	Buried and Underground Piping and Tanks (B2.1.25)	V.D1.EP-72	3.2.1.053	B
Piping	PB	Stainless Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	V.D1.EP-95	3.2.1.031	A
Piping	LBS, SIA	Stainless Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	V.D1.EP-81	3.2.1.048	B
Piping	LBS	Stainless Steel	Demineralized Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.B1.SP-87	3.4.1.016	A
Piping	PB	Stainless Steel	Dry Gas (Int)	None	None	V.F.EP-22	3.2.1.063	A
Piping	LBS, PB, SIA	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F.EP-18	3.2.1.063	A

Table 3.2.2-5 Engineered Safety Features – Summary of Aging Management Evaluation – High Pressure Coolant Injection System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Piping	PB	Stainless Steel	Reactor Coolant (Int)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	IV.C2.R-223	3.1.1.009	A
Piping	PB	Stainless Steel	Reactor Coolant (Int)	Loss of material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1.088	A
Piping	PB	Stainless Steel	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) for Class 1 components and Water Chemistry (B2.1.2)	IV.C2.RP-344	3.1.1.033	A
Piping	LBS	Stainless Steel	Steam (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.B1.SP-98	3.4.1.011	A
Piping	LBS	Stainless Steel	Steam (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.B1.SP-155	3.4.1.016	A
Piping	PB	Stainless Steel	Treated Borated Water (Int)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	V.D1.E-13	3.2.1.001	A
Piping	LBS, PB, SIA	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	V.D1.EP-41	3.2.1.022	E, 1
Pump	PB	Stainless Steel	Borated Water Leakage (Ext)	None	None	V.F.EP-19	3.2.1.063	A

Table 3.2.2-5 Engineered Safety Features – Summary of Aging Management Evaluation – High Pressure Coolant Injection System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Pump	PB	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	V.D1.EP-41	3.2.1.022	E, 1
Solenoid Valve	PB	Stainless Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	V.D1.EP-81	3.2.1.048	B
Solenoid Valve	PB	Stainless Steel	Dry Gas (Int)	None	None	V.F.EP-22	3.2.1.063	A
Solenoid Valve	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F.EP-18	3.2.1.063	A
Strainer	FIL, PB	Stainless Steel	Borated Water Leakage (Ext)	None	None	V.F.EP-19	3.2.1.063	A
Strainer	FIL, PB	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	V.D1.EP-41	3.2.1.022	E, 1
Tank	PB	Carbon Steel	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.24) and One-Time Inspection (B2.1.18)	V.D1.EP-77	3.2.1.049	C
Tank	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	V.E.E-44	3.2.1.040	A

Table 3.2.2-5 Engineered Safety Features – Summary of Aging Management Evaluation – High Pressure Coolant Injection System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Tank	PB	Carbon Steel with Stainless Steel Cladding	Borated Water Leakage (Ext)	Loss of material	Boric Acid Corrosion (B2.1.4)	V.A.E-28	3.2.1.009	A
Tank	PB	Carbon Steel with Stainless Steel Cladding	Dry Gas (Int)	None	None	V.F.EP-22	3.2.1.063	C
Tank	PB	Carbon Steel with Stainless Steel Cladding	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	V.E.E-44	3.2.1.040	A
Tank	PB	Carbon Steel with Stainless Steel Cladding	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	V.D1.EP-41	3.2.1.022	E, 1
Tank	PB	Stainless Steel	Atmosphere/ Weather (Ext)	Cracking	Aboveground Metallic Tanks (B2.1.15)	V.D1.EP-103	3.2.1.007	E, 2
Tank	PB	Stainless Steel	Atmosphere/ Weather (Ext)	Loss of material	Aboveground Metallic Tanks (B2.1.15)	V.D1.EP-107	3.2.1.004	E, 2
Tank	PB	Stainless Steel	Concrete (Ext)	Loss of material	Aboveground Metallic Tanks (B2.1.15)	VIII.E.SP-137	3.4.1.031	B

Table 3.2.2-5 Engineered Safety Features – Summary of Aging Management Evaluation – High Pressure Coolant Injection System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Tank	PB	Stainless Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	V.D1.EP-81	3.2.1.048	B
Tank	PB	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	V.A.E-12	3.2.1.020	E, 1
Tank	PB	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	V.D1.EP-41	3.2.1.022	E, 1
Tubing	LBS, PB	Stainless Steel	Borated Water Leakage (Ext)	None	None	V.F.EP-19	3.2.1.063	A
Tubing	LBS, PB	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	V.D1.EP-41	3.2.1.022	E, 1
Valve	LBS	Carbon Steel	Atmosphere/ Weather (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	V.E.E-45	3.2.1.041	A
Valve	PB, SIA	Carbon Steel	Dry Gas (Int)	None	None	V.F.EP-7	3.2.1.064	A
Valve	PB	Carbon Steel	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.24) and One-Time Inspection (B2.1.18)	V.D1.EP-77	3.2.1.049	A
Valve	PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	V.E.E-44	3.2.1.040	A

Table 3.2.2-5 Engineered Safety Features – Summary of Aging Management Evaluation – High Pressure Coolant Injection System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Valve	LBS	Carbon Steel	Steam (Int)	Wall thinning	Flow-Accelerated Corrosion (B2.1.7)	VIII.B1.S-15	3.4.1.005	A
Valve	LBS	Carbon Steel	Steam (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.B1.SP-71	3.4.1.014	A
Valve	LBS	Stainless Steel	Atmosphere/ Weather (Ext)	Cracking	External Surfaces Monitoring of Mechanical Components (B2.1.21)	V.D1.EP-103	3.2.1.007	A
Valve	LBS	Stainless Steel	Atmosphere/ Weather (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	V.D1.EP-107	3.2.1.004	A
Valve	LBS, PB, SIA	Stainless Steel	Borated Water Leakage (Ext)	None	None	V.F.EP-19	3.2.1.063	A
Valve	PB	Stainless Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	V.D1.EP-95	3.2.1.031	A
Valve	LBS	Stainless Steel	Demineralized Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.B1.SP-87	3.4.1.016	A
Valve	PB	Stainless Steel	Dry Gas (Int)	None	None	V.F.EP-22	3.2.1.063	A
Valve	LBS, PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F.EP-18	3.2.1.063	A

Table 3.2.2-5 Engineered Safety Features – Summary of Aging Management Evaluation – High Pressure Coolant Injection System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Valve	PB	Stainless Steel	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) for Class 1 components and Water Chemistry (B2.1.2)	IV.C2.R-09	3.1.1.033	A
Valve	PB	Stainless Steel	Reactor Coolant (Int)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	IV.C2.R-223	3.1.1.009	A
Valve	PB	Stainless Steel	Reactor Coolant (Int)	Loss of material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1.088	A
Valve	LBS	Stainless Steel	Steam (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.B1.SP-98	3.4.1.011	A
Valve	LBS	Stainless Steel	Steam (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.B1.SP-155	3.4.1.016	A
Valve	LBS, PB, SIA	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	V.D1.EP-41	3.2.1.022	E, 1

Notes for Table 3.2.2-5:

Standard Notes:

A	Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.
B	Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.
C	Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.
E	Consistent with NUREG-1801 for material, environment, and aging effect, but a different aging management program is credited or NUREG-1801 identifies a plant-specific aging management program.

Plant Specific Notes:

1	The One-Time Inspection program (B2.1.18) is used to verify the effectiveness of the Water Chemistry program (B2.1.2) to manage these aging effects.
2	The bottom of this tank rests on a concrete foundation. Therefore, the Aboveground Metallic Tanks program (B2.1.15) is credited.
3	The plant-specific aging management programs used to manage loss of material due to erosion in the miniflow orifices are Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18).

Table 3.2.2-6 Engineered Safety Features – Summary of Aging Management Evaluation – Residual Heat Removal System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Closure Bolting	LBS, PB	Carbon Steel	Borated Water Leakage (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	IV.C2.R-12	3.1.1.066	A
Closure Bolting	LBS, PB	Carbon Steel	Borated Water Leakage (Ext)	Loss of material	Boric Acid Corrosion (B2.1.4)	V.E.E-41	3.2.1.009	A
Closure Bolting	LBS, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	V.E.EP-69	3.2.1.015	A
Closure Bolting	LBS, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.8)	V.E.EP-70	3.2.1.013	A
Closure Bolting	LBS, PB	Stainless Steel	Borated Water Leakage (Ext)	Cracking	Bolting Integrity (B2.1.8)	IV.C2.R-11	3.1.1.062	A
Closure Bolting	LBS, PB	Stainless Steel	Borated Water Leakage (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	IV.C2.R-12	3.1.1.066	A
Closure Bolting	LBS, PB	Stainless Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	V.E.EP-69	3.2.1.015	A
Closure Bolting	LBS, PB	Stainless Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.8)	V.E.EP-70	3.2.1.013	A
Expansion Joint	PB	Carbon Steel	Borated Water Leakage (Ext)	Loss of material	Boric Acid Corrosion (B2.1.4)	V.D1.E-28	3.2.1.009	A
Expansion Joint	PB	Carbon Steel	Borated Water Leakage (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	V.A.EP-43	3.2.1.047	B
Expansion Joint	ES, PB	Stainless Steel	Borated Water Leakage (Ext)	None	None	V.F.EP-19	3.2.1.063	A
Expansion Joint	ES, PB	Stainless Steel	Borated Water Leakage (Int)	None	None	V.F.EP-19	3.2.1.063	A

Table 3.2.2-6 Engineered Safety Features – Summary of Aging Management Evaluation – Residual Heat Removal System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Flexible Hoses	LBS	Stainless Steel	Borated Water Leakage (Ext)	None	None	V.F.EP-19	3.2.1.063	A
Flexible Hoses	LBS	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	V.D1.E-12	3.2.1.020	E, 1
Flexible Hoses	LBS	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	V.D1.EP-41	3.2.1.022	E, 1
Flow Element	PB	Stainless Steel	Borated Water Leakage (Ext)	None	None	V.F.EP-19	3.2.1.063	A
Flow Element	PB	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	V.D1.E-12	3.2.1.020	E, 1
Flow Element	PB	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	V.D1.EP-41	3.2.1.022	E, 1
Flow Orifice	PB, TH	Stainless Steel	Borated Water Leakage (Ext)	None	None	V.F.EP-19	3.2.1.063	A
Flow Orifice	PB, TH	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	V.D1.E-12	3.2.1.020	E, 1

Table 3.2.2-6 Engineered Safety Features – Summary of Aging Management Evaluation – Residual Heat Removal System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Flow Orifice	PB, TH	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	V.D1.EP-41	3.2.1.022	E, 1
Heat Exchanger (Residual Heat Removal)	PB	Carbon Steel	Closed Cycle Cooling Water (Int)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	None	None	H, 3
Heat Exchanger (Residual Heat Removal)	PB	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	V.D1.EP-92	3.2.1.030	A
Heat Exchanger (Residual Heat Removal)	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	V.E.E-44	3.2.1.040	A
Heat Exchanger (Residual Heat Removal)	PB	Stainless Steel	Borated Water Leakage (Ext)	None	None	V.F.EP-19	3.2.1.063	C
Heat Exchanger (Residual Heat Removal)	HT, PB	Stainless Steel	Closed Cycle Cooling Water (Ext)	Loss of material	Closed Treated Water Systems (B2.1.11)	V.D1.EP-93	3.2.1.031	A

Table 3.2.2-6 Engineered Safety Features – Summary of Aging Management Evaluation – Residual Heat Removal System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Heat Exchanger (Residual Heat Removal)	HT, PB	Stainless Steel	Closed Cycle Cooling Water (Ext)	Reduction of heat transfer	Closed Treated Water Systems (B2.1.11)	V.D1.EP-96	3.2.1.033	A
Heat Exchanger (Residual Heat Removal)	HT, PB	Stainless Steel	Closed Cycle Cooling Water (Ext)	Cracking	Closed Treated Water Systems (B2.1.11)	V.D1.EP-98	3.2.1.028	C
Heat Exchanger (Residual Heat Removal)	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F.EP-18	3.2.1.063	C
Heat Exchanger (Residual Heat Removal)	PB	Stainless Steel	Treated Borated Water (Int)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	None	None	H, 3
Heat Exchanger (Residual Heat Removal)	HT, PB	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	V.D1.E-12	3.2.1.020	E, 1
Heat Exchanger (Residual Heat Removal)	HT, PB	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	V.D1.EP-41	3.2.1.022	E, 1

Table 3.2.2-6 Engineered Safety Features – Summary of Aging Management Evaluation – Residual Heat Removal System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Heat Exchanger (RHR Pump Seal Water Cooler)	PB	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	V.D1.EP-92	3.2.1.030	A
Heat Exchanger (RHR Pump Seal Water Cooler)	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	V.E.E-44	3.2.1.040	A
Heat Exchanger (RHR Pump Seal Water Cooler)	HT, PB	Stainless Steel	Closed Cycle Cooling Water (Ext)	Loss of material	Closed Treated Water Systems (B2.1.11)	V.D1.EP-93	3.2.1.031	A
Heat Exchanger (RHR Pump Seal Water Cooler)	HT, PB	Stainless Steel	Closed Cycle Cooling Water (Ext)	Reduction of heat transfer	Closed Treated Water Systems (B2.1.11)	V.D1.EP-96	3.2.1.033	A
Heat Exchanger (RHR Pump Seal Water Cooler)	HT, PB	Stainless Steel	Closed Cycle Cooling Water (Ext)	Cracking	Closed Treated Water Systems (B2.1.11)	V.D1.EP-98	3.2.1.028	C

Table 3.2.2-6 Engineered Safety Features – Summary of Aging Management Evaluation – Residual Heat Removal System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Heat Exchanger (RHR Pump Seal Water Cooler)	HT, PB	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	V.D1.E-12	3.2.1.020	E, 1
Heat Exchanger (RHR Pump Seal Water Cooler)	HT, PB	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	V.D1.EP-41	3.2.1.022	E, 1
Insulation	INS	Aluminum	Plant Indoor Air (Ext)	None	None	V.F.EP-3	3.2.1.056	C
Insulation	INS	Insulation Calcium Silicate	Plant Indoor Air (Ext)	None	None	None	None	J, 2
Insulation	INS	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F.EP-18	3.2.1.063	C
Piping	PB	Carbon Steel	Borated Water Leakage (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	V.A.EP-43	3.2.1.047	B
Piping	LBS, PB, SIA	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	V.D1.EP-92	3.2.1.030	C

Table 3.2.2-6 Engineered Safety Features – Summary of Aging Management Evaluation – Residual Heat Removal System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Piping	LBS, PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	V.E.E-44	3.2.1.040	A
Piping	DF, LBS, PB, SIA	Stainless Steel	Borated Water Leakage (Ext)	None	None	V.F.EP-19	3.2.1.063	A
Piping	DF	Stainless Steel	Borated Water Leakage (Int)	None	None	V.F.EP-19	3.2.1.063	A
Piping	PB	Stainless Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	V.D1.EP-95	3.2.1.031	A
Piping	PB	Stainless Steel	Closed Cycle Cooling Water (Int)	Cracking	Closed Treated Water Systems (B2.1.11)	V.D1.EP-98	3.2.1.028	A
Piping	PB	Stainless Steel	Reactor Coolant (Int)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	IV.C2.R-223	3.1.1.009	A
Piping	PB	Stainless Steel	Reactor Coolant (Int)	Loss of material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1.088	A

Table 3.2.2-6 Engineered Safety Features – Summary of Aging Management Evaluation – Residual Heat Removal System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Piping	PB	Stainless Steel	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) for Class 1 components and Water Chemistry (B2.1.2)	IV.C2.RP-344	3.1.1.033	A
Piping	LBS, PB, SIA	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	V.D1.E-12	3.2.1.020	E, 1
Piping	PB	Stainless Steel	Treated Borated Water (Int)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	V.D1.E-13	3.2.1.001	A
Piping	LBS, PB, SIA	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	V.D1.EP-41	3.2.1.022	E, 1
Pump	PB	Stainless Steel	Borated Water Leakage (Ext)	None	None	V.F.EP-19	3.2.1.063	A
Pump	PB	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	V.D1.E-12	3.2.1.020	E, 1

Table 3.2.2-6 Engineered Safety Features – Summary of Aging Management Evaluation – Residual Heat Removal System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Pump	PB	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	V.D1.EP-41	3.2.1.022	E, 1
Solenoid Valve	PB	Stainless Steel	Borated Water Leakage (Ext)	None	None	V.F.EP-19	3.2.1.063	A
Solenoid Valve	PB	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	V.D1.E-12	3.2.1.020	E, 1
Solenoid Valve	PB	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	V.D1.EP-41	3.2.1.022	E, 1
Strainer	PB	Stainless Steel	Borated Water Leakage (Ext)	None	None	V.F.EP-19	3.2.1.063	A
Strainer	PB	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	V.D1.E-12	3.2.1.020	E, 1
Strainer	PB	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	V.D1.EP-41	3.2.1.022	E, 1
Tank	PB	Stainless Steel	Borated Water Leakage (Ext)	None	None	V.F.EP-19	3.2.1.063	C

Table 3.2.2-6 Engineered Safety Features – Summary of Aging Management Evaluation – Residual Heat Removal System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Tank	PB	Stainless Steel	Borated Water Leakage (Int)	None	None	V.F.EP-19	3.2.1.063	C
Tubing	LBS, SIA	Carbon Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	V.A.E-29	3.2.1.044	B
Tubing	LBS, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	V.E.E-44	3.2.1.040	A
Tubing	LBS, SIA	Copper Alloy	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.G.AP-143	3.3.1.089	B
Tubing	LBS, SIA	Copper Alloy	Plant Indoor Air (Ext)	None	None	V.F.EP-10	3.2.1.057	A
Tubing	PB	Stainless Steel	Borated Water Leakage (Ext)	None	None	V.F.EP-19	3.2.1.063	A
Tubing	LBS, PB	Stainless Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	V.D1.EP-95	3.2.1.031	A

Table 3.2.2-6 Engineered Safety Features – Summary of Aging Management Evaluation – Residual Heat Removal System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Tubing	LBS, PB	Stainless Steel	Closed Cycle Cooling Water (Int)	Cracking	Closed Treated Water Systems (B2.1.11)	V.D1.EP-98	3.2.1.028	A
Tubing	LBS, SIA	Stainless Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	V.D1.EP-81	3.2.1.048	B
Tubing	LBS, PB, SIA	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F.EP-18	3.2.1.063	A
Tubing	PB	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	V.D1.E-12	3.2.1.020	E, 1
Tubing	PB	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	V.D1.EP-41	3.2.1.022	E, 1
Valve	PB	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	V.D1.EP-92	3.2.1.030	C
Valve	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	V.E.E-44	3.2.1.040	A

Table 3.2.2-6 Engineered Safety Features – Summary of Aging Management Evaluation – Residual Heat Removal System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Valve	LBS, PB, SIA	Stainless Steel	Borated Water Leakage (Ext)	None	None	V.F.EP-19	3.2.1.063	A
Valve	PB	Stainless Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	V.D1.EP-95	3.2.1.031	A
Valve	PB	Stainless Steel	Closed Cycle Cooling Water (Int)	Cracking	Closed Treated Water Systems (B2.1.11)	V.D1.EP-98	3.2.1.028	A
Valve	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F.EP-18	3.2.1.063	A
Valve	PB	Stainless Steel	Reactor Coolant (Int)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	IV.C2.R-223	3.1.1.009	A
Valve	PB	Stainless Steel	Reactor Coolant (Int)	Loss of material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1.088	A
Valve	PB	Stainless Steel	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) for Class 1 components and Water Chemistry (B2.1.2)	IV.C2.RP-344	3.1.1.033	A

Table 3.2.2-6 Engineered Safety Features – Summary of Aging Management Evaluation – Residual Heat Removal System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Valve	LBS, PB, SIA	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	V.D1.E-12	3.2.1.020	E, 1
Valve	LBS, PB, SIA	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	V.D1.EP-41	3.2.1.022	E, 1

Notes for Table 3.2.2-6:

Standard Notes:

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

B Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.

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

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

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

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

Plant Specific Notes:

1 The One-Time Inspection program (B2.1.18) is used to verify the effectiveness of the Water Chemistry program (B2.1.2) to manage these aging effects.

2 Based on plant operating experience, there are no aging effects requiring management for calcium silicate insulation in a metal jacket in a plant indoor air environment. The insulation does not experience aging effects unless exposed to temperatures, radiation, or chemicals capable of attacking the specific chemical composition of the insulation. The insulation is contained in metal jacket with a vapor barrier to prevent moisture intrusion and is in a non-aggressive air environment that does not experience significant aging effects.

3 These TLAAs are applicable to the Class 2 Heat Exchangers. Section 4.3.8 describes the evaluation of these TLAAs.

3.3 AGING MANAGEMENT OF AUXILIARY SYSTEMS

3.3.1 Introduction

Section 3.3 provides the results of the aging management reviews (AMRs) for those component types identified in Section 2.3.3, *Auxiliary Systems*, subject to AMR. These systems are described in the following sections:

- Fuel Storage and Handling System (Section 2.3.3.1)
- Fuel Pool Cooling and Cleanup System (Section 2.3.3.2)
- Cranes, Hoists, and Elevators (Section 2.3.3.3)
- Essential Service Water System (Section 2.3.3.4)
- Service Water System (Section 2.3.3.5)
- Reactor Makeup Water System (Section 2.3.3.6)
- Component Cooling Water System (Section 2.3.3.7)
- Compressed Air System (Section 2.3.3.8)
- Nuclear Sampling System (Section 2.3.3.9)
- Chemical and Volume Control System (Section 2.3.3.10)
- Control Building HVAC System (Section 2.3.3.11)
- Essential Service Water Pumphouse HVAC System (Section 2.3.3.12)
- Auxiliary Building HVAC System (Section 2.3.3.13)
- Fuel Building HVAC System (Section 2.3.3.14)
- Miscellaneous Buildings HVAC System (Section 2.3.3.15)
- Diesel Generator Building HVAC System (Section 2.3.3.16)
- Radwaste Building HVAC System (Section 2.3.3.17)
- Turbine Building HVAC System (Section 2.3.3.18)
- Containment Cooling System (Section 2.3.3.19)
- Fire Protection System (Section 2.3.3.20)
- Emergency Diesel Engine Fuel Oil Storage and Transfer System (Section 2.3.3.21)
- Standby Diesel Generator Engine System (Section 2.3.3.22)
- EOF and TSC Diesels, Security Building System (Section 2.3.3.23)

- Liquid Radwaste System (Section 2.3.3.24)
- Decontamination System (Section 2.3.3.25)
- Oily Waste System (Section 2.3.3.26)
- Floor and Equipment Drainage System (Section 2.3.3.27)
- Miscellaneous Systems in scope ONLY for Criterion 10 CFR 54.4(a)(2) (Section 2.3.3.28) includes:
  Boron Recycle
  Central Chilled Water
  Chemical and Detergent Waste
  Condensate
  Condensate and Feedwater Chemical Addition
  Demineralized Water Makeup
  Domestic Water
  Gaseous Radwaste
  Plant Heating
  Roof Drains
  Sanitary Drainage
  Secondary Liquid Waste
  Solid Radwaste

Table 3.3-1, *Summary of Aging Management Programs in Chapter VII of NUREG-1801 for Auxiliary Systems*, provides the summary of the programs evaluated in NUREG-1801 that are applicable to the component types in this section. Table 3.3-1 uses the format of Table 1 described in Section 3.0, *Aging Management Review*.

3.3.2 Results

The following tables summarize the results of the AMR for the systems in the Auxiliary Systems area:

- Table 3.3.2-1, *Auxiliary Systems – Summary of Aging Management Evaluation – Fuel Storage and Handling System*
- Table 3.3.2-2, *Auxiliary Systems – Summary of Aging Management Evaluation –Fuel Pool Cooling and Cleanup System*
- Table 3.3.2-3, *Auxiliary Systems – Summary of Aging Management Evaluation – Cranes, Hoists, and Elevators*
- Table 3.3.2-4, *Auxiliary Systems – Summary of Aging Management Evaluation – Essential Service Water System*
- Table 3.3.2-5, *Auxiliary Systems – Summary of Aging Management Evaluation – Service Water System*

- Table 3.3.2-6, *Auxiliary Systems – Summary of Aging Management Evaluation – Reactor Makeup Water System*
- Table 3.3.2-7, *Auxiliary Systems – Summary of Aging Management Evaluation – Component Cooling Water System*
- Table 3.3.2-8, *Auxiliary Systems – Summary of Aging Management Evaluation – Compressed Air System*
- Table 3.3.2-9, *Auxiliary Systems – Summary of Aging Management Evaluation – Nuclear Sampling System*
- Table 3.3.2-10, *Auxiliary Systems – Summary of Aging Management Evaluation – Chemical and Volume Control System*
- Table 3.3.2-11, *Auxiliary Systems – Summary of Aging Management Evaluation – Control Building HVAC System*
- Table 3.3.2-12, *Auxiliary Systems – Summary of Aging Management Evaluation – Essential Service Water Pumphouse HVAC System*
- Table 3.3.2-13, *Auxiliary Systems – Summary of Aging Management Evaluation – Auxiliary Building HVAC System*
- Table 3.3.2-14, *Auxiliary Systems – Summary of Aging Management Evaluation – Fuel Building HVAC System*
- Table 3.3.2-15, *Auxiliary Systems – Summary of Aging Management Evaluation – Miscellaneous Buildings HVAC System*
- Table 3.3.2-16, *Auxiliary Systems – Summary of Aging Management Evaluation – Diesel Generator Building HVAC System*
- Table 3.3.2-17, *Auxiliary Systems – Summary of Aging Management Evaluation – Radwaste Building HVAC System*
- Table 3.3.2-18, *Auxiliary Systems – Summary of Aging Management Evaluation – Turbine Building HVAC System*
- Table 3.3.2-19, *Auxiliary Systems – Summary of Aging Management Evaluation – Containment Cooling System*
- Table 3.3.2-20, *Auxiliary Systems – Summary of Aging Management Evaluation – Fire Protection System*
- Table 3.3.2-21, *Auxiliary Systems – Summary of Aging Management Evaluation – Emergency Diesel Engine Fuel Oil Storage and Transfer System*
- Table 3.3.2-22, *Auxiliary Systems – Summary of Aging Management Evaluation – Standby Diesel Generator Engine System*
- Table 3.3.2-23, *Auxiliary Systems – Summary of Aging Management Evaluation – EOF and TSC Diesels, Security Building System*

- Table 3.3.2-24, *Auxiliary Systems – Summary of Aging Management Evaluation – Liquid Radwaste System*
- Table 3.3.2-25, *Auxiliary Systems – Summary of Aging Management Evaluation – Decontamination System*
- Table 3.3.2-26, *Auxiliary Systems – Summary of Aging Management Evaluation – Oily Waste System*
- Table 3.3.2-27, *Auxiliary Systems – Summary of Aging Management Evaluation – Floor and Equipment Drainage System*
- Table 3.3.2-28, *Auxiliary Systems – Summary of Aging Management Evaluation – Miscellaneous Systems in scope ONLY for Criterion 10 CFR 54.4(a)(2)*

These tables use the format of Table 2 discussed in Section 3.0, *Aging Management Review*.

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

The materials from which the component types are fabricated, the environments to which they are exposed, the potential aging effects requiring management, and the aging management programs used to manage these aging effects are provided for each of the above systems in the following sections.

3.3.2.1.1 Fuel Storage and Handling System

Materials

The materials of construction for the fuel storage and handling system component types are:

- Boral
- Carbon Steel
- Stainless Steel

Environment

The fuel storage and handling system components are exposed to the following environments:

- Plant Indoor Air
- Treated Borated Water

Aging Effects Requiring Management

The following fuel storage and handling system aging effects require management:

- Cracking
- Loss of material
- Loss of preload
- Reduction of neutron-absorbing capacity; change in dimensions and loss of material

Aging Management Programs

The following aging management programs manage the aging effects for the fuel storage and handling system component types:

- External Surfaces Monitoring of Mechanical Components (B2.1.21)
- Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B2.1.12)
- Monitoring of Neutron-Absorbing Materials Other than Boraflex (B2.1.38)
- One-Time Inspection (B2.1.18)
- Structures Monitoring (B2.1.31)
- Water Chemistry (B2.1.2)

3.3.2.1.2 Fuel Pool Cooling and Cleanup System

Materials

The materials of construction for the fuel pool cooling and cleanup system component types are:

- Carbon Steel
- Stainless Steel

Environment

The fuel pool cooling and cleanup system component types are exposed to the following environments:

- Borated Water Leakage
- Closed-Cycle Cooling Water
- Condensation

- Plant Indoor Air
- Treated Borated Water

Aging Effects Requiring Management

The following fuel pool cooling and cleanup system aging effects require management:

- Cracking
- Loss of material
- Loss of preload
- Reduction of heat transfer

Aging Management Programs

The following aging management programs manage the aging effects for the fuel pool cooling and cleanup system component types:

- Bolting Integrity (B2.1.8)
- Boric Acid Corrosion (B2.1.4)
- Closed Treated Water Systems (B2.1.11)
- External Surfaces Monitoring of Mechanical Components (B2.1.21)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)
- One-Time Inspection (B2.1.18)
- Water Chemistry (B2.1.2)

3.3.2.1.3 Cranes, Hoists, and Elevators

Materials

The material of construction for the cranes, hoists, and elevators system component types is:

- Carbon Steel

Environment

The cranes, hoists, and elevators system component types are exposed to the following environments:

- Plant Indoor Air

Aging Effects Requiring Management

The following cranes, hoists, and elevators system aging effect requires management:

- Loss of material
- Loss of preload

Aging Management Programs

The following aging management program manages the aging effects for the cranes, hoists, and elevators system component types:

- Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B2.1.12)

3.3.2.1.4 Essential Service Water System

Materials

The materials of construction for the essential service water system component types are:

- Asbestos Cement
- Carbon Steel
- Cast Iron (Gray Cast Iron)
- Cellulose Silica Cement
- Copper Alloy
- HDPE
- Stainless Steel
- Stainless Steel Cast Austenitic

Environment

The essential service water system components are exposed to the following environments:

- Atmosphere/ Weather
- Buried
- Concrete
- Condensation
- Plant Indoor Air
- Raw Water

- Underground

Aging Effects Requiring Management

The following essential service water system aging effects require management:

- Cracking and changes in material properties
- Cracking, blistering, change in color
- Loss of material
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for the essential service water system component types:

- Bolting Integrity (B2.1.8)
- Buried and Underground Piping and Tanks (B2.1.25)
- External Surfaces Monitoring of Mechanical Components (B2.1.21)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)
- Open-Cycle Cooling Water System (B2.1.10)
- Selective Leaching (B2.1.19)

3.3.2.1.5 Service Water System

Materials

The materials of construction for the service water system component types are:

- Carbon Steel
- Cast Iron (Gray Cast Iron)
- Copper Alloy
- Ductile Iron
- Stainless Steel

Environment

The service water system components are exposed to the following environments:

- Buried

- Plant Indoor Air
- Raw Water

Aging Effects Requiring Management

The following service water system aging effects require management:

- Loss of material
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for the service water system component types:

- Bolting Integrity (B2.1.8)
- Buried and Underground Piping and Tanks (B2.1.25)
- External Surfaces Monitoring of Mechanical Components (B2.1.21)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)
- Selective Leaching (B2.1.19)

3.3.2.1.6 Reactor Makeup Water System

Materials

The materials of construction for the reactor makeup water system component types are:

- Carbon Steel
- Stainless Steel
- Stainless Steel Cast Austenitic

Environment

The reactor makeup water system components are exposed to the following environments:

- Condensation
- Demineralized Water
- Plant Indoor Air

Aging Effects Requiring Management

The following reactor makeup water system aging effects require management:

- Loss of material
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for the reactor makeup water system component types:

- Bolting Integrity (B2.1.8)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)
- One-Time Inspection (B2.1.18)
- Water Chemistry (B2.1.2)

3.3.2.1.7 Component Cooling Water System

Materials

The materials of construction for the component cooling water system component types are:

- Carbon Steel
- Copper Alloy
- Glass
- Stainless Steel

Environment

The component cooling water system component types are exposed to the following environments:

- Closed-Cycle Cooling Water
- Condensation
- Plant Indoor Air
- Raw Water

Aging Effects Requiring Management

The following component cooling water system aging effects require management:

- Loss of material
- Loss of preload
- Reduction of heat transfer

Aging Management Programs

The following aging management programs manage the aging effects for the component cooling water system component types:

- Bolting Integrity (B2.1.8)
- Closed Treated Water Systems (B2.1.11)
- External Surfaces Monitoring of Mechanical Components (B2.1.21)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)
- Open-Cycle Cooling Water System (B2.1.10)

3.3.2.1.8 Compressed Air System

Materials

The materials of construction for the compressed air system component types are:

- Carbon Steel
- Copper Alloy
- Stainless Steel

Environment

The compressed air system component types are exposed to the following environments:

- Condensation
- Dry Gas
- Plant Indoor Air

Aging Effects Requiring Management

The following compressed air system aging effects require management:

- Loss of material
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for the compressed air system component types:

- Bolting Integrity (B2.1.8)
- External Surfaces Monitoring of Mechanical Components (B2.1.21)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)

3.3.2.1.9 Nuclear Sampling System

Materials

The materials of construction for the nuclear sampling system component types are:

- Carbon Steel
- Stainless Steel

Environment

The nuclear sampling system component types are exposed to the following environments:

- Borated Water Leakage
- Closed-Cycle Cooling Water
- Condensation
- Demineralized Water
- Plant Indoor Air
- Secondary Water
- Treated Borated Water

Aging Effects Requiring Management

The following nuclear sampling system aging effects require management:

- Cracking
- Loss of material
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for the nuclear sampling system component types:

- Bolting Integrity (B2.1.8)
- Closed Treated Water Systems (B2.1.11)
- External Surfaces Monitoring of Mechanical Components (B2.1.21)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)
- One-Time Inspection (B2.1.18)
- Water Chemistry (B2.1.2)

3.3.2.1.10 Chemical and Volume Control System

Materials

The materials of construction for the chemical and volume control system component types are:

- Aluminum
- Carbon Steel
- Cast Iron
- Copper Alloy
- Copper Alloy (> 15% Zinc)
- Insulation Calcium Silicate
- Stainless Steel
- Stainless Steel Cast Austenitic

Environment

The chemical and volume control system component types are exposed to the following environments:

- Borated Water Leakage
- Closed-Cycle Cooling Water
- Condensation
- Demineralized Water

- Dry Gas
- Lubricating Oil
- Plant Indoor Air
- Raw Water
- Reactor Coolant
- Secondary Water
- Steam
- Treated Borated Water
- Waste Water

Aging Effects Requiring Management

The following chemical and volume control system aging effects require management:

- Cracking
- Loss of material
- Loss of preload
- Reduction of heat transfer
- Wall thinning

Aging Management Programs

The following aging management programs manage the aging effects for the chemical and volume control system component types:

- ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)
- Bolting Integrity (B2.1.8)
- Closed Treated Water Systems (B2.1.11)
- External Surfaces Monitoring of Mechanical Components (B2.1.21)
- Flow-Accelerated Corrosion (B2.1.7)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)
- Lubricating Oil Analysis (B2.1.24)
- One-Time Inspection (B2.1.18)
- One-Time Inspection of ASME Code Class 1 Small-Bore Piping (B2.1.20)

- Selective Leaching (B2.1.19)
- Water Chemistry (B2.1.2)

3.3.2.1.11 Control Building HVAC System

Materials

The materials of construction for the control building HVAC system component types are:

- Aluminum
- Carbon Steel
- Carbon Steel (Galvanized)
- Cast Iron
- Copper Alloy
- Elastomer
- Glass
- Stainless Steel

Environment

The control building HVAC system component types are exposed to the following environments:

- Closed-Cycle Cooling Water
- Concrete
- Condensation
- Dry Gas
- Plant Indoor Air
- Raw Water
- Ventilation Atmosphere

Aging Effects Requiring Management

The following control building HVAC system aging effects require management:

- Hardening and loss of strength
- Loss of material
- Loss of preload

- Reduction of heat transfer

Aging Management Programs

The following aging management programs manage the aging effects for the control building HVAC system component types:

- Bolting Integrity (B2.1.8)
- Closed Treated Water Systems (B2.1.11)
- External Surfaces Monitoring of Mechanical Components (B2.1.21)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)
- Open-Cycle Cooling Water System (B2.1.10)

3.3.2.1.12 Essential Service Water Pumphouse HVAC System

Materials

The materials of construction for the essential service water pumphouse HVAC system component types are:

- Carbon Steel
- Carbon Steel (Galvanized)
- Elastomer

Environment

The essential service water pumphouse HVAC system component types are exposed to the following environments:

- Plant Indoor Air
- Ventilation Atmosphere
- Waste Water

Aging Effects Requiring Management

The following essential service water pumphouse HVAC system aging effects require management:

- Hardening and loss of strength
- Loss of material
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for the essential service water pumphouse HVAC system component types:

- Bolting Integrity (B2.1.8)
- External Surfaces Monitoring of Mechanical Components (B2.1.21)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)

3.3.2.1.13 Auxiliary Building HVAC System

Materials

The materials of construction for the auxiliary building HVAC system component types are:

- Carbon Steel
- Carbon Steel (Galvanized)
- Cast Iron (Gray Cast Iron)
- Copper Alloy
- Elastomer
- Polyvinyl Chloride (PVC)
- Stainless Steel

Environment

The auxiliary building HVAC system component types are exposed to the following environments:

- Closed-Cycle Cooling Water
- Concrete
- Condensation
- Plant Indoor Air
- Raw Water
- Ventilation Atmosphere
- Waste Water

Aging Effects Requiring Management

The following auxiliary building HVAC system aging effects require management:

- Hardening and loss of strength
- Loss of material
- Loss of preload
- Reduction of heat transfer

Aging Management Programs

The following aging management programs manage the aging effects for the auxiliary building HVAC system component types:

- Bolting Integrity (B2.1.8)
- Closed Treated Water Systems (B2.1.11)
- External Surfaces Monitoring of Mechanical Components (B2.1.21)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)
- Open-Cycle Cooling Water System (B2.1.10)
- Selective Leaching (B2.1.19)

3.3.2.1.14 Fuel Building HVAC System

Materials

The materials of construction for the fuel building HVAC system component types are:

- Aluminum
- Carbon Steel
- Carbon Steel (Galvanized)
- Cast Iron (Gray Cast Iron)
- Copper Alloy
- Elastomer
- Glass
- Stainless Steel

Environment

The fuel building HVAC system component types are exposed to the following environments:

- Closed-Cycle Cooling Water

- Concrete
- Plant Indoor Air
- Raw Water
- Ventilation Atmosphere
- Waste Water

Aging Effects Requiring Management

The following fuel building HVAC system aging effects require management:

- Hardening and loss of strength
- Loss of material
- Loss of preload
- Reduction of heat transfer

Aging Management Programs

The following aging management programs manage the aging effects for the fuel building HVAC system component types:

- Bolting Integrity (B2.1.8)
- Closed Treated Water Systems (B2.1.11)
- External Surfaces Monitoring of Mechanical Components (B2.1.21)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)
- Open-Cycle Cooling Water System (B2.1.10)
- Selective Leaching (B2.1.19)

3.3.2.1.15 Miscellaneous Buildings HVAC System

Materials

The materials of construction for the miscellaneous buildings HVAC system component types are:

- Carbon Steel
- Carbon Steel (Galvanized)
- Copper Alloy
- Elastomer

- Stainless Steel

Environment

The miscellaneous buildings HVAC system component types are exposed to the following environments:

- Closed-Cycle Cooling Water
- Condensation
- Plant Indoor Air
- Raw Water
- Ventilation Atmosphere
- Waste Water

Aging Effects Requiring Management

The following miscellaneous buildings HVAC system aging effects require management:

- Hardening and loss of strength
- Loss of material
- Loss of preload
- Reduction of heat transfer

Aging Management Programs

The following aging management programs manage the aging effects for the miscellaneous buildings HVAC system component types:

- Bolting Integrity (B2.1.8)
- Closed Treated Water Systems (B2.1.11)
- External Surfaces Monitoring of Mechanical Components (B2.1.21)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)
- Open-Cycle Cooling Water System (B2.1.10)

3.3.2.1.16 Diesel Generator Building HVAC System

Materials

The materials of construction for the diesel generator building HVAC system component types are:

- Carbon Steel
- Carbon Steel (Galvanized)
- Elastomer
- Stainless Steel

Environment

The diesel generator building HVAC system component types are exposed to the following environments:

- Condensation
- Plant Indoor Air
- Ventilation Atmosphere

Aging Effects Requiring Management

The following diesel generator building HVAC system aging effects require management:

- Hardening and loss of strength
- Loss of material
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for the diesel generator building HVAC system component types:

- Bolting Integrity (B2.1.8)
- External Surfaces Monitoring of Mechanical Components (B2.1.21)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)

3.3.2.1.17 Radwaste Building HVAC System

Materials

The materials of construction for the radwaste building HVAC system component types are:

- Carbon Steel
- Carbon Steel (Galvanized)
- Copper Alloy

- Stainless Steel

Environment

The radwaste building HVAC system component types are exposed to the following environments:

- Plant Indoor Air
- Ventilation Atmosphere

Aging Effects Requiring Management

The following radwaste building HVAC system aging effect requires management:

- Loss of material

Aging Management Programs

The following aging management programs manage the aging effects for the radwaste building HVAC system component types:

- External Surfaces Monitoring of Mechanical Components (B2.1.21)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)

3.3.2.1.18 Turbine Building HVAC System

Materials

The materials of construction for the turbine building HVAC system component types are:

- Carbon Steel
- Carbon Steel (Galvanized)
- Copper Alloy
- Stainless Steel

Environment

The turbine building HVAC system component types are exposed to the following environments:

- Concrete
- Plant Indoor Air
- Ventilation Atmosphere

Aging Effects Requiring Management

The following turbine building HVAC system aging effects require management:

- Loss of material
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for the turbine building HVAC system component types:

- Bolting Integrity (B2.1.8)
- External Surfaces Monitoring of Mechanical Components (B2.1.21)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)

3.3.2.1.19 Containment Cooling System

Materials

The materials of construction for the containment cooling system component types are:

- Carbon Steel
- Carbon Steel (Galvanized)
- Copper Alloy
- Elastomer
- Stainless Steel

Environment

The containment cooling system component types are exposed to the following environments:

- Plant Indoor Air
- Raw Water
- Ventilation Atmosphere
- Waste Water

Aging Effects Requiring Management

The following containment cooling system aging effects require management:

- Hardening and loss of strength
- Loss of material
- Loss of preload
- Reduction of heat transfer

Aging Management Programs

The following aging management programs manage the aging effects for the containment cooling system component types:

- Bolting Integrity (B2.1.8)
- External Surfaces Monitoring of Mechanical Components (B2.1.21)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)
- Open-Cycle Cooling Water System (B2.1.10)

3.3.2.1.20 Fire Protection System

Materials

The materials of construction for the fire protection system component types are:

- Aluminum
- Carbon Steel
- Carbon Steel (Galvanized)
- Cast Iron (Gray Cast Iron)
- Copper Alloy
- Polyvinyl Chloride (PVC)
- Stainless Steel

Environment

The fire protection system component types are exposed to the following environments:

- Atmosphere/ Weather
- Buried
- Closed-Cycle Cooling Water
- Condensation
- Diesel Exhaust

- Dry Gas
- Fuel Oil
- Plant Indoor Air
- Raw Water
- Waste Water

Aging Effects Requiring Management

The following fire protection system aging effects require management:

- Loss of material
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for the fire protection system component types:

- Aboveground Metallic Tanks (B2.1.15)
- Bolting Integrity (B2.1.8)
- Buried and Underground Piping and Tanks (B2.1.25)
- Closed Treated Water Systems (B2.1.11)
- External Surfaces Monitoring of Mechanical Components (B2.1.21)
- Fire Protection (B2.1.13)
- Fire Water System (B2.1.14)
- Fuel Oil Chemistry (B2.1.16)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)
- One-Time Inspection (B2.1.18)
- Selective Leaching (B2.1.19)

3.3.2.1.21 Emergency Diesel Engine Fuel Oil Storage and Transfer System

Materials

The materials of construction for the emergency diesel engine fuel oil storage and transfer system component types are:

- Carbon Steel

- Glass
- Stainless Steel

Environment

The emergency diesel engine fuel oil storage and transfer system component types are exposed to the following environments:

- Atmosphere/ Weather
- Buried
- Condensation
- Fuel Oil
- Plant Indoor Air
- Underground

Aging Effects Requiring Management

The following emergency diesel engine fuel oil storage and transfer system aging effects require management:

- Loss of material
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for the emergency diesel engine fuel oil storage and transfer system component types:

- Bolting Integrity (B2.1.8)
- Buried and Underground Piping and Tanks (B2.1.25)
- External Surfaces Monitoring of Mechanical Components (B2.1.21)
- Fuel Oil Chemistry (B2.1.16)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)
- One-Time Inspection (B2.1.18)

3.3.2.1.22 Standby Diesel Generator Engine System

Materials

The materials of construction for the standby diesel generator engine system component types are:

- Aluminum
- Carbon Steel
- Cast Iron
- Copper Alloy
- Elastomer
- Glass
- Insulation Calcium Silicate
- Stainless Steel

Environment

The standby diesel generator engine system component types are exposed to the following environments:

- Atmosphere/ Weather
- Closed-Cycle Cooling Water
- Condensation
- Diesel Exhaust
- Dry Gas
- Fuel Oil
- Lubricating Oil
- Plant Indoor Air
- Raw Water

Aging Effects Requiring Management

The following standby diesel generator engine system aging effects require management:

- Cracking
- Hardening and loss of strength
- Loss of material

- Loss of preload
- Reduction of heat transfer

Aging Management Programs

The following aging management programs manage the aging effects for the standby diesel generator engine system component types:

- Bolting Integrity (B2.1.8)
- Closed Treated Water Systems (B2.1.11)
- External Surfaces Monitoring of Mechanical Components (B2.1.21)
- Fuel Oil Chemistry (B2.1.16)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)
- Lubricating Oil Analysis (B2.1.24)
- One-Time Inspection (B2.1.18)
- Open-Cycle Cooling Water System (B2.1.10)

3.3.2.1.23 EOF and TSC Diesels, Security Building System

Materials

The materials of construction for the EOF and TSC diesels, security building system component types are:

- Carbon Steel
- Elastomer
- Stainless Steel

Environment

The EOF and TSC diesels, security building system component types are exposed to the following environments:

- Atmosphere/ Weather
- Condensation
- Diesel Exhaust
- Fuel Oil
- Plant Indoor Air

Aging Effects Requiring Management

The following EOF and TSC diesels, security building system aging effects require management:

- Cracking
- Hardening and loss of strength
- Loss of material
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for the EOF and TSC diesels, security building system component types:

- Bolting Integrity (B2.1.8)
- External Surfaces Monitoring of Mechanical Components (B2.1.21)
- Fuel Oil Chemistry (B2.1.16)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)
- One-Time Inspection (B2.1.18)

3.3.2.1.24 Liquid Radwaste System

Materials

The materials of construction for the liquid radwaste system component types are:

- Carbon Steel
- Stainless Steel
- Stainless Steel Cast Austenitic

Environment

The liquid radwaste system component types are exposed to the following environments:

- Borated Water Leakage
- Closed-Cycle Cooling Water
- Concrete
- Condensation
- Demineralized Water

- Dry Gas
- Plant Indoor Air
- Treated Borated Water
- Waste Water

Aging Effects Requiring Management

The following liquid radwaste system aging effects require management:

- Cracking
- Loss of material
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for the liquid radwaste system component types:

- Bolting Integrity (B2.1.8)
- Closed Treated Water Systems (B2.1.11)
- External Surfaces Monitoring of Mechanical Components (B2.1.21)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)
- One-Time Inspection (B2.1.18)
- Water Chemistry (B2.1.2)

3.3.2.1.25 Decontamination System

Materials

The materials of construction for the decontamination system component types are:

- Carbon Steel
- Stainless Steel

Environment

The decontamination system component types are exposed to the following environments:

- Condensation
- Demineralized Water

- Plant Indoor Air
- Steam

Aging Effects Requiring Management

The following decontamination system aging effects require management:

- Loss of material
- Loss of preload
- Wall thinning

Aging Management Programs

The following aging management programs manage the aging effects for the decontamination system component types:

- Bolting Integrity (B2.1.8)
- External Surfaces Monitoring of Mechanical Components (B2.1.21)
- Flow-Accelerated Corrosion (B2.1.7)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)
- One-Time Inspection (B2.1.18)
- Water Chemistry (B2.1.2)

3.3.2.1.26 Oily Waste System

Materials

The materials of construction for the oily waste system component types are:

- Carbon Steel
- Carbon Steel (Galvanized)
- Cast Iron
- Cast Iron (Gray Cast Iron)
- Stainless Steel

Environment

The oily waste system component types are exposed to the following environments:

- Concrete

- Condensation
- Plant Indoor Air
- Waste Water

Aging Effects Requiring Management

The following oily waste system aging effects require management:

- Loss of material
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for the oily waste system component types:

- Bolting Integrity (B2.1.8)
- External Surfaces Monitoring of Mechanical Components (B2.1.21)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)
- Selective Leaching (B2.1.19)

3.3.2.1.27 Floor and Equipment Drainage System

Materials

The materials of construction for the floor and equipment drainage system component types are:

- Carbon Steel
- Carbon Steel (Galvanized)
- Glass
- Stainless Steel
- Stainless Steel Cast Austenitic

Environment

The floor and equipment drainage system component types are exposed to the following environments:

- Borated Water Leakage
- Concrete

- Condensation
- Lubricating Oil
- Plant Indoor Air
- Waste Water

Aging Effects Requiring Management

The following floor and equipment drainage system aging effect requires management:

- Loss of material
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for the floor and equipment drainage system component types:

- Bolting Integrity (B2.1.8)
- External Surfaces Monitoring of Mechanical Components (B2.1.21)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)

3.3.2.1.28 Miscellaneous Systems In-Scope ONLY based on Criterion 10 CFR 54.4(a)(2)

Materials

The materials of construction for the miscellaneous systems in scope ONLY based on Criterion 10 CFR 54.4(a)(2) component types are:

- Carbon Steel
- Carbon Steel (Galvanized)
- Cast Iron (Gray Cast Iron)
- Copper Alloy
- Elastomer
- Glass
- Stainless Steel
- Stainless Steel Cast Austenitic

Environment

The miscellaneous systems in scope ONLY based on Criterion 10 CFR 54.4(a)(2) component types are exposed to the following environments:

- Borated Water Leakage
- Closed-Cycle Cooling Water
- Condensation
- Demineralized Water
- Dry Gas
- Plant Indoor Air
- Potable Water
- Raw Water
- Secondary Water
- Treated Borated Water
- Waste Water

Aging Effects Requiring Management

The following miscellaneous systems in-scope ONLY based on Criterion 10 CFR 54.4(a)(2) aging effects require management:

- Cracking
- Hardening and loss of strength
- Loss of material
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for the miscellaneous systems in scope ONLY based on Criterion 10 CFR 54.4(a)(2) component types:

- Bolting Integrity (B2.1.8)
- Closed Treated Water Systems (B2.1.11)
- External Surfaces Monitoring of Mechanical Components (B2.1.21)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)
- One-Time Inspection (B2.1.18)

- Selective Leaching (B2.1.19)
- Water Chemistry (B2.1.2)

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

NUREG-1801 provides the basis for identifying those programs that warrant further evaluation. For the auxiliary systems, those evaluations are addressed in the following sections.

3.3.2.2.1 Cumulative Fatigue Damage

[3.3.1.01] The CMAA 70 crane service classification depends on a number of lifts at or near the maximum allowable stress (full-capacity lifts) for that design class. Section 4.7.1 describes the evaluation of load handling crane TLAAs.

[3.3.1.02] Callaway piping outside the reactor coolant pressure boundary is designed to ASME III Class 2, Class 3, and ANSI B31.1, all of which require a reduction in the allowable secondary stress range if more than 7,000 full-range thermal cycles are expected in a design lifetime. Section 4.3.5 describes the evaluation of these cyclic design TLAAs.

Fatigue analyses were discovered for Class 2 heat exchangers. Section 4.3.8 describes the evaluation of these heat exchanger TLAAs.

Section 4.3.6 describes the evaluation of TLAAs for the spent fuel pool liner and fuel storage racks.

3.3.2.2.2 Cracking due to Stress Corrosion Cracking and Cyclic Loading

The Water Chemistry program (B2.1.2) and the One-Time Inspection program (B2.1.18) will manage cracking due to stress corrosion cracking and cyclic loading for stainless steel letdown (non-regenerative) heat exchanger exposed to treated borated water. The one-time inspection will include selected components at susceptible locations.

Temperature and radioactivity of the shell-side water of the letdown (non-regenerative) heat exchanger is monitored continuously by installed plant instrumentation.

The One-Time Inspection program (B2.1.18) will select heat exchanger tubes with similar materials and environment, including fluid temperatures, to those of the letdown (non-regenerative) heat exchanger with consideration for temperatures above the threshold of cracking for stainless steel. The One-Time Inspection program (B2.1.18) will perform eddy-current testing of stainless steel heat exchanger tubes in a borated water environment that is above the threshold temperature for cracking of stainless steel.

3.3.2.2.3 Cracking due to Stress Corrosion Cracking

Not applicable. Callaway has no in-scope stainless steel piping, piping components, piping elements or tanks exposed to air - outdoor in the auxiliary systems, so the applicable NUREG-1801 line was not used.

3.3.2.2.4 Loss of Material due to Cladding Breach

Not applicable. Callaway has no-in scope pump casings constructed of steel with stainless or nickel-alloy cladding exposed to treated borated water in the chemical and volume control system, so the applicable NUREG-1801 line was not used.

3.3.2.2.5 Loss of Material due to Pitting and Crevice Corrosion

Not applicable. Callaway has no in-scope stainless steel piping, piping components, piping elements or tanks exposed to air - outdoor in the auxiliary systems, so the applicable NUREG-1801 line was not used.

3.3.2.2.6 Quality Assurance for Aging Management of Nonsafety-Related Components

Quality Assurance Program and Administrative Controls are discussed in Section B1.3, *Quality Assurance Program and Administrative Controls*.

3.3.2.3 Time-Limited Aging Analyses

The time-limited aging analyses identified below are associated with the auxiliary systems components. The section of Chapter 4, *Time-Limited Aging Analyses* that contains the TLAA review results is indicated in parenthesis.

- Cumulative Fatigue Damage (Section 4.3, *Metal Fatigue*)
- Crane Load Cycle Limits (Section 4.7.1, *Containment Polar Crane, Fuel Building Cask Handling Crane, Spent Fuel Pool Bridge Crane, and Refueling Machine CMAA 70 Load Cycle Limits*)
- Cracking (Section 4.7.8, *Replacement Class 3 Buried Piping)*

3.3.3 Conclusions

The auxiliary systems component types that are subject to AMR have been evaluated. The aging management programs selected to manage the aging effects for the auxiliary systems component types are identified in the summary Tables and in Section 3.3.2.1.

A description of these aging management programs is provided in Appendix B, *Aging Management Programs*, along with a demonstration that the identified aging effects will be managed for the period of extended operation.

Therefore, based on the demonstration provided in Appendix B, *Aging Management Programs*, the effects of aging associated with the auxiliary systems component types will be adequately managed so that there is reasonable assurance that the intended functions will be maintained consistent with the current licensing basis during the period of extended operation.

Table 3.3-1 Summary of Aging Management Programs in Chapter VII of NUREG-1801 for Auxiliary Systems

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1.001	Steel Cranes: structural girders exposed to Air – indoor, uncontrolled (External)	Cumulative fatigue damage due to 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 (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)(1))	Yes, TLAA	Fatigue of steel crane components is a TLAA. See further evaluation in Section 3.3.2.2.1.
3.3.1.002	Stainless steel, Steel Heat exchanger components and tubes, Piping, piping components, and piping elements exposed to Treated borated water, Air - indoor, uncontrolled, Treated water	Cumulative fatigue damage due to fatigue	Fatigue is a time-limited aging analysis (TLAA) to be evaluated for the period of extended operation. See the SRP, Section 4.3 *Metal Fatigue*, for acceptable methods for meeting the requirements of 10 CFR 54.21(c)(1).	Yes, TLAA	Fatigue of metal components is a TLAA. See further evaluation in Section 3.2.2.2.1.

Table 3.3-1 Summary of Aging Management Programs in Chapter VII of NUREG-1801 for Auxiliary Systems (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1.003	Stainless steel Heat exchanger components, non-regenerative exposed to Treated borated water >60°C (>140°F)	Cracking due to stress corrosion cracking; cyclic loading	Water Chemistry (B2.1.2) The AMP is to be augmented by verifying the absence of cracking due to stress corrosion cracking and cyclic loading. 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	Consistent with NUREG-1801 for material, environment, and aging effect, but a different aging management program Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18) is credited. See further evaluation in Section 3.3.2.2.2.
3.3.1.004	Stainless steel Piping, piping components, and piping elements; tanks exposed to Air – outdoor	Cracking due to stress corrosion cracking	External Surfaces Monitoring of Mechanical Components (B2.1.21)	Yes, environmental conditions need to be evaluated	Not applicable. Callaway has no in-scope stainless steel piping, piping components, piping elements or tanks exposed to air - outdoor in the auxiliary systems, so the applicable NUREG-1801 line was not used. See further evaluation in Section 3.3.2.2.3.

Table 3.3-1 Summary of Aging Management Programs in Chapter VII of NUREG-1801 for Auxiliary Systems (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1.005	Steel (with stainless steel or nickel-alloy cladding) Pump Casings exposed to Treated borated water	Loss of material due to cladding breach	A plant-specific aging management program is to be evaluated. Reference NRC Information Notice 94-63, *Boric Acid Corrosion of Charging Pump Casings Caused by Cladding Cracks*.	Yes, verify that plant-specific program addresses clad cracking	Not applicable. Callaway has no-in scope pump casings constructed of steel with stainless or nickel-alloy cladding exposed to treated borated water in the chemical and volume control system, so the applicable NUREG-1801 line was not used. See further evaluation in Section 3.3.2.2.4.
3.3.1.006	Stainless steel Piping, piping components, and piping elements; tanks exposed to Air – outdoor	Loss of material due to pitting and crevice corrosion	External Surfaces Monitoring of Mechanical Components (B2.1.21)	Yes, environmental conditions need to be evaluated	Not applicable. Callaway has no in-scope stainless steel piping, piping components, piping elements or tanks exposed to air - outdoor in the auxiliary systems, so the applicable NUREG-1801 line was not used. See further evaluation in Section 3.3.2.2.5.
3.3.1.007	Stainless steel High-pressure pump, casing exposed to Treated borated water	Cracking due to cyclic loading	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD(B2.1.1) for ASME components	No	Consistent with NUREG-1801.

Table 3.3-1 Summary of Aging Management Programs in Chapter VII of NUREG-1801 for Auxiliary Systems (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1.008	Stainless steel Heat exchanger components and tubes exposed to Treated borated water >60°C (>140°F)	Cracking due to cyclic loading	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)for ASME components	No	Consistent with NUREG-1801.
3.3.1.009	Steel, Aluminum, Copper alloy (>15% Zn or >8% Al) External surfaces, Piping, piping components, and piping elements, Bolting exposed to Air with borated water leakage	Loss of material due to boric acid corrosion	Boric Acid Corrosion (B2.1.4)	No	Consistent with NUREG-1801.
3.3.1.010	Steel, high-strength Closure bolting exposed to Air with steam or water leakage	Cracking due to stress corrosion cracking; cyclic loading	Bolting Integrity (B2.1.8)	No	Not applicable. Callaway has no in-scope high-strength steel closure bolting in the auxiliary systems, so the applicable NUREG-1801 line was not used.

Table 3.3-1 Summary of Aging Management Programs in Chapter VII of NUREG-1801 for Auxiliary Systems (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1.011	Steel, high-strength High-pressure pump, closure bolting exposed to Air with steam or water leakage	Cracking due to stress corrosion cracking; cyclic loading	Bolting Integrity (B2.1.8)	No	Not applicable. Callaway has no in-scope high-strength, high pressure pump steel closure bolting exposed to air with steam or water leakage in the chemical and volume control system, so the applicable NUREG-1801 line was not used.
3.3.1.012	Steel; stainless steel Closure bolting, Bolting exposed to Condensation, Air – indoor, uncontrolled (External), Air – outdoor (External)	Loss of material due to general (steel only), pitting, and crevice corrosion	Bolting Integrity (B2.1.8)	No	Consistent with NUREG-1801.

Table 3.3-1 Summary of Aging Management Programs in Chapter VII of NUREG-1801 for Auxiliary Systems (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1.013	Steel Closure bolting exposed to Air with steam or water leakage	Loss of material due to general corrosion	Bolting Integrity (B2.1.8)	No	Not applicable. Callaway uses plant indoor air as the external environment to evaluated closure bolting. Callaway used the NUREG-1800, Table 3.3-1, line 3.3.1.012 to evaluate steel closure bolting exposed to an air-indoor uncontrolled environment instead of the NUREG-1800, Table 3.3-1, line 3.3.1.013. NUREG-1800, Table 3.3-1, line 3.3.1.013 and 3.3.1.012 both manage loss of material using Bolting Integrity (B2.1.8).
3.3.1.014	Steel, Stainless Steel Bolting exposed to Soil	Loss of preload	Bolting Integrity (B2.1.8)	No	Consistent with NUREG-1801.

Table 3.3-1 Summary of Aging Management Programs in Chapter VII of NUREG-1801 for Auxiliary Systems (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1.015	Steel; stainless steel, Copper alloy, Nickel alloy, Stainless steel Closure bolting, Bolting exposed to Air – indoor, uncontrolled (External), Any environment, Air – outdoor (External), Raw water, Treated borated water, Fuel oil, Treated water	Loss of preload due to thermal effects, gasket creep, and self-loosening	Bolting Integrity (B2.1.8)	No	Consistent with NUREG-1801.
3.3.1.016					Not applicable - BWR only
3.3.1.017					Not applicable - BWR only
3.3.1.018	Stainless steel High-pressure pump, casing, Piping, piping components, and piping elements exposed to Treated borated water >60°C (>140°F), Sodium pentaborate solution >60°C (>140°F)	Cracking due to stress corrosion cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	No	Consistent with NUREG-1801.

Table 3.3-1 Summary of Aging Management Programs in Chapter VII of NUREG-1801 for Auxiliary Systems (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1.019	Stainless steel Regenerative heat exchanger components exposed to Treated water >60°C (>140°F)	Cracking due to stress corrosion cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	No	Not applicable. - BWR only.
3.3.1.020	Stainless steel, Stainless steel; steel with stainless steel cladding Heat exchanger components exposed to Treated borated water >60°C (>140°F), Treated water >60°C (>140°F)	Cracking due to stress corrosion cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	No	Consistent with NUREG-1801.
3.3.1.021					Not applicable - BWR only
3.3.1.022					Not applicable - BWR only

Table 3.3-1 Summary of Aging Management Programs in Chapter VII of NUREG-1801 for Auxiliary Systems (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1.023	Aluminum Piping, piping components, and piping elements exposed to Treated water	Loss of material due to pitting and crevice corrosion	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	No	Not applicable. Callaway has no in-scope aluminum piping, piping components or piping elements exposed to treated water in the auxiliary systems, so the applicable NUREG-1801 lines were not used.
3.3.1.024					Not applicable - BWR only
3.3.1.025					Not applicable - BWR only
3.3.1.026	Steel (with elastomer lining), Steel (with elastomer lining or stainless steel cladding) Piping, piping components, and piping elements exposed to Treated water	Loss of material due to pitting and crevice corrosion (only for steel after lining/cladding degradation)	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	No	Not applicable. Callaway has no in-scope steel (with elastomer lining or stainless steel cladding) piping, piping components or piping elements exposed to treated water in the fuel pool cooling and clean up system, so the applicable NUREG-1801 lines were not used.
3.3.1.027					Not applicable - BWR only

Table 3.3-1 Summary of Aging Management Programs in Chapter VII of NUREG-1801 for Auxiliary Systems (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1.028	Stainless steel, Steel (with stainless steel or nickel-alloy cladding) Spent fuel storage racks (BWR), Spent fuel storage racks (PWR), Piping, piping components, and piping elements, Piping, piping components, and piping elements; tanks exposed Treated water >60°C (>140°F), Treated borated water >60°C (>140°F)	Cracking due to stress corrosion cracking	Water Chemistry (B2.1.2)	No	Consistent with NUREG-1801 for material, environment, and aging effect, but a different aging management program Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18) is credited.
3.3.1.029	Steel (with stainless steel cladding); stainless steel Piping, piping components, and piping elements exposed to Treated borated water	Loss of material due to pitting and crevice corrosion	Water Chemistry (B2.1.2)	No	Consistent with NUREG-1801 for material, environment, and aging effect, but a different aging management program Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18) is credited.

Table 3.3-1 Summary of Aging Management Programs in Chapter VII of NUREG-1801 for Auxiliary Systems (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1.030	Concrete; cementitious material Piping, piping components, and piping elements exposed to Raw Water	Changes in material properties due to aggressive chemical attack	Open-Cycle Cooling Water System (B2.1.10)	No	Not applicable. Callaway has no in-scope concrete or cementitious material piping, piping components or piping elements exposed to raw water in the auxiliary systems, so the applicable NUREG-1801 line was not used.
3.3.1.030a	Fiberglass, HDPE Piping, piping components, and piping elements exposed to Raw water (internal)	Cracking, blistering, change in color due to water absorption	Open-Cycle Cooling Water System (B2.1.10)	No	Consistent with NUREG-1801.
3.3.1.031	Concrete; cementitious material Piping, piping components, and piping elements exposed to Raw Water	Cracking due to settling	Open-Cycle Cooling Water System (B2.1.10)	No	Not applicable. Callaway has no in-scope concrete or cementitious material piping, piping components or piping elements exposed to raw water in the auxiliary systems, so the applicable NUREG-1801 line was not used.

Table 3.3-1 Summary of Aging Management Programs in Chapter VII of NUREG-1801 for Auxiliary Systems (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1.032	Reinforced concrete, asbestos cement Piping, piping components, and piping elements exposed to Raw water	Cracking due to aggressive chemical attack and leaching; Changes in material properties due to aggressive chemical attack	Open-Cycle Cooling Water System (B2.1.10)	No	Consistent with NUREG-1801 for material, environment, and aging effect, but a different aging management program External Surfaces Monitoring of Mechanical Components (B2.1.21) is credited.
3.3.1.032a	Elastomer seals and components exposed to raw water	Hardening and loss of strength due to elastomer degradation; loss of material due to erosion	Open-Cycle Cooling Water System (B2.1.10)	No	Consistent with NUREG-1801.
3.3.1.033	Concrete; cementitious material Piping, piping components, and piping elements exposed to Raw Water	Loss of material due to abrasion, cavitation, aggressive chemical attack, and leaching	Open-Cycle Cooling Water System (B2.1.10)	No	Not applicable. Callaway has no in-scope concrete or cementitious material piping, piping components or piping elements exposed to raw water in the auxiliary systems, so the applicable NUREG-1801 line was not used.

Table 3.3-1 Summary of Aging Management Programs in Chapter VII of NUREG-1801 for Auxiliary Systems (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1.034	Nickel alloy, Copper alloy Piping, piping components, and piping elements exposed to Raw water	Loss of material due to general, pitting, and crevice corrosion	Open-Cycle Cooling Water System (B2.1.10)	No	Not applicable. Callaway has no in-scope nickel alloy components exposed to raw water in the auxiliary systems, so the applicable NUREG-1800, Table 3.3-1, lines were not used. The loss of material of copper alloy piping, piping components and piping elements exposed to raw water associated with the essential service water system and the ultimate heat sink are addressed in lines 3.3.1.035, 3.3.1.036 and 3.3.1.038.
3.3.1.035	Copper alloy Piping, piping components, and piping elements exposed to Raw water	Loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion	Open-Cycle Cooling Water System (B2.1.10)	No	Consistent with NUREG-1801.

Table 3.3-1 Summary of Aging Management Programs in Chapter VII of NUREG-1801 for Auxiliary Systems (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1.036	Copper alloy Piping, piping components, and piping elements exposed to Raw water	Loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion; fouling that leads to corrosion	Open-Cycle Cooling Water System (B2.1.10)	No	Consistent with NUREG-1801 for all components except that a different aging management program is credited for the following. The aging of internal component surfaces exposed to the raw water environment of the service water system is managed by Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23).
3.3.1.037	Steel (with coating or lining) Piping, piping components, and piping elements exposed to Raw water	Loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion; fouling that leads to corrosion; lining/coating degradation	Open-Cycle Cooling Water System (B2.1.10)	No	Consistent with NUREG-1801 for material, environment, and aging effect, but a different aging management program Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23) is credited for those components not managed by the Open-Cycle Cooling Water System (B2.1.10) program.
3.3.1.038	Copper alloy, Steel Heat exchanger components exposed to Raw water	Loss of material due to general, pitting, crevice, galvanic, and microbiologically-influenced corrosion; fouling that leads to corrosion	Open-Cycle Cooling Water System (B2.1.10)	No	Consistent with NUREG-1801.

Table 3.3-1 Summary of Aging Management Programs in Chapter VII of NUREG-1801 for Auxiliary Systems (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1.039	Stainless steel Piping, piping components, and piping elements exposed to Raw water	Loss of material due to pitting and crevice corrosion	Open-Cycle Cooling Water System (B2.1.10)	No	Not applicable. Callaway has no in-scope stainless steel piping, piping components or piping elements exposed to raw water in the ultimate heat sink. In-scope stainless steel piping, piping components and piping elements exposed to raw water in the essential service water system are managed by NUREG-1801, Section VII.C1 lines.
3.3.1.040	Stainless steel Piping, piping components, and piping elements exposed to Raw water	Loss of material due to pitting and crevice corrosion; fouling that leads to corrosion	Open-Cycle Cooling Water System (B2.1.10)	No	Consistent with NUREG-1801 for all components except that a different aging management program is credited for the following. The aging of internal component surfaces exposed to the raw water environment of the chemical and volume control system, service water system and drains in the control building HVAC system is managed by Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23).

Table 3.3-1 Summary of Aging Management Programs in Chapter VII of NUREG-1801 for Auxiliary Systems (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1.041	Stainless steel Piping, piping components, and piping elements exposed to Raw water	Loss of material due to pitting, crevice, and microbiologically-influenced corrosion	Open-Cycle Cooling Water System (B2.1.10)	No	Consistent with NUREG-1801.
3.3.1.042	Copper alloy, Titanium, Stainless steel Heat exchanger tubes exposed to Raw water	Reduction of heat transfer due to fouling	Open-Cycle Cooling Water System (B2.1.10)	No	Consistent with NUREG-1801.
3.3.1.043	Stainless steel Piping, piping components, and piping elements exposed to Closed-cycle cooling water >60°C (>140°F)	Cracking due to stress corrosion cracking	Closed Treated Water Systems (B2.1.11)	No	Consistent with NUREG-1801.
3.3.1.044	Stainless steel; steel with stainless steel cladding Heat exchanger components exposed to Closed-cycle cooling water >60°C (>140°F)	Cracking due to stress corrosion cracking	Closed Treated Water Systems (B2.1.11)	No	Not applicable. - BWR only.

Table 3.3-1 Summary of Aging Management Programs in Chapter VII of NUREG-1801 for Auxiliary Systems (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1.045	Steel Piping, piping components, and piping elements; tanks exposed to Closed-cycle cooling water	Loss of material due to general, pitting, and crevice corrosion	Closed Treated Water Systems (B2.1.11)	No	Consistent with NUREG-1801.
3.3.1.046	Steel, Copper alloy Heat exchanger components, Piping, piping components, and piping elements exposed to Closed-cycle cooling water	Loss of material due to general, pitting, crevice, and galvanic corrosion	Closed Treated Water Systems (B2.1.11)	No	Consistent with NUREG-1801.
3.3.1.047					Not applicable - BWR only
3.3.1.048	Aluminum Piping, piping components, and piping elements exposed to Closed-cycle cooling water	Loss of material due to pitting and crevice corrosion	Closed Treated Water Systems (B2.1.11)	No	Not applicable. Callaway has no in-scope aluminum piping, piping components or piping elements exposed to closed-cycle cooling water in the auxiliary systems, so the applicable NUREG-1801 lines were not used.
3.3.1.049	Stainless steel Piping, piping components, and piping elements exposed to Closed-cycle cooling water	Loss of material due to pitting and crevice corrosion	Closed Treated Water Systems (B2.1.11)	No	Consistent with NUREG-1801.

Table 3.3-1 Summary of Aging Management Programs in Chapter VII of NUREG-1801 for Auxiliary Systems (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1.050	Stainless steel, Copper Alloy, Steel Heat exchanger tubes exposed to Closed-cycle cooling water	Reduction of heat transfer due to fouling	Closed Treated Water Systems (B2.1.11)	No	Consistent with NUREG-1801.
3.3.1.051	Boraflex Spent fuel storage racks: neutron-absorbing sheets (PWR), Spent fuel storage racks: neutron-absorbing sheets (BWR) exposed to Treated borated water, Treated water	Reduction of neutron-absorbing capacity due to boraflex degradation	Boraflex Monitoring	No	Not applicable. Callaway does not employ Boraflex in spent fuel storage racks to maintain subcriticality. Callaway uses Boral and soluble boron to provide criticality safety margin by maintaining keff < 0.95 including uncertainties, tolerances, and accident conditions.
3.3.1.052	Steel Cranes: rails and structural girders exposed to Air – indoor, uncontrolled (External)	Loss of material due to general corrosion	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B2.1.12)	No	Consistent with NUREG-1801.
3.3.1.053	Steel Cranes - rails exposed to Air – indoor, uncontrolled (External)	Loss of material due to wear	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B2.1.12)	No	Consistent with NUREG-1801.

Table 3.3-1 Summary of Aging Management Programs in Chapter VII of NUREG-1801 for Auxiliary Systems (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1.054	Copper alloy Piping, piping components, and piping elements exposed to Condensation	Loss of material due to general, pitting, and crevice corrosion	Compressed Air Monitoring	No	Consistent with NUREG-1801 for material, environment, and aging effect, but a different aging management program Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23) is credited.
3.3.1.055	Steel Piping, piping components, and piping elements: compressed air system exposed to Condensation (Internal)	Loss of material due to general and pitting corrosion	Compressed Air Monitoring	No	Consistent with NUREG-1801 for material, environment, and aging effect, but a different aging management program Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23) is credited.
3.3.1.056	Stainless steel Piping, piping components, and piping elements exposed to Condensation (Internal)	Loss of material due to pitting and crevice corrosion	Compressed Air Monitoring	No	Consistent with NUREG-1801 for material, environment, and aging effect, but a different aging management program Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23) is credited.

Table 3.3-1 Summary of Aging Management Programs in Chapter VII of NUREG-1801 for Auxiliary Systems (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1.057	Elastomers Fire barrier penetration seals exposed to Air - indoor, uncontrolled, Air – outdoor	Increased hardness; shrinkage; loss of strength due to weathering	Fire Protection (B2.1.13)	No	Consistent with NUREG-1801.
3.3.1.058	Steel Halon/carbon dioxide fire suppression system piping, piping components, and piping elements exposed to Air – indoor, uncontrolled (External)	Loss of material due to general, pitting, and crevice corrosion	Fire Protection (B2.1.13)	No	Consistent with NUREG-1801.
3.3.1.059	Steel Fire rated doors exposed to Air - indoor, uncontrolled, Air – outdoor	Loss of material due to wear	Fire Protection (B2.1.13)	No	Consistent with NUREG-1801.
3.3.1.060	Reinforced concrete Structural fire barriers: walls, ceilings and floors exposed to Air - indoor, uncontrolled	Concrete cracking and spalling due to aggressive chemical attack, and reaction with aggregates	Fire Protection (B2.1.13) and Structures Monitoring (B2.1.31)	No	Consistent with NUREG-1801.

Table 3.3-1 Summary of Aging Management Programs in Chapter VII of NUREG-1801 for Auxiliary Systems (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1.061	Reinforced concrete Structural fire barriers: walls, ceilings and floors exposed to Air – outdoor	Cracking, loss of material due to freeze-thaw, aggressive chemical attack, and reaction with aggregates	Fire Protection (B2.1.13) and Structures Monitoring (B2.1.31)	No	Consistent with NUREG-1801.
3.3.1.062	Reinforced concrete Structural fire barriers: walls, ceilings and floors exposed to Air - indoor, uncontrolled, Air – outdoor	Loss of material due to corrosion of embedded steel	Fire Protection (B2.1.13) and Structures Monitoring (B2.1.31)	No	Consistent with NUREG-1801.
3.3.1.063	Steel Fire Hydrants exposed to Air – outdoor	Loss of material due to general, pitting, and crevice corrosion	Fire Water System (B2.1.14)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Fire Water System (B2.1.14)
3.3.1.064	Steel, Copper alloy Piping, piping components, and piping elements exposed to Raw water	Loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion; fouling that leads to corrosion	Fire Water System (B2.1.14)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Fire Water System (B2.1.14)

Table 3.3-1 Summary of Aging Management Programs in Chapter VII of NUREG-1801 for Auxiliary Systems (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1.065	Aluminum Piping, piping components, and piping elements exposed to Raw water	Loss of material due to pitting and crevice corrosion	Fire Water System (B2.1.14)	No	Not applicable. Callaway has no in-scope aluminum piping, piping components or piping elements exposed to raw water in the fire protection system, so the applicable NUREG-1801 line was not used.
3.3.1.066	Stainless steel Piping, piping components, and piping elements exposed to Raw water	Loss of material due to pitting and crevice corrosion; fouling that leads to corrosion	Fire Water System (B2.1.14)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Fire Water System (B2.1.14)
3.3.1.067	Steel Tanks exposed to Air – outdoor (External)	Loss of material due to general, pitting, and crevice corrosion	Aboveground Metallic Tanks (B2.1.15)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Aboveground Metallic Tanks (B2.1.15)
3.3.1.068	Steel Piping, piping components, and piping elements exposed to Fuel oil	Loss of material due to general, pitting, and crevice corrosion	Fuel Oil Chemistry (B2.1.16) and One-Time Inspection (B2.1.18)	No	Consistent with NUREG-1801.

Table 3.3-1 Summary of Aging Management Programs in Chapter VII of NUREG-1801 for Auxiliary Systems (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1.069	Copper alloy Piping, piping components, and piping elements exposed to Fuel oil	Loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion	Fuel Oil Chemistry (B2.1.16) and One-Time Inspection (B2.1.18)	No	Consistent with NUREG-1801.
3.3.1.070	Steel Piping, piping components, and piping elements; tanks exposed to Fuel oil	Loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion; fouling that leads to corrosion	Fuel Oil Chemistry (B2.1.16) and One-Time Inspection (B2.1.18)	No	Consistent with NUREG-1801.
3.3.1.071	Stainless steel, Aluminum Piping, piping components, and piping elements exposed to Fuel oil	Loss of material due to pitting, crevice, and microbiologically-influenced corrosion	Fuel Oil Chemistry (B2.1.16) and One-Time Inspection (B2.1.18)	No	Consistent with NUREG-1801.
3.3.1.072	Gray cast iron, Copper alloy (>15% Zn or >8% Al) Piping, piping components, and piping elements, Heat exchanger components exposed to Treated water, Closed-cycle cooling water, Soil, Raw water	Loss of material due to selective leaching	Selective Leaching (B2.1.19)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Selective Leaching (B2.1.19).

Table 3.3-1 Summary of Aging Management Programs in Chapter VII of NUREG-1801 for Auxiliary Systems (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1.073	Concrete; cementitious material Piping, piping components, and piping elements exposed to Air - outdoor	Changes in material properties due to aggressive chemical attack	External Surfaces Monitoring of Mechanical Components (B2.1.21)	No	Not applicable. Callaway has no in-scope concrete or cementitious material piping, piping components or piping elements exposed to air - outdoor in the essential service water system, so the applicable NUREG-1801 line was not used.
3.3.1.074	Concrete; cementitious material Piping, piping components, and piping elements exposed to Air - outdoor	Cracking due to settling	External Surfaces Monitoring of Mechanical Components (B2.1.21)	No	Not applicable. Callaway has no in-scope concrete or cementitious material piping, piping components or piping elements exposed to air - outdoor in the essential service water system, so the applicable NUREG-1801 line was not used.
3.3.1.075	Reinforced concrete, asbestos cement Piping, piping components, and piping elements exposed to Air – outdoor	Cracking due to aggressive chemical attack and leaching; Changes in material properties due to aggressive chemical attack	External Surfaces Monitoring of Mechanical Components (B2.1.21)	No	Not applicable. Callaway has no in-scope reinforced concrete or asbestos cement piping, piping components or piping elements exposed to air - outdoor in the essential service water system, so the applicable NUREG-1801 line was not used.

Table 3.3-1 Summary of Aging Management Programs in Chapter VII of NUREG-1801 for Auxiliary Systems (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1.076	Elastomers Elastomer: seals and components exposed to Air – indoor, uncontrolled (Internal/External)	Hardening and loss of strength due to elastomer degradation	External Surfaces Monitoring of Mechanical Components (B2.1.21)	No	Consistent with NUREG-1801.
3.3.1.077	Concrete; cementitious material Piping, piping components, and piping elements exposed to Air - outdoor	Loss of material due to abrasion, cavitation, aggressive chemical attack, and leaching	External Surfaces Monitoring of Mechanical Components (B2.1.21)	No	Not applicable. Callaway has no in-scope concrete or cementitious material piping, piping components or piping elements exposed to air - outdoor in the essential service water system, so the applicable NUREG-1801 line was not used.

Table 3.3-1 Summary of Aging Management Programs in Chapter VII of NUREG-1801 for Auxiliary Systems (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1.078	Steel Piping and components (External surfaces), Ducting and components (External surfaces), Ducting; closure bolting exposed to Air – indoor, uncontrolled (External), Air – indoor, uncontrolled (External), Air – outdoor (External), Condensation (External)	Loss of material due to general corrosion	External Surfaces Monitoring of Mechanical Components (B2.1.21)	No	Consistent with NUREG-1801 for material, environment, and aging effect, but a different aging management program Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23) is credited for those components enclosed within another component.
3.3.1.079	Copper alloy Piping, piping components, and piping elements exposed to Condensation (External)	Loss of material due to general, pitting, and crevice corrosion	External Surfaces Monitoring of Mechanical Components (B2.1.21)	No	Consistent with NUREG-1801 for material, environment, and aging effect, but a different aging management program Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23) is credited for those components enclosed within another component.

Table 3.3-1 Summary of Aging Management Programs in Chapter VII of NUREG-1801 for Auxiliary Systems (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1.080	Steel Heat exchanger components, Piping, piping components, and piping elements exposed to Air – indoor, uncontrolled (External), Air – outdoor (External)	Loss of material due to general, pitting, and crevice corrosion	External Surfaces Monitoring of Mechanical Components (B2.1.21)	No	Consistent with NUREG-1801.
3.3.1.081	Copper alloy, Aluminum Piping, piping components, and piping elements exposed to Air – outdoor (External), Air - outdoor	Loss of material due to pitting and crevice corrosion	External Surfaces Monitoring of Mechanical Components (B2.1.21)	No	Consistent with NUREG-1801.
3.3.1.082	Elastomers Elastomer: seals and components exposed to Air – indoor, uncontrolled (External)	Loss of material due to wear	External Surfaces Monitoring of Mechanical Components (B2.1.21)	No	Consistent with NUREG-1801.

Table 3.3-1 Summary of Aging Management Programs in Chapter VII of NUREG-1801 for Auxiliary Systems (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1.083	Stainless steel Diesel engine exhaust piping, piping components, and piping elements exposed to Diesel exhaust	Cracking due to stress corrosion cracking	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)
3.3.1.085	Elastomers Elastomer seals and components exposed to Closed-cycle cooling water	Hardening and loss of strength due to elastomer degradation	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)
3.3.1.086	Elastomers; Elastomers, linings, Elastomer: seals and components exposed to Treated borated water, Treated water, Raw water	Hardening and loss of strength due to elastomer degradation	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	No	Not applicable. Callaway has no in-scope elastomers or linings, exposed to treated borated water within the fuel pool cooling and cleanup system, so the applicable NUREG-1801 lines were not used.

Table 3.3-1 Summary of Aging Management Programs in Chapter VII of NUREG-1801 for Auxiliary Systems (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1.088	Steel; stainless steel Piping, piping components, and piping elements, Piping, piping components, and piping elements, diesel engine exhaust exposed to Raw water (potable), Diesel exhaust	Loss of material due to general (steel only), pitting, and crevice corrosion	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)
3.3.1.089	Steel, Copper alloy Piping, piping components, and piping elements exposed to Moist air or condensation (Internal)	Loss of material due to general, pitting, and crevice corrosion	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)
3.3.1.090	Steel Ducting and components (Internal surfaces) exposed to Condensation (Internal)	Loss of material due to general, pitting, crevice, and (for drip pans and drain lines) microbiologically-influenced corrosion	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)

Table 3.3-1 Summary of Aging Management Programs in Chapter VII of NUREG-1801 for Auxiliary Systems (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1.091	Steel Piping, piping components, and piping elements; tanks exposed to Waste Water	Loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	No	Consistent with NUREG-1801 for all components except that a different aging management program is credited for the following: The aging of external component surfaces exposed to the waste water environment of the oily waste system is managed by External Surfaces Monitoring of Mechanical Components (B2.1.21)
3.3.1.092	Aluminum Piping, piping components, and piping elements exposed to Condensation (Internal)	Loss of material due to pitting and crevice corrosion	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)

Table 3.3-1 Summary of Aging Management Programs in Chapter VII of NUREG-1801 for Auxiliary Systems (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1.093	Copper alloy Piping, piping components, and piping elements exposed to Raw water (potable)	Loss of material due to pitting and crevice corrosion	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)
3.3.1.094	Stainless steel Ducting and components exposed to Condensation	Loss of material due to pitting and crevice corrosion	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)

Table 3.3-1 Summary of Aging Management Programs in Chapter VII of NUREG-1801 for Auxiliary Systems (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1.095	Copper alloy, Stainless steel, Nickel alloy, Steel Piping, piping components, and piping elements, Heat exchanger components, Piping, piping components, and piping elements; tanks exposed to Waste water, Condensation (Internal)	Loss of material due to pitting, crevice, and microbiologically-influenced corrosion	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	No	Consistent with NUREG-1801 for all components except that a different aging management program is credited for the following: The aging of external component surfaces exposed to the waste water environment of the oily waste system and the floor and equipment drainage system is managed by External Surfaces Monitoring of Mechanical Components (B2.1.21)
3.3.1.096	Elastomers Elastomer: seals and components exposed to Air – indoor, uncontrolled (Internal)	Loss of material due to wear	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)

Table 3.3-1 Summary of Aging Management Programs in Chapter VII of NUREG-1801 for Auxiliary Systems (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1.097	Steel Piping, piping components, and piping elements, Reactor coolant pump oil collection system: tanks, Reactor coolant pump oil collection system: piping, tubing, valve bodies exposed to Lubricating oil	Loss of material due to general, pitting, and crevice corrosion	Lubricating Oil Analysis (B2.1.24) and One-Time Inspection (B2.1.18)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23) which manages the components in the floor and equipment drainage system.
3.3.1.098	Steel Heat exchanger components exposed to Lubricating oil	Loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion; fouling that leads to corrosion	Lubricating Oil Analysis (B2.1.24) and One-Time Inspection (B2.1.18)	No	Consistent with NUREG-1801.
3.3.1.099	Copper alloy, Aluminum Piping, piping components, and piping elements exposed to Lubricating oil	Loss of material due to pitting and crevice corrosion	Lubricating Oil Analysis (B2.1.24) and One-Time Inspection (B2.1.18)	No	Consistent with NUREG-1801.

Table 3.3-1 Summary of Aging Management Programs in Chapter VII of NUREG-1801 for Auxiliary Systems (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1.100	Stainless steel Piping, piping components, and piping elements exposed to Lubricating oil	Loss of material due to pitting, crevice, and microbiologically-influenced corrosion	Lubricating Oil Analysis (B2.1.24) and One-Time Inspection (B2.1.18)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23) which manages the components in the floor and equipment drainage system.
3.3.1.101	Aluminum Heat exchanger tubes exposed to Lubricating oil	Reduction of heat transfer due to fouling	Lubricating Oil Analysis (B2.1.24) and One-Time Inspection (B2.1.18)	No	Not applicable. Callaway has no in-scope aluminum heat exchanger tubes exposed to lubricating oil in the standby diesel generator engine system, so the applicable NUREG-1801 line was not used.

Table 3.3-1 Summary of Aging Management Programs in Chapter VII of NUREG-1801 for Auxiliary Systems (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1.102	Boral®; boron steel, and other materials (excluding Boraflex) Spent fuel storage racks: neutron-absorbing sheets (PWR), Spent fuel storage racks: neutron-absorbing sheets (BWR) exposed to Treated borated water, Treated water	Reduction of neutron-absorbing capacity; change in dimensions and loss of material due to effects of SFP environment	Monitoring of Neutron-Absorbing Materials other than Boraflex (B2.1.38)	No	Consistent with NUREG-1801.
3.3.1.103	Reinforced concrete, asbestos cement Piping, piping components, and piping elements exposed to Soil or concrete	Cracking due to aggressive chemical attack and leaching; Changes in material properties due to aggressive chemical attack	Buried and Underground Piping and Tanks (B2.1.25)	No	Not applicable. Callaway has no in-scope reinforced concrete or asbestos cement piping, piping components or piping elements exposed to soil or concrete in the essential service water system, so the applicable NUREG-1801 line was not used.

Table 3.3-1 Summary of Aging Management Programs in Chapter VII of NUREG-1801 for Auxiliary Systems (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1.104	HDPE, Fiberglass Piping, piping components, and piping elements exposed to Soil or concrete	Cracking, blistering, change in color due to water absorption	Buried and Underground Piping and Tanks (B2.1.25)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Buried and Underground Piping and Tanks (B2.1.25)
3.3.1.105	Concrete cylinder piping, Asbestos cement pipe Piping, piping components, and piping elements exposed to Soil or concrete	Cracking, spalling, corrosion of rebar due to exposure of rebar	Buried and Underground Piping and Tanks (B2.1.25)	No	Not applicable. Callaway has no in-scope concrete cylinder piping or asbestos cement piping, piping components or piping elements exposed to soil or concrete in the essential service water system, so the applicable NUREG-1801 lines were not used.
3.3.1.106	Steel (with coating or wrapping) Piping, piping components, and piping elements exposed to Soil or concrete	Loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion	Buried and Underground Piping and Tanks (B2.1.25)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Buried and Underground Piping and Tanks (B2.1.25)

Table 3.3-1 Summary of Aging Management Programs in Chapter VII of NUREG-1801 for Auxiliary Systems (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1.107	Stainless steel Piping, piping components, and piping elements exposed to Soil or concrete	Loss of material due to pitting and crevice corrosion	Buried and Underground Piping and Tanks (B2.1.25)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Buried and Underground Piping and Tanks (B2.1.25)
3.3.1.108	Titanium, Super austenitic, Aluminum, Copper Alloy, Stainless Steel Piping, piping components, and piping elements, Bolting exposed to Soil or concrete	Loss of material due to pitting and crevice corrosion	Buried and Underground Piping and Tanks (B2.1.25)	No	Not applicable. Callaway has no in-scope piping, piping components or piping elements constructed of titanium, super austenitic stainless steel, aluminum or copper alloy exposed to soil or concrete in the auxiliary systems. Nor does Callaway have any in-scope stainless steel bolting exposed to soil or concrete in the auxiliary systems. Therefore the applicable NUREG-1801 lines were not used.

Table 3.3-1 Summary of Aging Management Programs in Chapter VII of NUREG-1801 for Auxiliary Systems (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1.109	Steel Bolting exposed to Soil or concrete	Loss of material due to general, pitting and crevice corrosion	Buried and Underground Piping and Tanks (B2.1.25)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Buried and Underground Piping and Tanks (B2.1.25)
3.3.1.109a	Underground Aluminum, Copper Alloy, Stainless Steel and Steel Piping, piping components, and piping elements	Loss of material due to general (steel only), pitting and crevice corrosion	Buried and Underground Piping and Tanks (B2.1.25)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Buried and Underground Piping and Tanks (B2.1.25)
3.3.1.110					Not applicable - BWR only
3.3.1.111	Steel Structural steel exposed to Air – indoor, uncontrolled (External)	Loss of material due to general, pitting, and crevice corrosion	Structures Monitoring (B2.1.31)	No	Consistent with NUREG-1801.

Table 3.3-1 Summary of Aging Management Programs in Chapter VII of NUREG-1801 for Auxiliary Systems (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1.112	Steel Piping, piping components, and piping elements exposed to Concrete	None	None, provided 1) attributes of the concrete are consistent with ACI 318 or ACI 349 (low water-to-cement ratio, low permeability and adequate air entrainment) as cited in NUREG-1557 and 2) plant OE indicates no degradation of the concrete	No, if conditions are met.	Consistent with NUREG-1801. Refer to Further Evaluation in Section 3.5.2.2.2.1.4.
3.3.1.113	Aluminum Piping, piping components, and piping elements exposed to Air – dry (Internal/External), Air – indoor, uncontrolled (Internal/External), Air – indoor, controlled (External), Gas	None	None	NA - No AEM or AMP	Consistent with NUREG-1801.
3.3.1.114	Copper alloy Piping, piping components, and piping elements exposed to Air – indoor, uncontrolled (Internal/External), Air – dry, Gas	None	None	NA - No AEM or AMP	Consistent with NUREG-1801.

Table 3.3-1 Summary of Aging Management Programs in Chapter VII of NUREG-1801 for Auxiliary Systems (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1.115	Copper alloy (≤15% Zn and ≤8% Al) Piping, piping components, and piping elements exposed to Air with borated water leakage	None	None	NA - No AEM or AMP	Not applicable. Callaway has no in-scope copper alloy piping, piping components or piping elements exposed to air with borated water leakage in the auxiliary systems, so the applicable NUREG-1801 line was not used.
3.3.1.116	Galvanized steel Piping, piping components, and piping elements exposed to Air - indoor, uncontrolled	None	None	NA - No AEM or AMP	Consistent with NUREG-1801.

Table 3.3-1 Summary of Aging Management Programs in Chapter VII of NUREG-1801 for Auxiliary Systems (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1.117	Glass Piping elements exposed to Air – indoor, uncontrolled (External), Lubricating oil, Closed-cycle cooling water, Air – outdoor, Fuel oil, Raw water, Treated water, Treated borated water, Air with borated water leakage, Condensation (Internal/External) Gas	None	None	NA - No AEM or AMP	Consistent with NUREG-1801.
3.3.1.118	Nickel alloy Piping, piping components, and piping elements exposed to Air – indoor, uncontrolled (External)	None	None	NA - No AEM or AMP	Not applicable. Callaway has no in-scope nickel alloy piping, piping components or piping elements exposed to air - indoor, uncontrolled in the auxiliary systems, so the applicable NUREG-1801 line was not used.

Table 3.3-1 Summary of Aging Management Programs in Chapter VII of NUREG-1801 for Auxiliary Systems (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1.119	Nickel alloy, PVC, Glass Piping, piping components, and piping elements exposed to Air with borated water leakage, Air – indoor, uncontrolled, Condensation (Internal), Waste Water	None	None	NA - No AEM or AMP	Consistent with NUREG-1801.
3.3.1.120	Stainless steel Piping, piping components, and piping elements exposed to Air – indoor, uncontrolled (Internal/External), Air – indoor, uncontrolled (External), Air with borated water leakage, Concrete, Air – dry, Gas	None	None	NA - No AEM or AMP	Consistent with NUREG-1801.

Table 3.3-1 Summary of Aging Management Programs in Chapter VII of NUREG-1801 for Auxiliary Systems (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1.121	Steel Piping, piping components, and piping elements exposed to Air – indoor, controlled (External), Air – dry, Gas	None	None	NA - No AEM or AMP	Consistent with NUREG-1801.
3.3.1.122	Titanium Heat exchanger components, Piping, piping components, and piping elements exposed to Air – indoor, uncontrolled or Air – outdoor	None	None	NA - No AEM or AMP	Not applicable. Callaway has no in-scope titanium heat exchanger components, piping, piping components or piping elements exposed to air - indoor, uncontrolled or air - outdoor in the essential service water system, so the applicable NUREG-1801 lines were not used.

Table 3.3-1 Summary of Aging Management Programs in Chapter VII of NUREG-1801 for Auxiliary Systems (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1.123	Titanium (ASTM Grades 1,2, 7, 11, or 12 that contains > 5% aluminum or more than 0.20% oxygen or any amount of tin) Heat exchanger components other than tubes, Piping, piping components, and piping elements exposed to Raw water	None	None	NA - No AEM or AMP	Not applicable. Callaway has no in-scope titanium heat exchanger components, piping, piping components or piping elements exposed to raw water in the essential service water system, so the applicable NUREG-1801 lines were not used.

Table 3.3.2-1 Auxiliary Systems – Summary of Aging Management Evaluation – Fuel Storage and Handling System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Bolting (Structural)	SS	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B2.1.12)	III.B4.TP-248	3.5.1.080	E, 3
Bolting (Structural)	SS	Carbon Steel	Plant Indoor Air (Ext)	Loss of preload	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B2.1.12)	III.B4.TP-261	3.5.1.088	E, 4
Crane	SS	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B2.1.12)	VII.B.A-05	3.3.1.053	A
Crane	SS	Carbon Steel	Plant Indoor Air (Ext)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	None	None	H, 5
Crane	SS	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B2.1.12)	VII.B.A-07	3.3.1.052	A
Crane	SS	Stainless Steel	Plant Indoor Air (Ext)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	VII.B.A-06	3.3.1.001	A

Table 3.3.2-1 Auxiliary Systems – Summary of Aging Management Evaluation – Fuel Storage and Handling System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Crane	SS	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	C
Crane	SS	Stainless Steel	Treated Borated Water (Ext)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.A2.AP-79	3.3.1.029	E, 1
Cranes - Rails	SS	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B2.1.12)	VII.B.A-05	3.3.1.053	A
Fuel Handling Equip	SS	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B2.1.12)	VII.B.A-05	3.3.1.053	C
Fuel Handling Equip	SS	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Fuel Handling Equip	SS	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	C
Fuel Handling Equip	SS	Stainless Steel	Treated Borated Water (Ext)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.A2.AP-79	3.3.1.029	E, 1

Table 3.3.2-1 Auxiliary Systems – Summary of Aging Management Evaluation – Fuel Storage and Handling System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Fuel Storage Racks	AN	Boral	Treated Borated Water (Ext)	Reduction of neutron-absorbing capacity; change in dimensions and loss of material	Monitoring of Neutron-Absorbing Materials Other than Boraflex (B2.1.38)	VII.A2.AP-235	3.3.1.102	A
Fuel Storage Racks	SS	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Structures Monitoring (B2.1.31)	VII.A1.A-94	3.3.1.111	A
Fuel Storage Racks	SS	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	C
Fuel Storage Racks	SS	Stainless Steel	Treated Borated Water (Ext)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.A2.A-97	3.3.1.028	E, 1
Fuel Storage Racks	SS	Stainless Steel	Treated Borated Water (Ext)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.A2.AP-79	3.3.1.029	E, 1
Fuel Storage Racks	SS	Stainless Steel	Treated Borated Water (Ext)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	VII.E1.A-57	3.3.1.002	C, 2

Notes for Table 3.3.2-1:

Standard Notes:

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

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

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

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

Plant Specific Notes:

1 The One-Time Inspection program (B2.1.18) verifies the effectiveness of the Water Chemistry program (B2.1.2) in managing the aging of stainless steel components exposed to treated borated water.

2 Fatigue design of the spent fuel pool liner and racks for seismic events is a TLAA as defined in 10 CFR 54.3. TLAAs are evaluated in accordance with 10 CFR 54.21(c)(1). Section 4.3.6 describes the evaluation of these TLAAs for the fatigue design of the spent fuel pool liner and racks.

3 NUREG 1801 requires aging management for loss of material for structural bolting components associated with the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B2.1.12). Note E is used here to ensure the proper aging management program is employed for the managing of this aging effect for carbon steel structural bolting.

4 NUREG 1801 requires aging management for loss of preload for structural bolting components associated with the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B2.1.12). Note E is used here to ensure the proper aging management program is employed for the managing of this aging effect for carbon steel structural bolting.

5 This TLAA is applicable to the stainless steel refueling machine. Section 4.7.1 describes the evaluation of this TLAA.

Table 3.3.2-2 Auxiliary Systems – Summary of Aging Management Evaluation – Fuel Pool Cooling and Cleanup System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Closure Bolting	LBS, PB, SIA	Carbon Steel	Borated Water Leakage (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	IV.C2.R-12	3.1.1.066	A
Closure Bolting	LBS, PB, SIA	Carbon Steel	Borated Water Leakage (Ext)	Loss of material	Boric Acid Corrosion (B2.1.4)	VII.I.A-102	3.3.1.009	A
Closure Bolting	LBS, PB, SIA	Stainless Steel	Borated Water Leakage (Ext)	Cracking	Bolting Integrity (B2.1.8)	IV.C2.R-11	3.1.1.062	A
Closure Bolting	LBS, PB, SIA	Stainless Steel	Borated Water Leakage (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	IV.C2.R-12	3.1.1.066	A
Expansion Joint	ES	Stainless Steel	Treated Borated Water (Ext)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.A3.AP-79	3.3.1.029	E, 1
Expansion Joint	ES	Stainless Steel	Treated Borated Water (Ext)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-82	3.3.1.028	E, 1
Expansion Joint	ES	Stainless Steel	Borated Water Leakage (Int)	None	None	VII.J.AP-18	3.3.1.120	A
Flow Element	LBS, PB	Stainless Steel	Borated Water Leakage (Ext)	None	None	VII.J.AP-18	3.3.1.120	A
Flow Element	LBS, PB	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.A3.AP-79	3.3.1.029	E, 1
Flow Element	LBS, PB	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-82	3.3.1.028	E, 1
Fuel Transfer Tube	PB	Stainless Steel	Borated Water Leakage (Ext)	None	None	VII.J.AP-18	3.3.1.120	A

Table 3.3.2-2 Auxiliary Systems – Summary of Aging Management Evaluation – Fuel Pool Cooling and Cleanup System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Fuel Transfer Tube	PB	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.A3.AP-79	3.3.1.029	E, 1
Fuel Transfer Tube	PB	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-82	3.3.1.028	E, 1
Heat Exchanger (Fuel Pool Cooling)	PB	Carbon Steel	Borated Water Leakage (Ext)	Loss of material	Boric Acid Corrosion (B2.1.4)	VII.A3.A-79	3.3.1.009	A
Heat Exchanger (Fuel Pool Cooling)	PB	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.A3.AP-189	3.3.1.046	A
Heat Exchanger (Fuel Pool Cooling)	PB	Stainless Steel	Borated Water Leakage (Ext)	None	None	VII.J.AP-18	3.3.1.120	C
Heat Exchanger (Fuel Pool Cooling)	HT, PB	Stainless Steel	Closed Cycle Cooling Water (Ext)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.C2.A-52	3.3.1.049	C
Heat Exchanger (Fuel Pool Cooling)	HT, PB	Stainless Steel	Closed Cycle Cooling Water (Ext)	Reduction of heat transfer	Closed Treated Water Systems (B2.1.11)	VII.C2.AP-188	3.3.1.050	A

Table 3.3.2-2 Auxiliary Systems – Summary of Aging Management Evaluation – Fuel Pool Cooling and Cleanup System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Heat Exchanger (Fuel Pool Cooling)	HT, PB	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.A3.AP-79	3.3.1.029	E, 1
Heat Exchanger (Fuel Pool Cooling)	HT, PB	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-82	3.3.1.028	E, 1
Piping	LBS, PB, SIA	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.C2.AP-202	3.3.1.045	A
Piping	LBS, PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Piping	LBS, PB, SIA	Stainless Steel	Borated Water Leakage (Ext)	None	None	VII.J.AP-18	3.3.1.120	A
Piping	LBS, SIA	Stainless Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.E5.AP-273	3.3.1.095	B
Piping	LBS, SIA	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Piping	LBS, PB, SIA	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.A3.AP-79	3.3.1.029	E, 1

Table 3.3.2-2 Auxiliary Systems – Summary of Aging Management Evaluation – Fuel Pool Cooling and Cleanup System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Piping	PB	Stainless Steel	Treated Borated Water (Int)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	VII.E1.A-57	3.3.1.002	A
Piping	LBS, PB, SIA	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-82	3.3.1.028	E, 1
Pump	LBS, PB, SIA	Stainless Steel	Borated Water Leakage (Ext)	None	None	VII.J.AP-18	3.3.1.120	A
Pump	LBS, PB, SIA	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.A3.AP-79	3.3.1.029	E, 1
Pump	LBS, PB, SIA	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-82	3.3.1.028	E, 1
Strainer	PB	Stainless Steel	Borated Water Leakage (Ext)	None	None	VII.J.AP-18	3.3.1.120	A
Strainer	SIA	Stainless Steel	Treated Borated Water (Ext)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.A3.AP-79	3.3.1.029	E, 1
Strainer	SIA	Stainless Steel	Treated Borated Water (Ext)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-82	3.3.1.028	E, 1
Strainer	PB, SIA	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.A3.AP-79	3.3.1.029	E, 1

Table 3.3.2-2 Auxiliary Systems – Summary of Aging Management Evaluation – Fuel Pool Cooling and Cleanup System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Strainer	PB, SIA	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-82	3.3.1.028	E, 1
Thermowell	PB	Stainless Steel	Borated Water Leakage (Ext)	None	None	VII.J.AP-18	3.3.1.120	A
Thermowell	PB	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.A3.AP-79	3.3.1.029	E, 1
Thermowell	PB	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-82	3.3.1.028	E, 1
Tubing	LBS, PB	Stainless Steel	Borated Water Leakage (Ext)	None	None	VII.J.AP-18	3.3.1.120	A
Tubing	LBS, PB	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.A3.AP-79	3.3.1.029	E, 1
Tubing	LBS, PB	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-82	3.3.1.028	E, 1
Valve	PB	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.C2.AP-202	3.3.1.045	A
Valve	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A

Table 3.3.2-2 Auxiliary Systems – Summary of Aging Management Evaluation – Fuel Pool Cooling and Cleanup System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Valve	LBS, PB, SIA	Stainless Steel	Borated Water Leakage (Ext)	None	None	VII.J.AP-18	3.3.1.120	A
Valve	LBS, PB, SIA	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.A3.AP-79	3.3.1.029	E, 1
Valve	LBS, PB, SIA	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-82	3.3.1.028	E, 1

Notes for Table 3.3.2-2:

Standard Notes:

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

B Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.

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

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

Plant Specific Notes:

1 The One-Time Inspection program (B2.1.18) is used to verify the effectiveness of the Water Chemistry program (B2.1.2) to manage these aging effects.

Table 3.3.2-3 Auxiliary Systems – Summary of Aging Management Evaluation – Cranes, Hoists, and Elevators

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Bolting (Structural)	SS	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B2.1.12)	III.B4.TP-248	3.5.1.080	E, 1
Bolting (Structural)	SS	Carbon Steel	Plant Indoor Air (Ext)	Loss of preload	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B2.1.12)	III.B4.TP-261	3.5.1.088	E, 2
Crane	SS	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B2.1.12)	VII.B.A-07	3.3.1.052	A
Cranes - Rails	SS	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B2.1.12)	VII.B.A-05	3.3.1.053	A
Cranes - Rails	SS	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B2.1.12)	VII.B.A-07	3.3.1.052	A

Table 3.3.2-3 Auxiliary Systems – Summary of Aging Management Evaluation – Cranes, Hoists, and Elevators (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Hoist	SS	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B2.1.12)	VII.B.A-07	3.3.1.052	A
Trolley	SS	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B2.1.12)	VII.B.A-07	3.3.1.052	A

Notes for Table 3.3.2-3:

Standard Notes:

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

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

Plant Specific Notes:

1 NUREG 1801 requires aging management for loss of material for structural bolting components associated with the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B2.1.12). Note E is used to ensure the proper aging management program is employed for managing of this aging effect for carbon steel structural bolting.

2 NUREG 1801 requires aging management for loss of preload for structural bolting components associated with the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B2.1.12). Note E is used to ensure the proper aging management program is employed for managing of this aging effect for carbon steel structural bolting.

Table 3.3.2-4 Auxiliary Systems – Summary of Aging Management Evaluation – Essential Service Water System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Closure Bolting	LBS, PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	VII.I.AP-124	3.3.1.015	A
Closure Bolting	LBS, PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.8)	VII.I.AP-125	3.3.1.012	A
Closure Bolting	LBS, PB, SIA	Stainless Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	VII.I.AP-124	3.3.1.015	A
Closure Bolting	LBS, PB, SIA	Stainless Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.8)	VII.I.AP-125	3.3.1.012	A
Filter	FIL	Stainless Steel	Raw Water (Ext)	Loss of material	Open-Cycle Cooling Water System (B2.1.10)	VII.C1.A-54	3.3.1.040	C
Flow Element	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Flow Element	PB	Stainless Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.10)	VII.C1.A-54	3.3.1.040	A
Flow Orifice	PB, TH	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Flow Orifice	PB, TH	Stainless Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.10)	VII.C1.A-54	3.3.1.040	A
Piping	PB	Carbon Steel	Buried (Ext)	Loss of material	Buried and Underground Piping and Tanks (B2.1.25)	VII.C1.AP-198	3.3.1.106	B
Piping	PB	Carbon Steel	Concrete (Ext)	None	None	VII.J.AP-282	3.3.1.112	A
Piping	LBS, PB, SIA	Carbon Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.E5.AP-280	3.3.1.095	B

Table 3.3.2-4 Auxiliary Systems – Summary of Aging Management Evaluation – Essential Service Water System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Piping	LBS, PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Piping	PB	Carbon Steel	Raw Water (Ext)	Loss of material	Open-Cycle Cooling Water System (B2.1.10)	VII.C1.AP-194	3.3.1.037	A
Piping	LBS, PB, SIA	Carbon Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.10)	VII.C1.AP-194	3.3.1.037	A
Piping	PB	HDPE	Buried (Ext)	Cracking	Time-Limited Aging Analysis evaluated for the period of extended operation	None	None	H, 4
Piping	PB	HDPE	Buried (Ext)	Cracking, blistering, change in color	Buried and Underground Piping and Tanks (B2.1.25)	VII.C1.AP-175	3.3.1.104	B
Piping	PB	HDPE	Plant Indoor Air (Ext)	None	None	None	None	G, 3
Piping	PB	HDPE	Raw Water (Int)	Cracking, blistering, change in color	Open-Cycle Cooling Water System (B2.1.10)	VII.C1.AP-239	3.3.1.030a	A
Piping	PB	HDPE	Underground (Ext)	Cracking, blistering, change in color	Buried and Underground Piping and Tanks (B2.1.25)	None	None	G, 2
Piping	PB	Stainless Steel	Buried (Ext)	Loss of material	Buried and Underground Piping and Tanks (B2.1.25)	VII.C1.AP-137	3.3.1.107	B

Table 3.3.2-4 Auxiliary Systems – Summary of Aging Management Evaluation – Essential Service Water System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Piping	LBS, PB, SIA	Stainless Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.E5.AP-273	3.3.1.095	B
Piping	LBS, PB, SIA	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Piping	LBS, PB, SIA	Stainless Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.10)	VII.C1.A-54	3.3.1.040	A
Piping	PB	Stainless Steel	Underground (Ext)	Loss of material	Buried and Underground Piping and Tanks (B2.1.25)	VII.I.AP-284	3.3.1.109a	B
Pump	LBS	Cast Iron (Gray Cast Iron)	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Pump	LBS	(Gray Cast Iron)	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.10)	VII.C1.AP-194	3.3.1.037	A
Pump	LBS	(Gray Cast Iron)	Raw Water (Int)	Loss of material	Selective Leaching (B2.1.19)	VII.C1.A-51	3.3.1.072	B
Pump	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Pump	PB	Stainless Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.10)	VII.C1.A-54	3.3.1.040	A
Screen	FIL	Carbon Steel	Raw Water (Ext)	Loss of material	Open-Cycle Cooling Water System (B2.1.10)	VII.C1.AP-194	3.3.1.037	C

Table 3.3.2-4 Auxiliary Systems – Summary of Aging Management Evaluation – Essential Service Water System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Splash Panel	HS	Asbestos Cement	Raw Water (Ext)	Cracking and Changes in material properties	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.C1.AP-155	3.3.1.032	E, 1
Splash Panel	HS	Cellulose Silica Cement	Raw Water (Ext)	Cracking and Changes in material properties	External Surfaces Monitoring of Mechanical Components (B2.1.21)	None	None	F
Spray Nozzle	SP	Copper Alloy	Atmosphere/ Weather (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.AP-159	3.3.1.081	C
Spray Nozzle	SP	Copper Alloy	Raw Water (Ext)	Loss of material	Open-Cycle Cooling Water System (B2.1.10)	VII.C1.AP-196	3.3.1.036	C
Strainer	FIL, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Strainer	FIL, PB	Carbon Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.10)	VII.C1.AP-194	3.3.1.037	A
Tank	PB	Stainless Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.E5.AP-273	3.3.1.095	D
Tank	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	C
Tank	PB	Stainless Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.10)	VII.C1.A-54	3.3.1.040	C

Table 3.3.2-4 Auxiliary Systems – Summary of Aging Management Evaluation – Essential Service Water System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Thermowell	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	C
Thermowell	PB	Stainless Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.10)	VII.C1.A-54	3.3.1.040	C
Tubing	LBS, PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Tubing	LBS, PB	Stainless Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.10)	VII.C1.A-54	3.3.1.040	A
Valve	LBS, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Valve	LBS, PB	Carbon Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.10)	VII.C1.AP-194	3.3.1.037	A
Valve	LBS, PB, SIA	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Valve	LBS, PB, SIA	Stainless Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.10)	VII.C1.A-54	3.3.1.040	A
Valve	PB	Stainless Steel	Underground (Ext)	Loss of material	Buried and Underground Piping and Tanks (B2.1.25)	VII.I.AP-284	3.3.1.109a	B
Valve	PB	Stainless Steel Cast Austenitic	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Valve	PB	Stainless Steel Cast Austenitic	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.10)	VII.C1.A-54	3.3.1.040	A

Notes for Table 3.3.2-4:

Standard Notes:

- A Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.
- B Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.
- C Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.
- D Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.
- E Consistent with NUREG-1801 for material, environment, and aging effect, but a different aging management program is credited or NUREG-1801 identifies a plant-specific aging management program.
- F Material not in NUREG-1801 for this component.
- G Environment not in NUREG-1801 for this component and material.
- H Aging effect not in NUREG-1801 for this component, material, and environment combination.

Plant Specific Notes:

1. External Surfaces Monitoring of Mechanical Components program (B2.1.21) is used instead of Open Cycle Cooling Water program (B2.1.10) to manage the aging of the external surfaces of nonsafety-related components exposed to raw water.
2. HDPE piping is in an underground vault and potentially exposed to groundwater.
3. HDPE components in a plant indoor air environment are not exposed to an aggressive chemical environment that would concentrate contaminants and degrade HDPE chemical and mechanical properties. HDPE is not exposed to ozone, ionizing radiation or a UV source (sunlight or fluorescent light) that would result in aging. Operating temperatures do not exceed 140°F. HDPE components in a plant indoor air environment have no aging effects requiring aging management.
4. This TLAA is applicable to the high-density polyethylene (HDPE) piping. Section 4.7.7 describes the evaluation of this TLAA for the replacement ESW piping.

Table 3.3.2-5 Auxiliary Systems – Summary of Aging Management Evaluation – Service Water System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Closure Bolting	LBS, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	VII.I.AP-124	3.3.1.015	A
Closure Bolting	LBS, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.8)	VII.I.AP-125	3.3.1.012	A
Closure Bolting	LBS, PB, SIA	Stainless Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	VII.I.AP-124	3.3.1.015	A
Closure Bolting	LBS, PB, SIA	Stainless Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.8)	VII.I.AP-125	3.3.1.012	A
Piping	PB, SIA	Carbon Steel	Buried (Ext)	Loss of material	Buried and Underground Piping and Tanks (B2.1.25)	VII.C1.AP-198	3.3.1.106	B
Piping	LBS, PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Piping	LBS, PB, SIA	Carbon Steel	Raw Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.C1.AP-194	3.3.1.037	E, 1
Piping	LBS, PB, SIA	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Piping	LBS, PB, SIA	Stainless Steel	Raw Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.C1.A-54	3.3.1.040	E, 1

Table 3.3.2-5 Auxiliary Systems – Summary of Aging Management Evaluation – Service Water System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Pump	PB	Cast Iron (Gray Cast Iron)	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Pump	PB	Cast Iron (Gray Cast Iron)	Raw Water (Ext)	Loss of material	Selective Leaching (B2.1.19)	VII.C1.A-51	3.3.1.072	B
Pump	PB	Cast Iron (Gray Cast Iron)	Raw Water (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.C1.AP-194	3.3.1.037	E, 2
Pump	PB	Cast Iron (Gray Cast Iron)	Raw Water (Int)	Loss of material	Selective Leaching (B2.1.19)	VII.C1.A-51	3.3.1.072	B
Pump	PB	Cast Iron (Gray Cast Iron)	Raw Water (Int)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.C1.AP-194	3.3.1.037	E, 3
Strainer	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Strainer	PB	Carbon Steel	Raw Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.C1.AP-194	3.3.1.037	E, 1
Thermowell	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A

Table 3.3.2-5 Auxiliary Systems – Summary of Aging Management Evaluation – Service Water System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Thermowell	PB	Stainless Steel	Raw Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.C1.A-54	3.3.1.040	E, 1
Tubing	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Tubing	PB	Carbon Steel	Raw Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.C1.AP-194	3.3.1.037	E, 1
Tubing	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Tubing	PB	Stainless Steel	Raw Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.C1.A-54	3.3.1.040	E, 1
Valve	LBS, PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Valve	LBS, PB, SIA	Carbon Steel	Raw Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.C1.AP-194	3.3.1.037	E, 1

Table 3.3.2-5 Auxiliary Systems – Summary of Aging Management Evaluation – Service Water System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Valve	PB	Cast Iron (Gray Cast Iron)	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Valve	PB	Cast Iron (Gray Cast Iron)	Raw Water (Int)	Loss of material	Selective Leaching (B2.1.19)	VII.C1.A-51	3.3.1.072	B
Valve	PB	Cast Iron (Gray Cast Iron)	Raw Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.C1.AP-194	3.3.1.037	E, 1
Valve	PB	Copper Alloy	Plant Indoor Air (Ext)	None	None	VII.J.AP-144	3.3.1.114	A
Valve	PB	Copper Alloy	Raw Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.C1.AP-196	3.3.1.036	E, 1
Valve	PB	Ductile Iron	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Valve	PB	Ductile Iron	Raw Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.C1.AP-194	3.3.1.037	E, 1
Valve	LBS, PB, SIA	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A

Table 3.3.2-5 Auxiliary Systems – Summary of Aging Management Evaluation – Service Water System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Valve	LBS, PB, SIA	Stainless Steel	Raw Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.C1.A-54	3.3.1.040	E, 1

Notes for Table 3.3.2-5:

Standard Notes:

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

B Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.

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

Plant Specific Notes:

1 NUREG-1801, Section XI.M20, *Open-Cycle Cooling Water System* is for water which cools safety-related components and rejects heat to the ultimate heat sink. Since the service water system rejects heat to the circulating water system and is nonsafety-related, the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program (B2.1.23) is credited.

2 External Surfaces Monitoring of Mechanical Components program (B2.1.21) is used instead of Open-Cycle Cooling Water program (B2.1.10) to manage the aging of the external surfaces of nonsafety-related components exposed to raw water.

3 Since the internal and external environments for this component are the same, the External Surfaces Monitoring of Mechanical Components (B2.1.21) is credited to manage the aging of the internal surfaces of this component.

Table 3.3.2-6 Auxiliary Systems – Summary of Aging Management Evaluation – Reactor Makeup Water System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Closure Bolting	LBS, PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	VII.I.AP-124	3.3.1.015	A
Closure Bolting	LBS, PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.8)	VII.I.AP-125	3.3.1.012	A
Closure Bolting	LBS, PB, SIA	Stainless Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	VII.I.AP-124	3.3.1.015	A
Closure Bolting	LBS, PB, SIA	Stainless Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.8)	VII.I.AP-125	3.3.1.012	A
Flow Orifice	LBS	Stainless Steel	Demineralized Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.E.SP-87	3.4.1.016	A
Flow Orifice	LBS	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Piping	LBS	Stainless Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VIII.B1.SP-110	3.4.1.039	B
Piping	LBS, PB, SIA	Stainless Steel	Demineralized Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.E.SP-87	3.4.1.016	A
Piping	LBS, PB, SIA	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Pump	LBS	Stainless Steel	Demineralized Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.E.SP-87	3.4.1.016	A

Table 3.3.2-6 Auxiliary Systems – Summary of Aging Management Evaluation – Reactor Makeup Water System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Pump	LBS	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Tubing	LBS, PB	Stainless Steel	Demineralized Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.E.SP-87	3.4.1.016	A
Tubing	LBS, PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Valve	LBS, PB	Stainless Steel	Demineralized Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.E.SP-87	3.4.1.016	A
Valve	LBS, PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Valve	LBS, PB, SIA	Stainless Steel Cast Austenitic	Demineralized Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.E.SP-87	3.4.1.016	A
Valve	LBS, PB, SIA	Stainless Steel Cast Austenitic	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A

Notes for Table 3.3.2-6:

Standard Notes:

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

B Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.

Plant Specific Notes:

None

Table 3.3.2-7 Auxiliary Systems – Summary of Aging Management Evaluation – Component Cooling Water System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Closure Bolting	LBS, PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	VII.I.AP-124	3.3.1.015	A
Closure Bolting	LBS, PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.8)	VII.I.AP-125	3.3.1.012	A
Closure Bolting	LBS, PB, SIA	Stainless Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	VII.I.AP-124	3.3.1.015	A
Closure Bolting	LBS, PB, SIA	Stainless Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.8)	VII.I.AP-125	3.3.1.012	A
Corrosion Coupon Rack	PB	Stainless Steel	Closed Cycle Cooling Water (Ext)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.C2.A-52	3.3.1.049	C
Flow Element	LBS, PB, SIA	Stainless Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.C2.A-52	3.3.1.049	A
Flow Element	LBS, PB, SIA	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Flow Orifice	PB, TH	Stainless Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.C2.A-52	3.3.1.049	A
Flow Orifice	PB, TH	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Heat Exchanger (CCW Heat Exchanger)	PB	Carbon Steel	Closed Cycle Cooling Water (Ext)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.C2.AP-189	3.3.1.046	A

Table 3.3.2-7 Auxiliary Systems – Summary of Aging Management Evaluation – Component Cooling Water System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Heat Exchanger (CCW Heat Exchanger)	PB	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.C2.AP-189	3.3.1.046	A
Heat Exchanger (CCW Heat Exchanger)	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Heat Exchanger (CCW Heat Exchanger)	PB	Carbon Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.10)	VII.C1.AP-183	3.3.1.038	A
Heat Exchanger (CCW Heat Exchanger)	HT, PB	Copper Alloy	Closed Cycle Cooling Water (Ext)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.C2.AP-199	3.3.1.046	C
Heat Exchanger (CCW Heat Exchanger)	HT, PB	Copper Alloy	Closed Cycle Cooling Water (Ext)	Reduction of heat transfer	Closed Treated Water Systems (B2.1.11)	VII.C2.AP-205	3.3.1.050	A
Heat Exchanger (CCW Heat Exchanger)	HT, PB	Copper Alloy	Raw Water (Int)	Reduction of heat transfer	Open-Cycle Cooling Water System (B2.1.10)	VII.C1.A-72	3.3.1.042	A

Table 3.3.2-7 Auxiliary Systems – Summary of Aging Management Evaluation – Component Cooling Water System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Heat Exchanger (CCW Heat Exchanger)	HT, PB	Copper Alloy	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.10)	VII.C1.AP-196	3.3.1.036	C
Piping	LBS, PB, SIA	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.C2.AP-202	3.3.1.045	A
Piping	LBS, PB	Carbon Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.G.A-23	3.3.1.089	B
Piping	LBS, PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Piping	PB	Carbon Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.10)	VII.C1.AP-183	3.3.1.038	C
Piping	LBS, PB, SIA	Stainless Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.C2.A-52	3.3.1.049	A
Piping	LBS	Stainless Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VIII.B1.SP-110	3.4.1.039	B

Table 3.3.2-7 Auxiliary Systems – Summary of Aging Management Evaluation – Component Cooling Water System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Piping	LBS, PB, SIA	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Pump	PB	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.C2.AP-202	3.3.1.045	A
Pump	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Sight Gauge	LBS, SIA	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.C2.AP-202	3.3.1.045	A
Sight Gauge	LBS, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Sight Gauge	LBS, SIA	Glass	Closed Cycle Cooling Water (Int)	None	None	VII.J.AP-166	3.3.1.117	A
Sight Gauge	LBS, SIA	Glass	Plant Indoor Air (Ext)	None	None	VII.J.AP-14	3.3.1.117	A
Tank	LBS, PB, SIA	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.C2.AP-202	3.3.1.045	A

Table 3.3.2-7 Auxiliary Systems – Summary of Aging Management Evaluation – Component Cooling Water System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Tank	PB	Carbon Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.G.A-23	3.3.1.089	D
Tank	LBS, PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Tubing	LBS, PB	Stainless Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.C2.A-52	3.3.1.049	A
Tubing	LBS, PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Valve	LBS, PB, SIA	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.C2.AP-202	3.3.1.045	A
Valve	LBS, PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Valve	PB	Carbon Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.10)	VII.C1.AP-183	3.3.1.038	C
Valve	LBS, SIA	Stainless Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.C2.A-52	3.3.1.049	A

Table 3.3.2-7 Auxiliary Systems – Summary of Aging Management Evaluation – Component Cooling Water System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Valve	LBS, SIA	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A

Notes for Table 3.3.2-7:

Standard Notes:

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

B Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.

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

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

Plant Specific Notes:

None

Table 3.3.2-8 Auxiliary Systems – Summary of Aging Management Evaluation – Compressed Air System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Closure Bolting	PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	VII.I.AP-124	3.3.1.015	A
Closure Bolting	PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.8)	VII.I.AP-125	3.3.1.012	A
Closure Bolting	PB, SIA	Copper Alloy	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	VII.I.AP-261	3.3.1.015	A
Closure Bolting	PB, SIA	Stainless Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	VII.I.AP-124	3.3.1.015	A
Closure Bolting	PB, SIA	Stainless Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.8)	VII.I.AP-125	3.3.1.012	A
Flow Orifice	SIA	Stainless Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.D.AP-81	3.3.1.056	E, 1
Flow Orifice	SIA	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Piping	LBS, PB, SIA	Carbon Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.D.A-26	3.3.1.055	E, 1
Piping	PB, SIA	Carbon Steel	Dry Gas (Int)	None	None	VII.J.AP-6	3.3.1.121	A
Piping	LBS, PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.D.A-80	3.3.1.078	A

Table 3.3.2-8 Auxiliary Systems – Summary of Aging Management Evaluation – Compressed Air System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Piping	LBS, SIA	Copper Alloy	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.D.AP-240	3.3.1.054	E, 1
Piping	LBS, SIA	Copper Alloy	Plant Indoor Air (Ext)	None	None	VII.J.AP-144	3.3.1.114	A
Piping	LBS, PB, SIA	Stainless Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.D.AP-81	3.3.1.056	E, 1
Piping	LBS, PB, SIA	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Tank	PB	Carbon Steel	Dry Gas (Int)	None	None	VII.J.AP-6	3.3.1.121	C
Tank	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.D.A-80	3.3.1.078	A
Tubing	PB	Stainless Steel	Dry Gas (Int)	None	None	VII.J.AP-22	3.3.1.120	A
Tubing	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A

Table 3.3.2-8 Auxiliary Systems – Summary of Aging Management Evaluation – Compressed Air System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Valve	PB, SIA	Carbon Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.D.A-26	3.3.1.055	E, 1
Valve	PB	Carbon Steel	Dry Gas (Int)	None	None	VII.J.AP-6	3.3.1.121	A
Valve	PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.D.A-80	3.3.1.078	A
Valve	SIA	Copper Alloy	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.D.AP-240	3.3.1.054	E, 1
Valve	SIA	Copper Alloy	Plant Indoor Air (Ext)	None	None	VII.J.AP-144	3.3.1.114	A
Valve	PB, SIA	Stainless Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.D.AP-81	3.3.1.056	E, 1
Valve	PB	Stainless Steel	Dry Gas (Int)	None	None	VII.J.AP-22	3.3.1.120	A
Valve	PB, SIA	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A

Notes for Table 3.3.2-8:

Standard Notes:

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

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

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

Plant Specific Notes:

1 NUREG-1801, Section XI.M24, *Compressed Air Monitoring* applies to monitoring the piping and components associated with the air compressors and dryers. Air compressor and dryer piping and components are not within the scope of license renewal for Callaway. In-scope piping and components are associated with containment penetrations and nitrogen gas piping and components for backup closure of valves. The Internal Surfaces in Miscellaneous Piping and Ducting Components requires internal inspections consistent with the NUREG-1801, Section M24, *Compressed Air Monitoring*. Therefore, for components associated with the compressed air system, the Internal Surfaces in Miscellaneous Piping and Ducting Components program (B2.1.23) is credited rather than Compressed Air Monitoring.

Table 3.3.2-9 Auxiliary Systems – Summary of Aging Management Evaluation – Nuclear Sampling System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Closure Bolting	LBS, PB	Stainless Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	VII.I.AP-124	3.3.1.015	A
Closure Bolting	LBS, PB	Stainless Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.8)	VII.I.AP-125	3.3.1.012	A
Piping	LBS, SIA	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.C2.AP-202	3.3.1.045	A
Piping	LBS, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Piping	LBS, PB, SIA	Stainless Steel	Borated Water Leakage (Ext)	None	None	VII.J.AP-18	3.3.1.120	A
Piping	PB	Stainless Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F2.AP-99	3.3.1.094	D
Piping	LBS, SIA	Stainless Steel	Demineralized Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.F.SP-87	3.4.1.016	A
Piping	LBS, PB, SIA	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A

Table 3.3.2-9 Auxiliary Systems – Summary of Aging Management Evaluation – Nuclear Sampling System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Piping	PB	Stainless Steel	Treated Borated Water (Int)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	VII.E1.A-57	3.3.1.002	A
Piping	LBS, PB, SIA	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-79	3.3.1.029	E, 1
Piping	LBS, PB, SIA	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-82	3.3.1.028	E, 1
Pump	LBS	Stainless Steel	Borated Water Leakage (Ext)	None	None	VII.J.AP-18	3.3.1.120	A
Pump	LBS	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-79	3.3.1.029	E, 1
Solenoid Valve	PB	Stainless Steel	Borated Water Leakage (Ext)	None	None	VII.J.AP-18	3.3.1.120	A
Solenoid Valve	PB	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-79	3.3.1.029	E, 1
Tank	LBS	Stainless Steel	Borated Water Leakage (Ext)	None	None	VII.J.AP-18	3.3.1.120	C

Table 3.3.2-9 Auxiliary Systems – Summary of Aging Management Evaluation – Nuclear Sampling System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Tank	LBS	Stainless Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F2.AP-99	3.3.1.094	D
Tank	LBS	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	C
Tank	LBS	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-79	3.3.1.029	E, 1
Tubing	LBS, PB	Stainless Steel	Borated Water Leakage (Ext)	None	None	VII.J.AP-18	3.3.1.120	A
Tubing	LBS	Stainless Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F2.AP-99	3.3.1.094	D
Tubing	LBS	Stainless Steel	Demineralized Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.F.SP-87	3.4.1.016	A
Tubing	LBS	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A

Table 3.3.2-9 Auxiliary Systems – Summary of Aging Management Evaluation – Nuclear Sampling System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Tubing	LBS, PB	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-79	3.3.1.029	E, 1
Tubing	LBS, PB	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-82	3.3.1.028	E, 1
Valve	LBS, PB, SIA	Stainless Steel	Borated Water Leakage (Ext)	None	None	VII.J.AP-18	3.3.1.120	A
Valve	LBS	Stainless Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F2.AP-99	3.3.1.094	D
Valve	LBS	Stainless Steel	Demineralized Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.F.SP-87	3.4.1.016	A
Valve	LBS	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Valve	LBS	Stainless Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.F.SP-87	3.4.1.016	A

Table 3.3.2-9 Auxiliary Systems – Summary of Aging Management Evaluation – Nuclear Sampling System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Valve	LBS, PB, SIA	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-79	3.3.1.029	E, 1
Valve	LBS, PB, SIA	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-82	3.3.1.028	E, 1

Notes for Table 3.3.2-9:

Standard Notes:

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

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

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

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

Plant Specific Notes:

1 The One-Time Inspection program (B2.1.18) is used to verify the effectiveness of the Water Chemistry program (B2.1.2) to manage these aging effects.

Table 3.3.2-10 Auxiliary Systems – Summary of Aging Management Evaluation – Chemical and Volume Control System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Bellows	LBS, PB	Stainless Steel	Borated Water Leakage (Ext)	None	None	VII.J.AP-18	3.3.1.120	A
Bellows	LBS, PB	Stainless Steel	Demineralized Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.D1.SP-87	3.4.1.016	A
Bellows	LBS, PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Bellows	LBS, PB	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-79	3.3.1.029	E, 2
Bellows	LBS, PB	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-82	3.3.1.028	E, 2
Chiller	LBS	Cast Iron	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.24) and One-Time Inspection (B2.1.18)	VII.H2.AP-131	3.3.1.098	A
Chiller	LBS	Cast Iron	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Class 1 Piping < NPS 4	PB	Stainless Steel	Borated Water Leakage (Ext)	None	None	IV.E.RP-05	3.1.1.107	A
Class 1 Piping < NPS 4	PB	Stainless Steel	Reactor Coolant (Int)	Loss of material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1.088	A

Table 3.3.2-10 Auxiliary Systems – Summary of Aging Management Evaluation – Chemical and Volume Control System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Class 1 Piping < NPS 4	PB	Stainless Steel	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) for Class 1 components and Water Chemistry (B2.1.2) and One-Time Inspection of ASME Code Class 1 Small-Bore Piping (B2.1.20)	IV.C2.RP-235	3.1.1.039	A
Closure Bolting	LBS, PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	VII.I.AP-124	3.3.1.015	A
Closure Bolting	LBS, PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.8)	VII.I.AP-125	3.3.1.012	A
Closure Bolting	LBS, PB, SIA	Stainless Steel	Borated Water Leakage (Ext)	Cracking	Bolting Integrity (B2.1.8)	IV.C2.R-11	3.1.1.062	A
Closure Bolting	LBS, PB, SIA	Stainless Steel	Borated Water Leakage (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	IV.C2.R-12	3.1.1.066	A
Condenser	SIA	Carbon Steel	Dry Gas (Int)	None	None	VII.J.AP-6	3.3.1.121	A
Condenser	SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Demineralizer	LBS, SIA	Stainless Steel	Borated Water Leakage (Ext)	None	None	VII.J.AP-18	3.3.1.120	A

Table 3.3.2-10 Auxiliary Systems – Summary of Aging Management Evaluation – Chemical and Volume Control System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Demineralizer	LBS, SIA	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-79	3.3.1.029	E, 2
Demineralizer	LBS, SIA	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-82	3.3.1.028	E, 2
Filter	PB	Carbon Steel	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.24) and One-Time Inspection (B2.1.18)	VII.E1.AP-127	3.3.1.097	A
Filter	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Filter	LBS	Copper Alloy	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.24) and One-Time Inspection (B2.1.18)	VII.E1.AP-133	3.3.1.099	A
Filter	LBS	Copper Alloy	Plant Indoor Air (Ext)	None	None	VII.J.AP-144	3.3.1.114	A
Filter	FIL, PB	Stainless Steel	Borated Water Leakage (Ext)	None	None	VII.J.AP-18	3.3.1.120	A
Filter	FIL, PB	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-79	3.3.1.029	E, 2
Filter	FIL, PB	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-82	3.3.1.028	E, 2

Table 3.3.2-10 Auxiliary Systems – Summary of Aging Management Evaluation – Chemical and Volume Control System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Flow Element	LBS	Carbon Steel	Demineralized Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.D1.SP-74	3.4.1.013	A
Flow Element	LBS	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Flow Element	LBS, PB	Stainless Steel	Borated Water Leakage (Ext)	None	None	VII.J.AP-18	3.3.1.120	A
Flow Element	LBS, PB	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-79	3.3.1.029	E, 2
Flow Element	LBS, PB	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-82	3.3.1.028	E, 2
Flow Orifice	LBS, PB, TH	Stainless Steel	Borated Water Leakage (Ext)	None	None	VII.J.AP-18	3.3.1.120	A
Flow Orifice	LBS, PB, TH	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-79	3.3.1.029	E, 2
Flow Orifice	LBS, PB, TH	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-82	3.3.1.028	E, 2
Heat Exchanger (CVCS BTRS Letdown Chiller)	LBS	Carbon Steel	Demineralized Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.E.SP-77	3.4.1.015	A

Table 3.3.2-10 Auxiliary Systems – Summary of Aging Management Evaluation – Chemical and Volume Control System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Heat Exchanger (CVCS BTRS Letdown Chiller)	LBS	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.H2.AP-41	3.3.1.080	A
Heat Exchanger (CVCS BTRS Letdown Chiller)	LBS	Stainless Steel	Borated Water Leakage (Ext)	None	None	VII.J.AP-18	3.3.1.120	C
Heat Exchanger (CVCS BTRS Letdown Chiller)	LBS	Stainless Steel	Demineralized Water (Ext)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.E.SP-80	3.4.1.016	A
Heat Exchanger (CVCS BTRS Letdown Chiller)	LBS	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-79	3.3.1.029	E, 2
Heat Exchanger (CVCS BTRS Letdown Reheat - Shell)	LBS, SIA	Stainless Steel	Borated Water Leakage (Ext)	None	None	VII.J.AP-18	3.3.1.120	C

Table 3.3.2-10 Auxiliary Systems – Summary of Aging Management Evaluation – Chemical and Volume Control System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Heat Exchanger (CVCS BTRS Letdown Reheat - Shell)	LBS, SIA	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-79	3.3.1.029	E, 2
Heat Exchanger (CVCS BTRS Letdown Reheat - Shell)	LBS, SIA	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-118	3.3.1.020	A
Heat Exchanger (CVCS BTRS Letdown Reheat - Shell)	LBS, SIA	Stainless Steel	Treated Borated Water (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	VII.E1.AP-119	3.3.1.008	A
Heat Exchanger (CVCS BTRS Letdown Reheat - Tube)	PB	Stainless Steel	Borated Water Leakage (Ext)	None	None	VII.J.AP-18	3.3.1.120	C
Heat Exchanger (CVCS BTRS Letdown Reheat - Tube)	PB	Stainless Steel	Treated Borated Water (Ext)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-79	3.3.1.029	E, 2

Table 3.3.2-10 Auxiliary Systems – Summary of Aging Management Evaluation – Chemical and Volume Control System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Heat Exchanger (CVCS BTRS Letdown Reheat - Tube)	PB	Stainless Steel	Treated Borated Water (Ext)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-118	3.3.1.020	A
Heat Exchanger (CVCS BTRS Letdown Reheat - Tube)	PB	Stainless Steel	Treated Borated Water (Ext)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	VII.E1.AP-119	3.3.1.008	A
Heat Exchanger (CVCS BTRS Letdown Reheat - Tube)	PB	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-79	3.3.1.029	E, 2
Heat Exchanger (CVCS BTRS Letdown Reheat - Tube)	PB	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-118	3.3.1.020	A
Heat Exchanger (CVCS BTRS Letdown Reheat - Tube)	PB	Stainless Steel	Treated Borated Water (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	VII.E1.AP-119	3.3.1.008	A

Table 3.3.2-10 Auxiliary Systems – Summary of Aging Management Evaluation – Chemical and Volume Control System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Heat Exchanger (CVCS BTRS Letdown Reheat)	PB	Stainless Steel	Treated Borated Water (Int)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	VII.E1.A-100	3.3.1.002	A
Heat Exchanger (CVCS BTRS Moderating)	LBS	Stainless Steel	Borated Water Leakage (Ext)	None	None	VII.J.AP-18	3.3.1.120	C
Heat Exchanger (CVCS BTRS Moderating)	LBS	Stainless Steel	Treated Borated Water (Ext)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-79	3.3.1.029	E, 2
Heat Exchanger (CVCS BTRS Moderating)	LBS	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-79	3.3.1.029	E, 2
Heat Exchanger (CVCS Excess Letdown)	PB	Carbon Steel	Closed Cycle Cooling Water (Int)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	None	None	H, 4
Heat Exchanger (CVCS Excess Letdown)	PB	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.E1.AP-189	3.3.1.046	A

Table 3.3.2-10 Auxiliary Systems – Summary of Aging Management Evaluation – Chemical and Volume Control System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Heat Exchanger (CVCS Excess Letdown)	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.H2.AP-41	3.3.1.080	A
Heat Exchanger (CVCS Excess Letdown)	PB	Stainless Steel	Borated Water Leakage (Ext)	None	None	VII.J.AP-18	3.3.1.120	C
Heat Exchanger (CVCS Excess Letdown)	PB	Stainless Steel	Closed Cycle Cooling Water (Ext)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.C2.A-52	3.3.1.049	C
Heat Exchanger (CVCS Excess Letdown)	PB	Stainless Steel	Closed Cycle Cooling Water (Ext)	Cracking	Closed Treated Water Systems (B2.1.11)	VII.C2.AP-186	3.3.1.043	C
Heat Exchanger (CVCS Excess Letdown)	PB	Stainless Steel	Treated Borated Water (Int)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	VII.E1.A-100	3.3.1.002	A
Heat Exchanger (CVCS Excess Letdown)	PB	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-79	3.3.1.029	E, 2

Table 3.3.2-10 Auxiliary Systems – Summary of Aging Management Evaluation – Chemical and Volume Control System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Heat Exchanger (CVCS Excess Letdown)	PB	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-118	3.3.1.020	A
Heat Exchanger (CVCS Excess Letdown)	PB	Stainless Steel	Treated Borated Water (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	VII.E1.AP-119	3.3.1.008	A
Heat Exchanger (CVCS Letdown)	PB	Carbon Steel	Closed Cycle Cooling Water (Int)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	None	None	H, 4
Heat Exchanger (CVCS Letdown)	PB	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.E1.AP-189	3.3.1.046	A
Heat Exchanger (CVCS Letdown)	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.H2.AP-41	3.3.1.080	A
Heat Exchanger (CVCS Letdown)	PB	Stainless Steel	Borated Water Leakage (Ext)	None	None	VII.J.AP-18	3.3.1.120	C

Table 3.3.2-10 Auxiliary Systems – Summary of Aging Management Evaluation – Chemical and Volume Control System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Heat Exchanger (CVCS Letdown)	PB	Stainless Steel	Closed Cycle Cooling Water (Ext)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.C2.A-52	3.3.1.049	C
Heat Exchanger (CVCS Letdown)	PB	Stainless Steel	Closed Cycle Cooling Water (Ext)	Cracking	Closed Treated Water Systems (B2.1.11)	VII.C2.AP-186	3.3.1.043	C
Heat Exchanger (CVCS Letdown)	PB	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.A-69	3.3.1.003	E, 2
Heat Exchanger (CVCS Letdown)	PB	Stainless Steel	Treated Borated Water (Int)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	VII.E1.A-100	3.3.1.002	A
Heat Exchanger (CVCS Letdown)	PB	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-79	3.3.1.029	E, 2
Heat Exchanger (CVCS Regenerative)	PB	Stainless Steel	Borated Water Leakage (Ext)	None	None	VII.J.AP-18	3.3.1.120	C

Table 3.3.2-10 Auxiliary Systems – Summary of Aging Management Evaluation – Chemical and Volume Control System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Heat Exchanger (CVCS Regenerative)	PB	Stainless Steel	Treated Borated Water (Ext)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-79	3.3.1.029	E, 2
Heat Exchanger (CVCS Regenerative)	PB	Stainless Steel	Treated Borated Water (Ext)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-118	3.3.1.020	A
Heat Exchanger (CVCS Regenerative)	PB	Stainless Steel	Treated Borated Water (Ext)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	VII.E1.AP-119	3.3.1.008	A
Heat Exchanger (CVCS Regenerative)	PB	Stainless Steel	Treated Borated Water (Int)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	VII.E1.A-100	3.3.1.002	A
Heat Exchanger (CVCS Regenerative)	PB	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-79	3.3.1.029	E, 2
Heat Exchanger (CVCS Regenerative)	PB	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-118	3.3.1.020	A

Table 3.3.2-10 Auxiliary Systems – Summary of Aging Management Evaluation – Chemical and Volume Control System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Heat Exchanger (CVCS Regenerative)	PB	Stainless Steel	Treated Borated Water (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	VII.E1.AP-119	3.3.1.008	A
Heat Exchanger (CVCS Seal Water Return)	PB	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.E1.AP-189	3.3.1.046	A
Heat Exchanger (CVCS Seal Water Return)	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.H2.AP-41	3.3.1.080	A
Heat Exchanger (CVCS Seal Water Return)	PB	Stainless Steel	Borated Water Leakage (Ext)	None	None	VII.J.AP-18	3.3.1.120	C
Heat Exchanger (CVCS Seal Water Return)	HT, PB	Stainless Steel	Closed Cycle Cooling Water (Ext)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.C2.A-52	3.3.1.049	C
Heat Exchanger (CVCS Seal Water Return)	HT, PB	Stainless Steel	Closed Cycle Cooling Water (Ext)	Cracking	Closed Treated Water Systems (B2.1.11)	VII.C2.AP-186	3.3.1.043	C

Table 3.3.2-10 Auxiliary Systems – Summary of Aging Management Evaluation – Chemical and Volume Control System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Heat Exchanger (CVCS Seal Water Return)	HT, PB	Stainless Steel	Closed Cycle Cooling Water (Ext)	Reduction of heat transfer	Closed Treated Water Systems (B2.1.11)	VII.C2.AP-188	3.3.1.050	A
Heat Exchanger (CVCS Seal Water Return)	HT, PB	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-79	3.3.1.029	E, 2
Heat Exchanger (CVCS Seal Water Return)	HT, PB	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-118	3.3.1.020	A
Heat Exchanger (CVCS Seal Water Return)	HT, PB	Stainless Steel	Treated Borated Water (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	VII.E1.AP-119	3.3.1.008	A
Heat Exchanger (Lube Oil Cooler)	HT, PB	Copper Alloy	Closed Cycle Cooling Water (Int)	Reduction of heat transfer	Closed Treated Water Systems (B2.1.11)	VII.C2.AP-205	3.3.1.050	A
Heat Exchanger (Lube Oil Cooler)	HT, PB	Copper Alloy	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.E1.AP-203	3.3.1.046	A

Table 3.3.2-10 Auxiliary Systems – Summary of Aging Management Evaluation – Chemical and Volume Control System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Heat Exchanger (Lube Oil Cooler)	LBS	Copper Alloy	Demineralized Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.A.SP-101	3.4.1.016	C
Heat Exchanger (Lube Oil Cooler)	LBS	Copper Alloy	Lubricating Oil (Ext)	Loss of material	Lubricating Oil Analysis (B2.1.24) and One-Time Inspection (B2.1.18)	VII.C2.AP-133	3.3.1.099	C
Heat Exchanger (Lube Oil Cooler)	HT, PB	Copper Alloy	Lubricating Oil (Ext)	Loss of material	Lubricating Oil Analysis (B2.1.24) and One-Time Inspection (B2.1.18)	VII.E1.AP-133	3.3.1.099	C
Heat Exchanger (Lube Oil Cooler)	HT, PB	Copper Alloy	Lubricating Oil (Ext)	Reduction of heat transfer	Lubricating Oil Analysis (B2.1.24) and One-Time Inspection (B2.1.18)	VIII.G.SP-99	3.4.1.046	A
Heat Exchanger (Lube Oil Cooler)	PB	Stainless Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.C2.A-52	3.3.1.049	C
Heat Exchanger (Lube Oil Cooler)	PB	Stainless Steel	Closed Cycle Cooling Water (Int)	Cracking	Closed Treated Water Systems (B2.1.11)	VII.C2.AP-186	3.3.1.043	C

Table 3.3.2-10 Auxiliary Systems – Summary of Aging Management Evaluation – Chemical and Volume Control System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Heat Exchanger (Lube Oil Cooler)	PB	Stainless Steel	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.24) and One-Time Inspection (B2.1.18)	VII.E1.AP-138	3.3.1.100	C
Heat Exchanger (Lube Oil Cooler)	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	C
Insulation	INS	Aluminum	Plant Indoor Air (Ext)	None	None	VII.J.AP-135	3.3.1.113	C
Insulation	INS	Insulation Calcium Silicate	Plant Indoor Air (Ext)	None	None	None	None	J, 3
Insulation	INS	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	C
Piping	LBS, PB, SIA	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.C2.AP-202	3.3.1.045	A
Piping	LBS, SIA	Carbon Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.E5.AP-280	3.3.1.095	B
Piping	LBS	Carbon Steel	Demineralized Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.D1.SP-74	3.4.1.013	A

Table 3.3.2-10 Auxiliary Systems – Summary of Aging Management Evaluation – Chemical and Volume Control System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Piping	PB	Carbon Steel	Dry Gas (Int)	None	None	VII.J.AP-6	3.3.1.121	A
Piping	LBS, PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Piping	LBS, SIA	Carbon Steel	Raw Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VIII.G.SP-136	3.4.1.038	B
Piping	LBS	Carbon Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.D1.SP-74	3.4.1.013	A
Piping	LBS	Carbon Steel	Steam (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.A.SP-71	3.4.1.014	A
Piping	LBS	Carbon Steel	Steam (Int)	Wall thinning	Flow-Accelerated Corrosion (B2.1.7)	VIII.B1.S-15	3.4.1.005	A
Piping	LBS	Carbon Steel	Waste Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.E5.AP-281	3.3.1.091	B
Piping	LBS, PB, SIA	Stainless Steel	Borated Water Leakage (Ext)	None	None	VII.J.AP-18	3.3.1.120	A

Table 3.3.2-10 Auxiliary Systems – Summary of Aging Management Evaluation – Chemical and Volume Control System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Piping	LBS, PB, SIA	Stainless Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VIII.B1.SP-110	3.4.1.039	B
Piping	LBS, SIA	Stainless Steel	Demineralized Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.D1.SP-87	3.4.1.016	A
Piping	PB, SIA	Stainless Steel	Dry Gas (Int)	None	None	VII.J.AP-22	3.3.1.120	A
Piping	LBS, PB, SIA	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Piping	LBS, SIA	Stainless Steel	Raw Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.C1.A-54	3.3.1.040	E, 1
Piping	PB	Stainless Steel	Treated Borated Water (Int)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	VII.E1.A-57	3.3.1.002	A
Piping	LBS, PB, SIA	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-79	3.3.1.029	E, 2
Piping	LBS, PB, SIA	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-82	3.3.1.028	E, 2

Table 3.3.2-10 Auxiliary Systems – Summary of Aging Management Evaluation – Chemical and Volume Control System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Pump	LBS	Carbon Steel	Demineralized Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.D1.SP-74	3.4.1.013	A
Pump	LBS	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Pump	LBS	Cast Iron	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.24) and One-Time Inspection (B2.1.18)	VII.E1.AP-127	3.3.1.097	C
Pump	LBS	Cast Iron	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Pump	LBS, PB, SIA	Stainless Steel	Borated Water Leakage (Ext)	None	None	VII.J.AP-18	3.3.1.120	A
Pump	PB	Stainless Steel	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.24) and One-Time Inspection (B2.1.18)	VII.E1.AP-138	3.3.1.100	A
Pump	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Pump	LBS, PB, SIA	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-79	3.3.1.029	E, 2
Pump	PB	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-114	3.3.1.018	A

Table 3.3.2-10 Auxiliary Systems – Summary of Aging Management Evaluation – Chemical and Volume Control System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Pump	PB	Stainless Steel	Treated Borated Water (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	VII.E1.AP-115	3.3.1.007	A
Solenoid Valve	LBS	Copper Alloy (> 15% Zinc)	Demineralized Water (Int)	Loss of material	Selective Leaching (B2.1.19)	VII.C2.AP-32	3.3.1.072	B
Solenoid Valve	LBS	Copper Alloy (> 15% Zinc)	Demineralized Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.A.SP-101	3.4.1.016	A
Solenoid Valve	LBS	Copper Alloy (> 15% Zinc)	Plant Indoor Air (Ext)	None	None	VII.J.AP-144	3.3.1.114	A
Solenoid Valve	PB	Stainless Steel	Borated Water Leakage (Ext)	None	None	VII.J.AP-18	3.3.1.120	A
Solenoid Valve	PB	Stainless Steel	Reactor Coolant (Int)	Loss of material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1.088	A
Solenoid Valve	PB	Stainless Steel	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)for Class 1 components and Water Chemistry (B2.1.2) and One-Time Inspection of ASME Code Class 1 Small-Bore Piping (B2.1.20)	IV.C2.RP-235	3.1.1.039	A

Table 3.3.2-10 Auxiliary Systems – Summary of Aging Management Evaluation – Chemical and Volume Control System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Strainer	LBS	Copper Alloy	Demineralized Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.A.SP-101	3.4.1.016	A
Strainer	LBS	Copper Alloy	Plant Indoor Air (Ext)	None	None	VII.J.AP-144	3.3.1.114	A
Tank	LBS	Carbon Steel	Demineralized Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.D1.SP-74	3.4.1.013	C
Tank	LBS	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Tank	LBS, PB, SIA	Stainless Steel	Borated Water Leakage (Ext)	None	None	VII.J.AP-18	3.3.1.120	C
Tank	LBS, PB, SIA	Stainless Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VIII.B1.SP-110	3.4.1.039	D
Tank	LBS, PB, SIA	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	C
Tank	LBS	Stainless Steel	Steam (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.A.SP-98	3.4.1.011	C
Tank	LBS	Stainless Steel	Steam (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.A.SP-155	3.4.1.016	C

Table 3.3.2-10 Auxiliary Systems – Summary of Aging Management Evaluation – Chemical and Volume Control System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Tank	LBS, PB, SIA	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-79	3.3.1.029	E, 2
Tank	LBS, SIA	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-82	3.3.1.028	E, 2
Tubing	LBS, PB	Carbon Steel	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.24) and One-Time Inspection (B2.1.18)	VII.E1.AP-127	3.3.1.097	A
Tubing	LBS, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Tubing	PB	Stainless Steel	Borated Water Leakage (Ext)	None	None	VII.J.AP-18	3.3.1.120	A
Tubing	LBS, PB	Stainless Steel	Demineralized Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.D1.SP-87	3.4.1.016	A
Tubing	LBS, PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Tubing	PB	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-79	3.3.1.029	E, 2
Tubing	PB	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-82	3.3.1.028	E, 2

Table 3.3.2-10 Auxiliary Systems – Summary of Aging Management Evaluation – Chemical and Volume Control System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Valve	PB	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.C2.AP-202	3.3.1.045	A
Valve	LBS, SIA	Carbon Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.E5.AP-280	3.3.1.095	B
Valve	LBS	Carbon Steel	Demineralized Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.D1.SP-74	3.4.1.013	A
Valve	LBS, PB	Carbon Steel	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.24) and One-Time Inspection (B2.1.18)	VII.E1.AP-127	3.3.1.097	A
Valve	LBS, PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Valve	LBS	Carbon Steel	Raw Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VIII.G.SP-136	3.4.1.038	B
Valve	LBS	Carbon Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.D1.SP-74	3.4.1.013	A

Table 3.3.2-10 Auxiliary Systems – Summary of Aging Management Evaluation – Chemical and Volume Control System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Valve	LBS	Carbon Steel	Steam (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.A.SP-71	3.4.1.014	A
Valve	LBS	Copper Alloy (> 15% Zinc)	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.24) and One-Time Inspection (B2.1.18)	VII.E1.AP-133	3.3.1.099	A
Valve	LBS	Copper Alloy (> 15% Zinc)	Plant Indoor Air (Ext)	None	None	VII.J.AP-144	3.3.1.114	A
Valve	LBS, PB, SIA	Stainless Steel	Borated Water Leakage (Ext)	None	None	VII.J.AP-18	3.3.1.120	A
Valve	LBS, PB	Stainless Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VIII.B1.SP-110	3.4.1.039	B
Valve	LBS, SIA	Stainless Steel	Demineralized Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.D1.SP-87	3.4.1.016	A
Valve	PB, SIA	Stainless Steel	Dry Gas (Int)	None	None	VII.J.AP-22	3.3.1.120	A
Valve	LBS, PB, SIA	Stainless Steel	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.24) and One-Time Inspection (B2.1.18)	VII.E1.AP-138	3.3.1.100	A
Valve	LBS, PB, SIA	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A

Table 3.3.2-10 Auxiliary Systems – Summary of Aging Management Evaluation – Chemical and Volume Control System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Valve	LBS, SIA	Stainless Steel	Raw Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.C1.A-54	3.3.1.040	E, 1
Valve	PB	Stainless Steel	Reactor Coolant (Int)	Loss of material	Water Chemistry (B2.1.2)	IV.C2.RP-23	3.1.1.088	A
Valve	PB	Stainless Steel	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) for Class 1 components and Water Chemistry (B2.1.2)	IV.C2.RP-344	3.1.1.033	A
Valve	LBS, PB, SIA	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-79	3.3.1.029	E, 2
Valve	LBS, PB, SIA	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-118	3.3.1.020	C
Valve	PB	Stainless Steel Cast Austenitic	Borated Water Leakage (Ext)	None	None	VII.J.AP-18	3.3.1.120	A
Valve	PB	Stainless Steel Cast Austenitic	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-79	3.3.1.029	E, 2

Table 3.3.2-10 Auxiliary Systems – Summary of Aging Management Evaluation – Chemical and Volume Control System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Valve	PB	Stainless Steel Cast Austenitic	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-118	3.3.1.020	C

Notes for Table 3.3.2-10:

Standard Notes:

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

B Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.

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

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

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

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

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

Plant Specific Notes:

1 Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program (B2.1.23) is used instead of the Open Cycle Cooling Water program (B2.1.10) to manage the aging of the internal surfaces of stainless steel components exposed to raw water.

2 The One-Time Inspection program (B2.1.18) is used to verify the effectiveness of the Water Chemistry program (B2.1.2) to manage these aging effects.

3. Based on plant operating experience, there are no aging effects requiring management for calcium silicate insulation in a metal jacket in a plant indoor air environment. The insulation does not experience aging effects unless exposed to temperatures, radiation, or chemicals capable of attacking the specific chemical composition of the insulation. The insulation is contained in metal jacket with a vapor barrier to prevent moisture intrusion and is in a non-aggressive air environment that does not experience significant aging effects.

4 These TLAAs are applicable to the Class 2 Heat Exchangers. Section 4.3.8 describes the evaluation of these TLAAs.

Table 3.3.2-11 Auxiliary Systems – Summary of Aging Management Evaluation –Control Building HVAC System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Air Conditioner	PB	Carbon Steel (Galvanized)	Plant Indoor Air (Ext)	None	None	VII.J.AP-13	3.3.1.116	C
Air Conditioner	PB	Carbon Steel (Galvanized)	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F1.A-08	3.3.1.090	B
Closure Bolting	LBS, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.F1.A-105	3.3.1.078	A
Closure Bolting	LBS, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	VII.I.AP-124	3.3.1.015	A
Closure Bolting	LBS, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.8)	VII.I.AP-125	3.3.1.012	A
Closure Bolting	PB	Stainless Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	VII.I.AP-124	3.3.1.015	A
Closure Bolting	PB	Stainless Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.8)	VII.I.AP-125	3.3.1.012	A
Compressor	PB	Cast Iron	Dry Gas (Int)	None	None	VII.J.AP-6	3.3.1.121	C
Compressor	PB	Cast Iron	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Condenser	HT, PB	Copper Alloy	Dry Gas (Ext)	None	None	VII.J.AP-9	3.3.1.114	C

Table 3.3.2-11 Auxiliary Systems – Summary of Aging Management Evaluation –Control Building HVAC System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Condenser	HT, PB	Copper Alloy	Raw Water (Int)	Reduction of heat transfer	Open-Cycle Cooling Water System (B2.1.10)	VII.C1.A-72	3.3.1.042	A
Condenser	HT, PB	Copper Alloy	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.10)	VII.C1.AP-179	3.3.1.038	A
Damper	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.F1.A-10	3.3.1.078	A
Damper	PB	Carbon Steel	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F1.A-08	3.3.1.090	B
Damper	FB, PB	Carbon Steel (Galvanized)	Concrete (Ext)	None	None	VII.J.AP-282	3.3.1.112	C
Damper	FB, PB	Carbon Steel (Galvanized)	Plant Indoor Air (Ext)	None	None	VII.J.AP-13	3.3.1.116	C
Damper	FB, PB	Carbon Steel (Galvanized)	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F1.A-08	3.3.1.090	B

Table 3.3.2-11 Auxiliary Systems – Summary of Aging Management Evaluation –Control Building HVAC System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Ductwork	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.F1.A-10	3.3.1.078	A
Ductwork	PB	Carbon Steel	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F1.A-08	3.3.1.090	B
Ductwork	PB, TH	Carbon Steel (Galvanized)	Plant Indoor Air (Ext)	None	None	VII.J.AP-13	3.3.1.116	C
Ductwork	PB, TH	Carbon Steel (Galvanized)	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F1.A-08	3.3.1.090	B
Fan	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.F1.A-10	3.3.1.078	A
Fan	PB	Carbon Steel	Ventilation Atmosphere (Ext)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.I.A-81	3.3.1.078	E, 1

Table 3.3.2-11 Auxiliary Systems – Summary of Aging Management Evaluation –Control Building HVAC System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Fan	PB	Carbon Steel	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F1.A-08	3.3.1.090	B
Filter	PB	Carbon Steel	Dry Gas (Int)	None	None	VII.J.AP-6	3.3.1.121	A
Filter	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Filter	PB	Carbon Steel	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F1.A-08	3.3.1.090	B
Filter	PB	Stainless Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F1.AP-99	3.3.1.094	B
Filter	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	C
Filter	DF	Stainless Steel	Ventilation Atmosphere (Ext)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F1.AP-99	3.3.1.094	B, 1

Table 3.3.2-11 Auxiliary Systems – Summary of Aging Management Evaluation –Control Building HVAC System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Filter	PB	Stainless Steel	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F1.AP-99	3.3.1.094	B
Flex Connectors	PB	Elastomer	Plant Indoor Air (Ext)	Hardening and loss of strength	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.F1.AP-102	3.3.1.076	A
Flex Connectors	PB	Elastomer	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.F1.AP-113	3.3.1.082	A
Flex Connectors	PB	Elastomer	Ventilation Atmosphere (Int)	Hardening and loss of strength	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.F1.AP-102	3.3.1.076	A
Flex Connectors	PB	Elastomer	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F1.AP-103	3.3.1.096	B
Flow Indicator	PB	Glass	Plant Indoor Air (Ext)	None	None	VII.J.AP-14	3.3.1.117	A
Flow Indicator	PB	Glass	Ventilation Atmosphere (Int)	None	None	VII.J.AP-97	3.3.1.117	A

Table 3.3.2-11 Auxiliary Systems – Summary of Aging Management Evaluation –Control Building HVAC System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Heat Exchanger (Control Building HVAC)	HT	Aluminum	Ventilation Atmosphere (Ext)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F1.AP-142	3.3.1.092	B, 1
Heat Exchanger (Control Building HVAC)	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.F1.A-10	3.3.1.078	C
Heat Exchanger (Control Building HVAC)	PB	Carbon Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.10)	VII.C1.AP-194	3.3.1.037	A
Heat Exchanger (Control Building HVAC)	LBS	Copper Alloy	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.F1.AP-203	3.3.1.046	A
Heat Exchanger (Control Building HVAC)	HT, PB	Copper Alloy	Dry Gas (Int)	None	None	VII.J.AP-9	3.3.1.114	C

Table 3.3.2-11 Auxiliary Systems – Summary of Aging Management Evaluation –Control Building HVAC System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Heat Exchanger (Control Building HVAC)	PB	Copper Alloy	Ventilation Atmosphere (Ext)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F1.AP-109	3.3.1.079	E, 1
Heat Exchanger (Control Building HVAC)	LBS	Copper Alloy	Ventilation Atmosphere (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.F1.AP-109	3.3.1.079	C
Heat Exchanger (Control Building HVAC)	HT	Copper Alloy	Ventilation Atmosphere (Ext)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F1.AP-109	3.3.1.079	E, 1
Piping	LBS	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.F1.AP-202	3.3.1.045	A
Piping	LBS, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Piping	LBS	Carbon Steel	Raw Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.C1.AP-194	3.3.1.037	E, 2

Table 3.3.2-11 Auxiliary Systems – Summary of Aging Management Evaluation –Control Building HVAC System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Piping	PB	Carbon Steel	Ventilation Atmosphere (Ext)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.I.A-81	3.3.1.078	E, 1
Piping	PB	Carbon Steel	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F1.A-08	3.3.1.090	D
Piping	PB	Copper Alloy	Dry Gas (Int)	None	None	VII.J.AP-9	3.3.1.114	A
Piping	PB	Copper Alloy	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.F1.AP-109	3.3.1.079	A, 3
Piping	PB	Copper Alloy	Ventilation Atmosphere (Ext)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F1.AP-109	3.3.1.079	E,1
Piping	PB	Copper Alloy	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.G.AP-143	3.3.1.089	B
Piping	PB	Stainless Steel	Dry Gas (Int)	None	None	VII.J.AP-22	3.3.1.120	A

Table 3.3.2-11 Auxiliary Systems – Summary of Aging Management Evaluation –Control Building HVAC System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Piping	LBS, PB, SIA	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Piping	LBS	Stainless Steel	Raw Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.C1.A-54	3.3.1.040	E, 2
Piping	PB	Stainless Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.10)	VII.C1.A-54	3.3.1.040	A
Piping	SIA	Stainless Steel	Raw Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.C1.A-54	3.3.1.040	E, 2
Piping	PB	Stainless Steel	Ventilation Atmosphere (Ext)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F1.AP-99	3.3.1.094	D, 1
Piping	PB	Stainless Steel	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F1.AP-99	3.3.1.094	D
Pump	PB	Aluminum	Plant Indoor Air (Ext)	None	None	VII.J.AP-135	3.3.1.113	A

Table 3.3.2-11 Auxiliary Systems – Summary of Aging Management Evaluation –Control Building HVAC System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Pump	PB	Aluminum	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F1.AP-142	3.3.1.092	B
Solenoid Valve	PB	Copper Alloy	Dry Gas (Int)	None	None	VII.J.AP-9	3.3.1.114	A
Solenoid Valve	PB	Copper Alloy	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.F1.AP-109	3.3.1.079	A, 3
Solenoid Valve	PB	Stainless Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F1.AP-99	3.3.1.094	D
Solenoid Valve	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Tubing	LBS, PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Tubing	LBS, PB	Stainless Steel	Raw Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.C1.A-54	3.3.1.040	E, 2

Table 3.3.2-11 Auxiliary Systems – Summary of Aging Management Evaluation –Control Building HVAC System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Tubing	PB	Stainless Steel	Ventilation Atmosphere (Ext)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F1.AP-99	3.3.1.094	D, 1
Tubing	PB	Stainless Steel	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F1.AP-99	3.3.1.094	D
Valve	LBS	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.F1.AP-202	3.3.1.045	A
Valve	LBS, PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Valve	PB, SIA	Carbon Steel	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F1.A-08	3.3.1.090	D
Valve	PB	Copper Alloy	Dry Gas (Int)	None	None	VII.J.AP-9	3.3.1.114	A
Valve	PB, SIA	Copper Alloy	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.F1.AP-109	3.3.1.079	A, 3

Table 3.3.2-11 Auxiliary Systems – Summary of Aging Management Evaluation –Control Building HVAC System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Valve	SIA	Copper Alloy	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.G.AP-143	3.3.1.089	B
Valve	PB	Stainless Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F1.AP-99	3.3.1.094	D
Valve	PB	Stainless Steel	Dry Gas (Int)	None	None	VII.J.AP-22	3.3.1.120	A
Valve	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Valve	PB	Stainless Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.10)	VII.C1.A-54	3.3.1.040	A
Valve	PB	Stainless Steel	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F1.AP-99	3.3.1.094	D

Notes for Table 3.3.2-11:

Standard Notes:

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

B Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.

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

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

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

Plant Specific Notes:

1 The subject component is enclosed within another component. Loss of material on the external surface of the subject component is managed by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program (B2.1.23).

2 Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program (B2.1.23) is used instead of the Open-Cycle Cooling Water program since these components are nonsafety-related drains.

3 Component is refrigeration piping which is expected to experience condensation during times of elevated humidity on the external surface.

Table 3.3.2-12 Auxiliary Systems – Summary of Aging Management Evaluation – Essential Service Water Pumphouse HVAC System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Closure Bolting	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	VII.I.AP-124	3.3.1.015	A
Closure Bolting	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.8)	VII.I.AP-125	3.3.1.012	A
Damper	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.F2.A-10	3.3.1.078	A
Damper	PB	Carbon Steel	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F2.A-08	3.3.1.090	B
Damper	PB	Carbon Steel (Galvanized)	Plant Indoor Air (Ext)	None	None	VII.J.AP-13	3.3.1.116	C
Damper	PB	Carbon Steel (Galvanized)	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F2.A-08	3.3.1.090	B
Ductwork	FIL	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.F2.A-10	3.3.1.078	A
Ductwork	PB	Carbon Steel	Ventilation Atmosphere (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-81	3.3.1.078	C

Table 3.3.2-12 Auxiliary Systems – Summary of Aging Management Evaluation – Essential Service Water Pumphouse HVAC System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Ductwork	PB	Carbon Steel	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F2.A-08	3.3.1.090	B
Ductwork	PB, TH	Carbon Steel (Galvanized)	Plant Indoor Air (Ext)	None	None	VII.J.AP-13	3.3.1.116	C
Ductwork	PB, TH	Carbon Steel (Galvanized)	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F2.A-08	3.3.1.090	B
Fan	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.F2.A-10	3.3.1.078	A
Fan	PB	Carbon Steel	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F2.A-08	3.3.1.090	B
Flex Connectors	PB	Elastomer	Plant Indoor Air (Ext)	Hardening and loss of strength	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.F2.AP-102	3.3.1.076	A
Flex Connectors	PB	Elastomer	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.F2.AP-113	3.3.1.082	A

Table 3.3.2-12 Auxiliary Systems – Summary of Aging Management Evaluation – Essential Service Water Pumphouse HVAC System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Flex Connectors	PB	Elastomer	Ventilation Atmosphere (Int)	Hardening and loss of strength	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.F2.AP-102	3.3.1.076	A
Flex Connectors	PB	Elastomer	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F2.AP-103	3.3.1.096	B
Piping	LBS, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.F2.A-10	3.3.1.078	C
Piping	LBS, SIA	Carbon Steel	Waste Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.E5.AP-281	3.3.1.091	B

Notes for Table 3.3.2-12:

Standard Notes:

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

B Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.

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

Plant Specific Notes:

None

Table 3.3.2-13 Auxiliary Systems – Summary of Aging Management Evaluation – Auxiliary Building HVAC System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Closure Bolting	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.F2.A-105	3.3.1.078	A
Closure Bolting	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	VII.I.AP-124	3.3.1.015	A
Closure Bolting	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.8)	VII.I.AP-125	3.3.1.012	A
Closure Bolting	PB	Stainless Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	VII.I.AP-124	3.3.1.015	A
Closure Bolting	PB	Stainless Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.8)	VII.I.AP-125	3.3.1.012	A
Damper	FB, PB	Carbon Steel (Galvanized)	Concrete (Ext)	None	None	VII.J.AP-282	3.3.1.112	C, 4
Damper	FB, PB	Carbon Steel (Galvanized)	Plant Indoor Air (Ext)	None	None	VII.J.AP-13	3.3.1.116	C
Damper	FB, PB	Carbon Steel (Galvanized)	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F2.A-08	3.3.1.090	B
Damper	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	C
Damper	PB	Stainless Steel	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F2.AP-99	3.3.1.094	B

Table 3.3.2-13 Auxiliary Systems – Summary of Aging Management Evaluation – Auxiliary Building HVAC System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Ductwork	PB, TH	Carbon Steel (Galvanized)	Plant Indoor Air (Ext)	None	None	VII.J.AP-13	3.3.1.116	C
Ductwork	PB, TH	Carbon Steel (Galvanized)	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F2.A-08	3.3.1.090	B
Ductwork	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	C
Ductwork	PB	Stainless Steel	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F2.AP-99	3.3.1.094	B
Fan	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.F2.A-10	3.3.1.078	A
Fan	PB	Carbon Steel	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F2.A-08	3.3.1.090	B
Fan	PB	Carbon Steel (Galvanized)	Plant Indoor Air (Ext)	None	None	VII.J.AP-13	3.3.1.116	C

Table 3.3.2-13 Auxiliary Systems – Summary of Aging Management Evaluation – Auxiliary Building HVAC System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Fan	PB	Carbon Steel (Galvanized)	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F2.A-08	3.3.1.090	B
Flex Connectors	PB	Elastomer	Plant Indoor Air (Ext)	Hardening and loss of strength	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.F2.AP-102	3.3.1.076	A
Flex Connectors	PB	Elastomer	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.F2.AP-113	3.3.1.082	A
Flex Connectors	PB	Elastomer	Ventilation Atmosphere (Int)	Hardening and loss of strength	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.F2.AP-102	3.3.1.076	A
Flex Connectors	PB	Elastomer	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F2.AP-103	3.3.1.096	B
Heat Exchanger (Aux Bldg HVAC)	LBS	Copper Alloy	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.F2.AP-199	3.3.1.046	C

Table 3.3.2-13 Auxiliary Systems – Summary of Aging Management Evaluation – Auxiliary Building HVAC System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Heat Exchanger (Aux Bldg HVAC)	LBS	Copper Alloy	Plant Indoor Air (Ext)	None	None	VIII.I.SP-6	3.4.1.054	C
Heat Exchanger (Aux Bldg HVAC)	LBS	Copper Alloy	Ventilation Atmosphere (Ext)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F2.AP-109	3.3.1.079	E, 1
Heat Exchanger (Aux Bldg HVAC)	PB	Stainless Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.C2.A-52	3.3.1.049	C
Heat Exchanger (Aux Bldg HVAC)	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Heat Exchanger (Aux Bldg HVAC)	HT, PB	Stainless Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.10)	VII.C1.A-54	3.3.1.040	C
Heat Exchanger (Aux Bldg HVAC)	HT, PB	Stainless Steel	Raw Water (Int)	Reduction of heat transfer	Open-Cycle Cooling Water System (B2.1.10)	VII.C1.AP-187	3.3.1.042	A

Table 3.3.2-13 Auxiliary Systems – Summary of Aging Management Evaluation – Auxiliary Building HVAC System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Heat Exchanger (Aux Bldg HVAC)	HT, PB	Stainless Steel	Ventilation Atmosphere (Ext)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F2.AP-99	3.3.1.094	D, 1
Piping	LBS	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.F2.AP-202	3.3.1.045	A
Piping	LBS, PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Piping	PB	Carbon Steel	Ventilation Atmosphere (Ext)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.I.A-81	3.3.1.078	E, 1
Piping	PB, SIA	Carbon Steel	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F2.A-08	3.3.1.090	D
Piping	LBS, SIA	Carbon Steel	Waste Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.E5.AP-281	3.3.1.091	B, 3
Piping	PB	Copper Alloy	Plant Indoor Air (Ext)	None	None	VIII.I.SP-6	3.4.1.054	A

Table 3.3.2-13 Auxiliary Systems – Summary of Aging Management Evaluation – Auxiliary Building HVAC System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Piping	PB	Copper Alloy	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F2.AP-109	3.3.1.079	E, 2
Piping	LBS	Polyvinyl Chloride (PVC)	Condensation (Int)	None	None	VII.J.AP-269	3.3.1.119	A
Piping	LBS	Polyvinyl Chloride (PVC)	Plant Indoor Air (Ext)	None	None	VII.J.AP-268	3.3.1.119	A
Piping	LBS, PB	Stainless Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.C2.A-52	3.3.1.049	A
Piping	LBS, PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Piping	PB	Stainless Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.10)	VII.C1.A-54	3.3.1.040	A
Piping	PB	Stainless Steel	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F2.AP-99	3.3.1.094	B
Pump	LBS	Cast Iron (Gray Cast Iron)	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.F2.AP-202	3.3.1.045	A

Table 3.3.2-13 Auxiliary Systems – Summary of Aging Management Evaluation – Auxiliary Building HVAC System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Pump	LBS	Cast Iron (Gray Cast Iron)	Closed Cycle Cooling Water (Int)	Loss of material	Selective Leaching (B2.1.19)	VII.C2.AP-50	3.3.1.072	B
Pump	LBS	Cast Iron (Gray Cast Iron)	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Tubing	LBS	Stainless Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.C2.A-52	3.3.1.049	A
Tubing	LBS, PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Tubing	PB	Stainless Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.10)	VII.C1.A-54	3.3.1.040	A
Valve	LBS	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.F2.AP-202	3.3.1.045	A
Valve	LBS, PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Valve	PB, SIA	Carbon Steel	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F2.A-08	3.3.1.090	D

Table 3.3.2-13 Auxiliary Systems – Summary of Aging Management Evaluation – Auxiliary Building HVAC System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Valve	LBS	Cast Iron (Gray Cast Iron)	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.F2.AP-202	3.3.1.045	A
Valve	LBS	Cast Iron (Gray Cast Iron)	Closed Cycle Cooling Water (Int)	Loss of material	Selective Leaching (B2.1.19)	VII.C2.AP-50	3.3.1.072	B
Valve	LBS	Cast Iron (Gray Cast Iron)	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Valve	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Valve	PB	Stainless Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.10)	VII.C1.A-54	3.3.1.040	A

Notes for Table 3.3.2-13:

Standard Notes:

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

B Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.

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

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

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

Plant Specific Notes:

1 The subject component is enclosed within another component. Loss of material on the external surface of the subject component will be managed by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program (B2.1.23).

2 Ventilation air internal is a condensation environment and therefore is used interchangeably as the condensation - external environment.

3 Component internal environment is condensation from cooling coil drains that is evaluated as waste water per NUREG-1801, Section IX. This waste water environment is managed by Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program (B2.1.23) and not by Open-Cycle Cooling Water program (B2.1.10).

4 For discussion of concrete attributes and operating experience, see further evaluation in Section 3.5.2.2.2.1.4.

Table 3.3.2-14 Auxiliary Systems – Summary of Aging Management Evaluation – Fuel Building HVAC System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Closure Bolting	LBS, PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	VII.I.AP-124	3.3.1.015	A
Closure Bolting	LBS, PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.8)	VII.I.AP-125	3.3.1.012	A
Closure Bolting	PB, SIA	Stainless Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	VII.I.AP-124	3.3.1.015	A
Closure Bolting	PB, SIA	Stainless Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.8)	VII.I.AP-125	3.3.1.012	A
Damper	FB, PB	Carbon Steel (Galvanized)	Concrete (Ext)	None	None	VII.J.AP-282	3.3.1.112	C
Damper	FB, PB	Carbon Steel (Galvanized)	Plant Indoor Air (Ext)	None	None	VII.J.AP-13	3.3.1.116	C
Damper	FB, PB	Carbon Steel (Galvanized)	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F2.A-08	3.3.1.090	B
Ductwork	PB	Carbon Steel (Galvanized)	Plant Indoor Air (Ext)	None	None	VII.J.AP-13	3.3.1.116	C
Ductwork	PB	Carbon Steel (Galvanized)	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F2.A-08	3.3.1.090	B

Table 3.3.2-14 Auxiliary Systems – Summary of Aging Management Evaluation – Fuel Building HVAC System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Ductwork	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	C
Ductwork	PB	Stainless Steel	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F2.AP-99	3.3.1.094	B
Fan	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.F2.A-10	3.3.1.078	C
Fan	PB	Carbon Steel	Ventilation Atmosphere (Ext)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.I.A-81	3.3.1.078	E, 1
Fan	PB	Carbon Steel	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F2.A-08	3.3.1.090	B
Fan	PB	Carbon Steel (Galvanized)	Plant Indoor Air (Ext)	None	None	VII.J.AP-13	3.3.1.116	C

Table 3.3.2-14 Auxiliary Systems – Summary of Aging Management Evaluation – Fuel Building HVAC System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Fan	PB	Carbon Steel (Galvanized)	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F2.A-08	3.3.1.090	B
Filter	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.F2.A-10	3.3.1.078	C
Filter	PB	Carbon Steel	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F2.A-08	3.3.1.090	B
Filter	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	C
Filter	PB	Stainless Steel	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F2.AP-99	3.3.1.094	D
Flex Connectors	PB	Elastomer	Plant Indoor Air (Ext)	Hardening and loss of strength	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.F2.AP-102	3.3.1.076	A
Flex Connectors	PB	Elastomer	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.F2.AP-113	3.3.1.082	A

Table 3.3.2-14 Auxiliary Systems – Summary of Aging Management Evaluation – Fuel Building HVAC System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Flex Connectors	PB	Elastomer	Ventilation Atmosphere (Int)	Hardening and loss of strength	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.F2.AP-102	3.3.1.076	A
Flex Connectors	PB	Elastomer	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F2.AP-103	3.3.1.096	B
Flow Indicator	PB	Glass	Plant Indoor Air (Ext)	None	None	VII.J.AP-14	3.3.1.117	A
Flow Indicator	PB	Glass	Ventilation Atmosphere (Int)	None	None	VII.J.AP-97	3.3.1.117	A
Heat Exchanger (Fuel Bldg HVAC)	LBS	Copper Alloy	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.F2.AP-199	3.3.1.046	C
Heat Exchanger (Fuel Bldg HVAC)	LBS	Copper Alloy	Plant Indoor Air (Ext)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F2.AP-109	3.3.1.079	E, 1
Heat Exchanger (Fuel Bldg HVAC)	LBS	Copper Alloy	Ventilation Atmosphere (Ext)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F2.AP-109	3.3.1.079	E, 1

Table 3.3.2-14 Auxiliary Systems – Summary of Aging Management Evaluation – Fuel Building HVAC System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Heat Exchanger (Fuel Bldg HVAC)	HT, PB	Stainless Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.10)	VII.C1.A-54	3.3.1.040	C
Heat Exchanger (Fuel Bldg HVAC)	HT, PB	Stainless Steel	Raw Water (Int)	Reduction of heat transfer	Open-Cycle Cooling Water System (B2.1.10)	VII.C1.AP-187	3.3.1.042	A
Heat Exchanger (Fuel Bldg HVAC)	HT, PB	Stainless Steel	Ventilation Atmosphere (Ext)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F2.AP-99	3.3.1.094	D, 1
Piping	LBS	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.F2.AP-202	3.3.1.045	A
Piping	LBS, PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Piping	PB	Carbon Steel	Ventilation Atmosphere (Ext)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.I.A-81	3.3.1.078	E, 1

Table 3.3.2-14 Auxiliary Systems – Summary of Aging Management Evaluation – Fuel Building HVAC System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Piping	PB	Carbon Steel	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F2.A-08	3.3.1.090	D
Piping	LBS, SIA	Carbon Steel	Waste Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.E5.AP-281	3.3.1.091	B
Piping	PB	Copper Alloy	Plant Indoor Air (Ext)	None	None	VII.J.AP-144	3.3.1.114	A
Piping	PB	Copper Alloy	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F2.AP-109	3.3.1.079	E, 2
Piping	LBS, PB, SIA	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Piping	LBS, PB, SIA	Stainless Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.10)	VII.C1.A-54	3.3.1.040	A
Piping	PB	Stainless Steel	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.E5.AP-273	3.3.1.095	B

Table 3.3.2-14 Auxiliary Systems – Summary of Aging Management Evaluation – Fuel Building HVAC System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Pump	PB	Aluminum	Plant Indoor Air (Ext)	None	None	VII.J.AP-135	3.3.1.113	A
Pump	PB	Aluminum	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F2.AP-142	3.3.1.092	B
Pump	LBS	Cast Iron (Gray Cast Iron)	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.F2.AP-202	3.3.1.045	A
Pump	LBS	Cast Iron (Gray Cast Iron)	Closed Cycle Cooling Water (Int)	Loss of material	Selective Leaching (B2.1.19)	VII.C2.AP-50	3.3.1.072	B
Pump	LBS	Cast Iron (Gray Cast Iron)	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Solenoid Valve	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Solenoid Valve	PB	Stainless Steel	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.E5.AP-273	3.3.1.095	B
Tubing	LBS, PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A

Table 3.3.2-14 Auxiliary Systems – Summary of Aging Management Evaluation – Fuel Building HVAC System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Tubing	LBS, PB	Stainless Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.10)	VII.C1.A-54	3.3.1.040	A
Tubing	PB	Stainless Steel	Ventilation Atmosphere (Ext)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F2.AP-99	3.3.1.094	D, 1
Tubing	PB	Stainless Steel	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.E5.AP-273	3.3.1.095	B
Valve	LBS	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.F2.AP-202	3.3.1.045	A
Valve	LBS, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Valve	PB	Carbon Steel	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.E5.AP-280	3.3.1.095	B
Valve	LBS	Cast Iron (Gray Cast Iron)	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.F2.AP-202	3.3.1.045	A

Table 3.3.2-14 Auxiliary Systems – Summary of Aging Management Evaluation – Fuel Building HVAC System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Valve	LBS	Cast Iron (Gray Cast Iron)	Closed Cycle Cooling Water (Int)	Loss of material	Selective Leaching (B2.1.19)	VII.C2.AP-50	3.3.1.072	B
Valve	LBS	Cast Iron (Gray Cast Iron)	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Valve	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Valve	PB	Stainless Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.10)	VII.C1.A-54	3.3.1.040	A
Valve	PB	Stainless Steel	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.E5.AP-273	3.3.1.095	B

Notes for Table 3.3.2-14:

Standard Notes:

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

B Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.

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

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

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

Plant Specific Notes:

1 The subject component is enclosed within another component. Loss of material on the external surface of the subject component is managed by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program (B2.1.23).

2 Ventilation air internal is a condensation environment and therefore is used interchangeably as the condensation -external environment.

Table 3.3.2-15 Auxiliary Systems – Summary of Aging Management Evaluation – Miscellaneous Buildings HVAC System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Closure Bolting	LBS, PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	VII.I.AP-124	3.3.1.015	A
Closure Bolting	LBS, PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.8)	VII.I.AP-125	3.3.1.012	A
Closure Bolting	LBS, PB, SIA	Stainless Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	VII.I.AP-124	3.3.1.015	A
Closure Bolting	LBS, PB, SIA	Stainless Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.8)	VII.I.AP-125	3.3.1.012	A
Damper	PB	Carbon Steel (Galvanized)	Plant Indoor Air (Ext)	None	None	VII.J.AP-13	3.3.1.116	C
Damper	PB	Carbon Steel (Galvanized)	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F2.A-08	3.3.1.090	B
Ductwork	PB	Carbon Steel (Galvanized)	Plant Indoor Air (Ext)	None	None	VII.J.AP-13	3.3.1.116	C
Ductwork	PB	Carbon Steel (Galvanized)	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F2.A-08	3.3.1.090	B
Fan	PB	Carbon Steel (Galvanized)	Plant Indoor Air (Ext)	None	None	VII.J.AP-13	3.3.1.116	C

Table 3.3.2-15 Auxiliary Systems – Summary of Aging Management Evaluation – Miscellaneous Buildings HVAC System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Fan	PB	Carbon Steel (Galvanized)	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F2.A-08	3.3.1.090	B
Flex Connectors	PB	Elastomer	Plant Indoor Air (Ext)	Hardening and loss of strength	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.F2.AP-102	3.3.1.076	A
Flex Connectors	PB	Elastomer	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.F2.AP-113	3.3.1.082	A
Flex Connectors	PB	Elastomer	Ventilation Atmosphere (Int)	Hardening and loss of strength	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.F2.AP-102	3.3.1.076	A
Flex Connectors	PB	Elastomer	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F2.AP-103	3.3.1.096	B

Table 3.3.2-15 Auxiliary Systems – Summary of Aging Management Evaluation – Miscellaneous Buildings HVAC System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Heat Exchanger (Aux Feedwater Room)	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	C
Heat Exchanger (Aux Feedwater Room)	HT, PB	Stainless Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.10)	VII.C1.A-54	3.3.1.040	C
Heat Exchanger (Aux Feedwater Room)	HT, PB	Stainless Steel	Raw Water (Int)	Reduction of heat transfer	Open-Cycle Cooling Water System (B2.1.10)	VII.C1.AP-187	3.3.1.042	A
Heat Exchanger (Aux Feedwater Room)	HT, PB	Stainless Steel	Ventilation Atmosphere (Ext)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F2.AP-99	3.3.1.094	D, 1
Heat Exchanger (Aux Feedwater Room)	PB	Stainless Steel	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F2.AP-99	3.3.1.094	D

Table 3.3.2-15 Auxiliary Systems – Summary of Aging Management Evaluation – Miscellaneous Buildings HVAC System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Heat Exchanger (Main Steam Enc. Bldg.)	LBS	Copper Alloy	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.F2.AP-199	3.3.1.046	C
Heat Exchanger (Main Steam Enc. Bldg.)	LBS	Copper Alloy	Ventilation Atmosphere (Ext)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F2.AP-109	3.3.1.079	E, 1
Piping	LBS	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.F2.AP-202	3.3.1.045	A
Piping	LBS, PB, SIA	Carbon Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F2.A-08	3.3.1.090	D
Piping	LBS, PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.F2.A-10	3.3.1.078	C
Piping	LBS	Carbon Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.10)	VII.C1.AP-183	3.3.1.038	C

Table 3.3.2-15 Auxiliary Systems – Summary of Aging Management Evaluation – Miscellaneous Buildings HVAC System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Piping	LBS, SIA	Carbon Steel	Waste Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.E5.AP-281	3.3.1.091	B
Piping	LBS, PB, SIA	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Piping	LBS, PB, SIA	Stainless Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.10)	VII.C1.A-54	3.3.1.040	A
Tubing	LBS	Carbon Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F2.A-08	3.3.1.090	D
Tubing	LBS	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.F2.A-10	3.3.1.078	C
Tubing	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Tubing	PB	Stainless Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.10)	VII.C1.A-54	3.3.1.040	A
Valve	LBS	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.F2.AP-202	3.3.1.045	A

Table 3.3.2-15 Auxiliary Systems – Summary of Aging Management Evaluation – Miscellaneous Buildings HVAC System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Valve	LBS	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.F2.A-10	3.3.1.078	C
Valve	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Valve	PB	Stainless Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.10)	VII.C1.A-54	3.3.1.040	A

Notes for Table 3.3.2-15:

Standard Notes:

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

B Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.

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

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

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

Plant Specific Notes:

1 The subject component is enclosed within another component. Loss of material on the external surface of the subject component is managed by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program (B2.1.23).

Table 3.3.2-16 Auxiliary Systems – Summary of Aging Management Evaluation – Diesel Generator Building HVAC System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Closure Bolting	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.F4.A-105	3.3.1.078	A
Closure Bolting	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	VII.I.AP-124	3.3.1.015	A
Closure Bolting	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.8)	VII.I.AP-125	3.3.1.012	A
Damper	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.F4.A-10	3.3.1.078	A
Damper	PB	Carbon Steel	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F4.A-08	3.3.1.090	B
Damper	PB	Carbon Steel (Galvanized)	Plant Indoor Air (Ext)	None	None	VII.J.AP-13	3.3.1.116	C
Damper	PB	Carbon Steel (Galvanized)	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F4.A-08	3.3.1.090	B
Ductwork	FIL	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.F4.A-10	3.3.1.078	A

Table 3.3.2-16 Auxiliary Systems – Summary of Aging Management Evaluation – Diesel Generator Building HVAC System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Ductwork	PB	Carbon Steel	Ventilation Atmosphere (Ext)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.I.A-81	3.3.1.078	E, 1
Ductwork	PB	Carbon Steel	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F4.A-08	3.3.1.090	B
Ductwork	PB	Carbon Steel (Galvanized)	Plant Indoor Air (Ext)	None	None	VII.J.AP-13	3.3.1.116	C
Ductwork	PB	Carbon Steel (Galvanized)	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F4.A-08	3.3.1.090	B
Fan	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.F4.A-10	3.3.1.078	C
Fan	PB	Carbon Steel	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F4.A-08	3.3.1.090	D

Table 3.3.2-16 Auxiliary Systems – Summary of Aging Management Evaluation – Diesel Generator Building HVAC System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Filter	PB	Stainless Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F2.AP-99	3.3.1.094	D
Filter	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	C
Flex Connectors	PB	Elastomer	Plant Indoor Air (Ext)	Hardening and loss of strength	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.F4.AP-102	3.3.1.076	A
Flex Connectors	PB	Elastomer	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.F4.AP-113	3.3.1.082	A
Flex Connectors	PB	Elastomer	Ventilation Atmosphere (Int)	Hardening and loss of strength	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.F4.AP-102	3.3.1.076	A
Flex Connectors	PB	Elastomer	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F4.AP-103	3.3.1.096	B
Valve	PB	Stainless Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F2.AP-99	3.3.1.094	D

Table 3.3.2-16 Auxiliary Systems – Summary of Aging Management Evaluation – Diesel Generator Building HVAC System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Valve	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A

Notes for Table 3.3.2-16:

Standard Notes:

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

B Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.

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

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

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

Plant Specific Notes:

1 The subject component is enclosed within another component. Loss of material on the external surface of the subject component is managed by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program (B2.1.23).

Table 3.3.2-17 Auxiliary Systems – Summary of Aging Management Evaluation – Radwaste Building HVAC System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Damper	FB	Carbon Steel (Galvanized)	Plant Indoor Air (Ext)	None	None	VII.J.AP-13	3.3.1.116	C
Damper	FB	Carbon Steel (Galvanized)	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F2.A-08	3.3.1.090	B
Piping	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Piping	PB	Carbon Steel	Ventilation Atmosphere (Ext)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.I.A-81	3.3.1.078	E, 1
Piping	PB	Carbon Steel	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F2.A-08	3.3.1.090	B
Piping	PB	Copper Alloy	Plant Indoor Air (Ext)	None	None	VII.J.AP-144	3.3.1.114	A

Table 3.3.2-17 Auxiliary Systems – Summary of Aging Management Evaluation – Radwaste Building HVAC System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Piping	PB	Copper Alloy	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.G.AP-143	3.3.1.089	B
Piping	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Piping	PB	Stainless Steel	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F2.AP-99	3.3.1.094	D

Notes for Table 3.3.2-17:

Standard Notes:

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

B Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.

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

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

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

Plant Specific Notes:

1 The subject component is enclosed within another component. Loss of material on the external surface of the subject component is managed by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program (B2.1.23).

Table 3.3.2-18 Auxiliary Systems – Summary of Aging Management Evaluation – Turbine Building HVAC System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Closure Bolting	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-105	3.3.1.078	A
Closure Bolting	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	VII.I.AP-124	3.3.1.015	A
Closure Bolting	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.8)	VII.I.AP-125	3.3.1.012	A
Damper	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.F2.A-10	3.3.1.078	A
Damper	PB	Carbon Steel	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F2.A-08	3.3.1.090	B
Damper	FB	Carbon Steel (Galvanized)	Concrete (Ext)	None	None	VII.J.AP-282	3.3.1.112	C
Damper	FB, PB	Carbon Steel (Galvanized)	Plant Indoor Air (Ext)	None	None	VII.J.AP-13	3.3.1.116	C
Damper	FB, PB	Carbon Steel (Galvanized)	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F2.A-08	3.3.1.090	B
Ductwork	PB	Carbon Steel (Galvanized)	Plant Indoor Air (Ext)	None	None	VII.J.AP-13	3.3.1.116	C

Table 3.3.2-18 Auxiliary Systems – Summary of Aging Management Evaluation – Turbine Building HVAC System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Ductwork	PB	Carbon Steel (Galvanized)	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F2.A-08	3.3.1.090	B
Piping	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Piping	PB	Carbon Steel	Ventilation Atmosphere (Ext)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.I.A-81	3.3.1.078	E, 1
Piping	PB	Carbon Steel	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F2.A-08	3.3.1.090	B
Piping	PB	Copper Alloy	Plant Indoor Air (Ext)	None	None	VII.J.AP-144	3.3.1.114	A
Piping	PB	Copper Alloy	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F2.AP-109	3.3.1.079	E, 2
Piping	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A

Table 3.3.2-18 Auxiliary Systems – Summary of Aging Management Evaluation – Turbine Building HVAC System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Piping	PB	Stainless Steel	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F2.AP-99	3.3.1.094	B
Valve	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Valve	PB	Carbon Steel	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F2.A-08	3.3.1.090	D

Notes for Table 3.3.2-18:

Standard Notes:

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

B Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.

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

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

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

Plant Specific Notes:

1 The subject component is enclosed within another component. Loss of material on the external surface of the subject component is managed by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program (B2.1.23).

2 Ventilation air internal is a condensation environment and therefore is used interchangeably as the condensation -external environment.

Table 3.3.2-19 Auxiliary Systems – Summary of Aging Management Evaluation – Containment Cooling System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Closure Bolting	LBS, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	VII.I.AP-124	3.3.1.015	A
Closure Bolting	LBS, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.8)	VII.I.AP-125	3.3.1.012	A
Closure Bolting	LBS, PB	Stainless Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	VII.I.AP-124	3.3.1.015	A
Closure Bolting	LBS, PB	Stainless Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.8)	VII.I.AP-125	3.3.1.012	A
Fan	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.F3.A-10	3.3.1.078	A
Fan	PB	Carbon Steel	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F3.A-08	3.3.1.090	B
Flex Connectors	PB	Elastomer	Plant Indoor Air (Ext)	Hardening and loss of strength	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.F3.AP-102	3.3.1.076	A
Flex Connectors	PB	Elastomer	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.F3.AP-113	3.3.1.082	A

Table 3.3.2-19 Auxiliary Systems – Summary of Aging Management Evaluation – Containment Cooling System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Flex Connectors	PB	Elastomer	Ventilation Atmosphere (Int)	Hardening and loss of strength	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.F3.AP-102	3.3.1.076	A
Flex Connectors	PB	Elastomer	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F3.AP-103	3.3.1.096	B
Heat Exchanger (Containment Fan Cooling Coil)	HT, PB	Copper Alloy	Raw Water (Int)	Reduction of heat transfer	Open-Cycle Cooling Water System (B2.1.10)	VII.C1.A-72	3.3.1.042	A
Heat Exchanger (Containment Fan Cooling Coil)	HT, PB	Copper Alloy	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.10)	VII.C1.AP-179	3.3.1.038	A
Heat Exchanger (Containment Fan Cooling Coil)	HT, PB	Copper Alloy	Ventilation Atmosphere (Ext)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F3.AP-109	3.3.1.079	E, 1
Heat Exchanger Housing	PB	Carbon Steel (Galvanized)	Plant Indoor Air (Ext)	None	None	VII.J.AP-13	3.3.1.116	A

Table 3.3.2-19 Auxiliary Systems – Summary of Aging Management Evaluation – Containment Cooling System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Heat Exchanger Housing	PB	Carbon Steel (Galvanized)	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F3.A-08	3.3.1.090	B
Instrument Bellows	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Instrument Bellows	PB	Stainless Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.10)	VII.C1.A-54	3.3.1.040	A
Piping	LBS, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Piping	PB	Carbon Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.10)	VII.C1.AP-194	3.3.1.037	A
Piping	LBS	Carbon Steel	Waste Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.E5.AP-281	3.3.1.091	B
Piping	LBS, PB, SIA	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Piping	LBS, PB, SIA	Stainless Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.10)	VII.C1.A-54	3.3.1.040	A

Table 3.3.2-19 Auxiliary Systems – Summary of Aging Management Evaluation – Containment Cooling System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Piping	LBS	Stainless Steel	Waste Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.E5.AP-278	3.3.1.095	B
Thermowell	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Thermowell	PB	Stainless Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.10)	VII.C1.A-54	3.3.1.040	A
Tubing	LBS, PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Tubing	LBS, PB	Stainless Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.10)	VII.C1.A-54	3.3.1.040	A
Valve	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Valve	PB	Stainless Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.10)	VII.C1.A-54	3.3.1.040	A

Notes for Table 3.3.2-19:

Standard Notes:

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

B Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.

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

Plant Specific Notes:

1 The subject component is enclosed within another component. Loss of material on the external surface of the subject component is managed by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program (B2.1.23).

Table 3.3.2-20 Auxiliary Systems – Summary of Aging Management Evaluation – Fire Protection System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Closure Bolting	PB	Carbon Steel	Atmosphere/ Weather (Ext)	Loss of material	Bolting Integrity (B2.1.8)	VII.I.AP-126	3.3.1.012	A
Closure Bolting	PB	Carbon Steel	Atmosphere/ Weather (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	VII.I.AP-263	3.3.1.015	A
Closure Bolting	PB	Carbon Steel	Buried (Ext)	Loss of material	Buried and Underground Piping and Tanks (B2.1.25)	VII.I.AP-241	3.3.1.109	B
Closure Bolting	PB	Carbon Steel	Buried (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	VII.I.AP-242	3.3.1.014	A
Closure Bolting	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	VII.I.AP-124	3.3.1.015	A
Closure Bolting	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.8)	VII.I.AP-125	3.3.1.012	A
Closure Bolting	PB	Copper Alloy	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	VII.I.AP-261	3.3.1.015	A
Expansion Joint	PB	Stainless Steel	Fuel Oil (Int)	Loss of material	Fuel Oil Chemistry (B2.1.16) and One-Time Inspection (B2.1.18)	VII.G.AP-136	3.3.1.071	A
Expansion Joint	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Filter	PB	Carbon Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.G.A-23	3.3.1.089	B

Table 3.3.2-20 Auxiliary Systems – Summary of Aging Management Evaluation – Fire Protection System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Filter	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Filter	PB	Carbon Steel	Raw Water (Int)	Loss of material	Fire Water System (B2.1.14)	VII.G.A-33	3.3.1.064	B
Filter (Halon)	PB	Stainless Steel	Dry Gas (Int)	None	None	VII.J.AP-22	3.3.1.120	A
Filter (Halon)	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Flame Arrestor	PB	Aluminum	Fuel Oil (Int)	Loss of material	Fuel Oil Chemistry (B2.1.16) and One-Time Inspection (B2.1.18)	VII.H1.AP-129	3.3.1.071	A
Flame Arrestor	PB	Aluminum	Plant Indoor Air (Ext)	None	None	VII.J.AP-135	3.3.1.113	A
Flexible Hoses	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Flexible Hoses	PB	Stainless Steel	Raw Water (Int)	Loss of material	Fire Water System (B2.1.14)	VII.G.A-55	3.3.1.066	B
Flow Element	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Flow Element	PB	Carbon Steel	Raw Water (Int)	Loss of material	Fire Water System (B2.1.14)	VII.G.A-33	3.3.1.064	B

Table 3.3.2-20 Auxiliary Systems – Summary of Aging Management Evaluation – Fire Protection System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Flow Orifice	PB	Copper Alloy	Plant Indoor Air (Ext)	None	None	VII.J.AP-144	3.3.1.114	A
Flow Orifice	PB	Copper Alloy	Raw Water (Int)	Loss of material	Fire Water System (B2.1.14)	VII.G.AP-197	3.3.1.064	B
Flow Orifice	PB	Stainless Steel	Raw Water (Ext)	Loss of material	Fire Water System (B2.1.14)	VII.G.A-55	3.3.1.066	B
Flow Orifice	PB	Stainless Steel	Raw Water (Int)	Loss of material	Fire Water System (B2.1.14)	VII.G.A-55	3.3.1.066	B
Heat Exchanger (DFP Jacket Water)	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.G.AP-41	3.3.1.080	A
Heat Exchanger (DFP Jacket Water)	PB	Carbon Steel	Raw Water (Int)	Loss of material	Fire Water System (B2.1.14)	VII.G.A-33	3.3.1.064	D
Heat Exchanger (DFP Jacket Water)	PB	Copper Alloy	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.H1.AP-199	3.3.1.046	C
Heat Exchanger (DFP Jacket Water)	PB	Copper Alloy	Raw Water (Ext)	Loss of material	Fire Water System (B2.1.14)	VII.G.AP-197	3.3.1.064	D
Hose Station	PB	Copper Alloy	Plant Indoor Air (Ext)	None	None	VII.J.AP-144	3.3.1.114	A
Hose Station	PB	Copper Alloy	Raw Water (Int)	Loss of material	Fire Water System (B2.1.14)	VII.G.AP-197	3.3.1.064	D

Table 3.3.2-20 Auxiliary Systems – Summary of Aging Management Evaluation – Fire Protection System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Hydrant	PB	Cast Iron (Gray Cast Iron)	Atmosphere/ Weather (Ext)	Loss of material	Fire Water System (B2.1.14)	VII.G.AP-149	3.3.1.063	B
Hydrant	PB	Cast Iron (Gray Cast Iron)	Raw Water (Int)	Loss of material	Fire Water System (B2.1.14)	VII.G.A-33	3.3.1.064	B
Hydrant	PB	Cast Iron (Gray Cast Iron)	Raw Water (Int)	Loss of material	Selective Leaching (B2.1.19)	VII.G.A-51	3.3.1.072	B
Piping	PB	Carbon Steel	Atmosphere/ Weather (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-78	3.3.1.078	A
Piping	PB	Carbon Steel	Buried (Ext)	Loss of material	Buried and Underground Piping and Tanks (B2.1.25)	VII.G.AP-198	3.3.1.106	B
Piping	PB	Carbon Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.G.A-23	3.3.1.089	B
Piping	PB	Carbon Steel	Diesel Exhaust (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.H2.AP-104	3.3.1.088	B

Table 3.3.2-20 Auxiliary Systems – Summary of Aging Management Evaluation – Fire Protection System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Piping	PB	Carbon Steel	Fuel Oil (Int)	Loss of material	Fuel Oil Chemistry (B2.1.16) and One-Time Inspection (B2.1.18)	VII.G.AP-234	3.3.1.068	A
Piping	PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Piping	PB, SIA	Carbon Steel	Raw Water (Int)	Loss of material	Fire Water System (B2.1.14)	VII.G.A-33	3.3.1.064	B
Piping	PB	Carbon Steel (Galvanized)	Atmosphere/ Weather (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-78	3.3.1.078	A
Piping	PB	Carbon Steel (Galvanized)	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.G.A-23	3.3.1.089	B
Piping	PB	Carbon Steel (Galvanized)	Plant Indoor Air (Ext)	None	None	VII.J.AP-13	3.3.1.116	A
Piping	PB	Carbon Steel (Galvanized)	Raw Water (Int)	Loss of material	Fire Water System (B2.1.14)	VII.G.A-33	3.3.1.064	B
Piping	PB	Cast Iron (Gray Cast Iron)	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A

Table 3.3.2-20 Auxiliary Systems – Summary of Aging Management Evaluation – Fire Protection System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Piping	PB	Cast Iron (Gray Cast Iron)	Raw Water (Int)	Loss of material	Fire Water System (B2.1.14)	VII.G.A-33	3.3.1.064	B
Piping	PB	Cast Iron (Gray Cast Iron)	Raw Water (Int)	Loss of material	Selective Leaching (B2.1.19)	VII.G.A-51	3.3.1.072	B
Piping	PB	Copper Alloy	Atmosphere/ Weather (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.AP-159	3.3.1.081	A
Piping	PB	Copper Alloy	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.G.AP-143	3.3.1.089	B
Piping	PB	Copper Alloy	Plant Indoor Air (Ext)	None	None	VII.J.AP-144	3.3.1.114	A
Piping	PB	Copper Alloy	Raw Water (Int)	Loss of material	Fire Water System (B2.1.14)	VII.G.AP-197	3.3.1.064	B
Piping	PB	Polyvinyl Chloride (PVC)	Plant Indoor Air (Ext)	None	None	VII.J.AP-268	3.3.1.119	A
Piping	PB	Polyvinyl Chloride (PVC)	Waste Water (Int)	None	None	None	None	G, 2
Piping (Halon)	PB	Carbon Steel	Dry Gas (Int)	None	None	VII.J.AP-6	3.3.1.121	A

Table 3.3.2-20 Auxiliary Systems – Summary of Aging Management Evaluation – Fire Protection System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Piping (Halon)	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Fire Protection (B2.1.13)	VII.G.AP-150	3.3.1.058	A
Pump	PB	Cast Iron (Gray Cast Iron)	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Pump	PB	Cast Iron (Gray Cast Iron)	Raw Water (Int)	Loss of material	Fire Water System (B2.1.14)	VII.G.A-33	3.3.1.064	B
Pump	PB	Cast Iron (Gray Cast Iron)	Raw Water (Int)	Loss of material	Selective Leaching (B2.1.19)	VII.G.A-51	3.3.1.072	B
Silencer	PB	Carbon Steel	Diesel Exhaust (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.H2.AP-104	3.3.1.088	B
Silencer	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	C
Solenoid Valve	PB	Copper Alloy	Plant Indoor Air (Ext)	None	None	VII.J.AP-144	3.3.1.114	A
Solenoid Valve	PB	Copper Alloy	Raw Water (Int)	Loss of material	Fire Water System (B2.1.14)	VII.G.AP-197	3.3.1.064	B
Solenoid Valve (Halon)	PB	Carbon Steel	Dry Gas (Int)	None	None	VII.J.AP-6	3.3.1.121	A

Table 3.3.2-20 Auxiliary Systems – Summary of Aging Management Evaluation – Fire Protection System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Solenoid Valve (Halon)	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Fire Protection (B2.1.13)	VII.G.AP-150	3.3.1.058	A
Spray Nozzle	SP	Copper Alloy	Atmosphere/ Weather (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.AP-159	3.3.1.081	A
Spray Nozzle	SP	Copper Alloy	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.G.AP-143	3.3.1.089	B
Spray Nozzle	SP	Copper Alloy	Plant Indoor Air (Ext)	None	None	VII.J.AP-144	3.3.1.114	A
Spray Nozzle	SP	Copper Alloy	Raw Water (Int)	Loss of material	Fire Water System (B2.1.14)	VII.G.AP-197	3.3.1.064	B
Spray Nozzle (Halon)	SP	Stainless Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VIII.B1.SP-110	3.4.1.039	B
Spray Nozzle (Halon)	SP	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Strainer	PB	Cast Iron (Gray Cast Iron)	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A

Table 3.3.2-20 Auxiliary Systems – Summary of Aging Management Evaluation – Fire Protection System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Strainer	PB	Cast Iron (Gray Cast Iron)	Raw Water (Int)	Loss of material	Fire Water System (B2.1.14)	VII.G.A-33	3.3.1.064	B
Strainer	PB	Cast Iron (Gray Cast Iron)	Raw Water (Int)	Loss of material	Selective Leaching (B2.1.19)	VII.G.A-51	3.3.1.072	B
Strainer	PB	Copper Alloy	Plant Indoor Air (Ext)	None	None	VII.J.AP-144	3.3.1.114	A
Strainer	PB	Copper Alloy	Raw Water (Int)	Loss of material	Fire Water System (B2.1.14)	VII.G.AP-197	3.3.1.064	B
Tank	PB	Carbon Steel	Atmosphere/ Weather (Ext)	Loss of material	Aboveground Metallic Tanks (B2.1.15)	VII.H1.A-95	3.3.1.067	B
Tank	PB	Carbon Steel	Buried (Ext)	Loss of material	Aboveground Metallic Tanks (B2.1.15)	VIII.G.SP-116	3.4.1.030	B, 1
Tank	PB	Carbon Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.G.A-23	3.3.1.089	D
Tank	PB	Carbon Steel	Fuel Oil (Int)	Loss of material	Fuel Oil Chemistry (B2.1.16) and One-Time Inspection (B2.1.18)	VII.G.AP-234	3.3.1.068	C
Tank	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A

Table 3.3.2-20 Auxiliary Systems – Summary of Aging Management Evaluation – Fire Protection System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Tank	PB	Carbon Steel	Raw Water (Int)	Loss of material	Fire Water System (B2.1.14)	VII.G.A-33	3.3.1.064	D
Tank	PB	Cast Iron (Gray Cast Iron)	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Tank	PB	Cast Iron (Gray Cast Iron)	Raw Water (Int)	Loss of material	Fire Water System (B2.1.14)	VII.G.A-33	3.3.1.064	D
Tank	PB	Cast Iron (Gray Cast Iron)	Raw Water (Int)	Loss of material	Selective Leaching (B2.1.19)	VII.G.A-51	3.3.1.072	D
Tank (Halon)	PB	Carbon Steel	Dry Gas (Int)	None	None	VII.J.AP-6	3.3.1.121	C
Tank (Halon)	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Fire Protection (B2.1.13)	VII.G.AP-150	3.3.1.058	A
Tubing	PB	Copper Alloy	Atmosphere/ Weather (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.AP-159	3.3.1.081	A
Tubing	PB	Copper Alloy	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.G.AP-143	3.3.1.089	B
Tubing	PB	Copper Alloy	Fuel Oil (Int)	Loss of material	Fuel Oil Chemistry (B2.1.16) and One-Time Inspection (B2.1.18)	VII.G.AP-132	3.3.1.069	A

Table 3.3.2-20 Auxiliary Systems – Summary of Aging Management Evaluation – Fire Protection System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Tubing	PB	Copper Alloy	Plant Indoor Air (Ext)	None	None	VII.J.AP-144	3.3.1.114	A
Tubing	PB	Copper Alloy	Raw Water (Int)	Loss of material	Fire Water System (B2.1.14)	VII.G.AP-197	3.3.1.064	B
Valve	PB	Carbon Steel	Buried (Ext)	Loss of material	Buried and Underground Piping and Tanks (B2.1.25)	VII.G.AP-198	3.3.1.106	B
Valve	PB	Carbon Steel	Fuel Oil (Int)	Loss of material	Fuel Oil Chemistry (B2.1.16) and One-Time Inspection (B2.1.18)	VII.G.AP-234	3.3.1.068	A
Valve	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Valve	PB	Carbon Steel	Raw Water (Int)	Loss of material	Fire Water System (B2.1.14)	VII.G.A-33	3.3.1.064	B
Valve	PB	Cast Iron (Gray Cast Iron)	Atmosphere/ Weather (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-78	3.3.1.078	A
Valve	PB	Cast Iron (Gray Cast Iron)	Buried (Ext)	Loss of material	Selective Leaching (B2.1.19)	VII.G.A-02	3.3.1.072	B
Valve	PB	Cast Iron (Gray Cast Iron)	Buried (Ext)	Loss of material	Buried and Underground Piping and Tanks (B2.1.25)	VII.G.AP-198	3.3.1.106	B

Table 3.3.2-20 Auxiliary Systems – Summary of Aging Management Evaluation – Fire Protection System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Valve	PB, SIA	Cast Iron (Gray Cast Iron)	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Valve	PB, SIA	Cast Iron (Gray Cast Iron)	Raw Water (Int)	Loss of material	Fire Water System (B2.1.14)	VII.G.A-33	3.3.1.064	B
Valve	PB, SIA	Cast Iron (Gray Cast Iron)	Raw Water (Int)	Loss of material	Selective Leaching (B2.1.19)	VII.G.A-51	3.3.1.072	B
Valve	PB	Copper Alloy	Atmosphere/ Weather (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.AP-159	3.3.1.081	A
Valve	PB	Copper Alloy	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.G.AP-143	3.3.1.089	B
Valve	PB	Copper Alloy	Fuel Oil (Int)	Loss of material	Fuel Oil Chemistry (B2.1.16) and One-Time Inspection (B2.1.18)	VII.G.AP-132	3.3.1.069	A
Valve	PB, SIA	Copper Alloy	Plant Indoor Air (Ext)	None	None	VII.J.AP-144	3.3.1.114	A
Valve	PB, SIA	Copper Alloy	Raw Water (Int)	Loss of material	Fire Water System (B2.1.14)	VII.G.AP-197	3.3.1.064	B
Valve (Halon)	PB	Carbon Steel	Dry Gas (Int)	None	None	VII.J.AP-6	3.3.1.121	A

Table 3.3.2-20 Auxiliary Systems – Summary of Aging Management Evaluation – Fire Protection System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Valve (Halon)	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Fire Protection (B2.1.13)	VII.G.AP-150	3.3.1.058	A
Valve (Halon)	PB	Copper Alloy	Dry Gas (Int)	None	None	VII.J.AP-9	3.3.1.114	A
Valve (Halon)	PB	Copper Alloy	Plant Indoor Air (Ext)	None	None	VII.J.AP-144	3.3.1.114	A

Notes for Table 3.3.2-20:

Standard Notes:

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

B Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.

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

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

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

Plant Specific Notes:

1 The fire water storage tanks rest on a sand cushion surrounded by a reinforced concrete ring beam.

2 PVC in a wastewater environment is unaffected by water, concentrated alkalies, nonoxidizing acids, oils, ozone, or humidity changes. PVC in a waste water environment is not exposed to direct sunlight or ionizing radiation. Therefore PVC in a wastewater environment has no aging effect.

Table 3.3.2-21 Auxiliary Systems – Summary of Aging Management Evaluation – Emergency Diesel Engine Fuel Oil Storage and Transfer System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Closure Bolting	LBS, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	VII.I.AP-124	3.3.1.015	A
Closure Bolting	LBS, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.8)	VII.I.AP-125	3.3.1.012	A
Closure Bolting	LBS	Stainless Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	VII.I.AP-124	3.3.1.015	A
Closure Bolting	LBS	Stainless Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.8)	VII.I.AP-125	3.3.1.012	A
Flame Arrestor	LBS, SIA	Carbon Steel	Atmosphere/ Weather (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.H1.A-24	3.3.1.080	A
Flame Arrestor	LBS, SIA	Carbon Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F2.A-08	3.3.1.090	B
Flow Element	PB	Stainless Steel	Fuel Oil (Int)	Loss of material	Fuel Oil Chemistry (B2.1.16) and One-Time Inspection (B2.1.18)	VII.H1.AP-136	3.3.1.071	A
Flow Element	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Piping	LBS, PB, SIA	Carbon Steel	Atmosphere/ Weather (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.H1.A-24	3.3.1.080	A
Piping	PB	Carbon Steel	Buried (Ext)	Loss of material	Buried and Underground Piping and Tanks (B2.1.25)	VII.H1.AP-198	3.3.1.106	B

Table 3.3.2-21 Auxiliary Systems – Summary of Aging Management Evaluation – Emergency Diesel Engine Fuel Oil Storage and Transfer System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Piping	LBS, SIA	Carbon Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F2.A-08	3.3.1.090	B
Piping	PB	Carbon Steel	Fuel Oil (Ext)	Loss of material	Fuel Oil Chemistry (B2.1.16) and One-Time Inspection (B2.1.18)	VII.H1.AP-105	3.3.1.070	A
Piping	LBS, PB, SIA	Carbon Steel	Fuel Oil (Int)	Loss of material	Fuel Oil Chemistry (B2.1.16) and One-Time Inspection (B2.1.18)	VII.H1.AP-105	3.3.1.070	A
Piping	LBS, PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Piping	LBS, SIA	Stainless Steel	Fuel Oil (Int)	Loss of material	Fuel Oil Chemistry (B2.1.16) and One-Time Inspection (B2.1.18)	VII.H1.AP-136	3.3.1.071	A
Piping	LBS, SIA	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Pump	PB	Stainless Steel	Fuel Oil (Ext)	Loss of material	Fuel Oil Chemistry (B2.1.16) and One-Time Inspection (B2.1.18)	VII.H1.AP-136	3.3.1.071	A
Pump	PB	Stainless Steel	Fuel Oil (Int)	Loss of material	Fuel Oil Chemistry (B2.1.16) and One-Time Inspection (B2.1.18)	VII.H1.AP-136	3.3.1.071	A

Table 3.3.2-21 Auxiliary Systems – Summary of Aging Management Evaluation – Emergency Diesel Engine Fuel Oil Storage and Transfer System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Sight Gauge	LBS, PB, SIA	Carbon Steel	Fuel Oil (Int)	Loss of material	Fuel Oil Chemistry (B2.1.16) and One-Time Inspection (B2.1.18)	VII.H1.AP-105	3.3.1.070	A
Sight Gauge	LBS, PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Sight Gauge	LBS, SIA	Glass	Fuel Oil (Int)	None	None	VII.J.AP-49	3.3.1.117	A
Sight Gauge	LBS, SIA	Glass	Plant Indoor Air (Ext)	None	None	VII.J.AP-14	3.3.1.117	A
Strainer	FIL, LBS, PB, SIA	Carbon Steel	Fuel Oil (Int)	Loss of material	Fuel Oil Chemistry (B2.1.16) and One-Time Inspection (B2.1.18)	VII.H1.AP-105	3.3.1.070	A
Strainer	FIL, LBS, PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Tank	PB	Carbon Steel	Buried (Ext)	Loss of material	Buried and Underground Piping and Tanks (B2.1.25)	VII.H1.AP-198	3.3.1.106	D
Tank	PB	Carbon Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F2.A-08	3.3.1.090	D
Tank	PB	Carbon Steel	Fuel Oil (Int)	Loss of material	Fuel Oil Chemistry (B2.1.16) and One-Time Inspection (B2.1.18)	VII.H1.AP-105	3.3.1.070	A

Table 3.3.2-21 Auxiliary Systems – Summary of Aging Management Evaluation – Emergency Diesel Engine Fuel Oil Storage and Transfer System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Tank	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Tank	PB	Carbon Steel	Underground (Ext)	Loss of material	Buried and Underground Piping and Tanks (B2.1.25)	VII.I.AP-284	3.3.1.109a	D
Tubing	PB	Stainless Steel	Fuel Oil (Int)	Loss of material	Fuel Oil Chemistry (B2.1.16) and One-Time Inspection (B2.1.18)	VII.H1.AP-136	3.3.1.071	A
Tubing	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Valve	LBS, PB, SIA	Carbon Steel	Fuel Oil (Int)	Loss of material	Fuel Oil Chemistry (B2.1.16) and One-Time Inspection (B2.1.18)	VII.H1.AP-105	3.3.1.070	A
Valve	LBS, PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Valve	PB	Stainless Steel	Fuel Oil (Int)	Loss of material	Fuel Oil Chemistry (B2.1.16) and One-Time Inspection (B2.1.18)	VII.H1.AP-136	3.3.1.071	A
Valve	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A

Notes for Table 3.3.2-21:

Standard Notes:

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

B Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.

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

Plant Specific Notes:

None

Table 3.3.2-22 Auxiliary Systems – Summary of Aging Management Evaluation – Standby Diesel Generator Engine System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Closure Bolting	LBS, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	VII.I.AP-124	3.3.1.015	A
Closure Bolting	LBS, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.8)	VII.I.AP-125	3.3.1.012	A
Closure Bolting	LBS, PB	Stainless Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	VII.I.AP-124	3.3.1.015	A
Closure Bolting	LBS, PB	Stainless Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.8)	VII.I.AP-125	3.3.1.012	A
Compressor	LBS	Cast Iron	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.H2.A-23	3.3.1.089	D
Compressor	LBS	Cast Iron	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Dryer	SIA	Carbon Steel	Dry Gas (Int)	None	None	VII.J.AP-4	3.3.1.121	C
Dryer	SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Dryer	SIA	Stainless Steel	Dry Gas (Int)	None	None	VII.J.AP-20	3.3.1.120	A
Dryer	SIA	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	C
Expansion Joint	PB	Elastomer	Plant Indoor Air (Ext)	Hardening and loss of strength	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.F4.AP-102	3.3.1.076	C

Table 3.3.2-22 Auxiliary Systems – Summary of Aging Management Evaluation – Standby Diesel Generator Engine System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Expansion Joint	PB	Elastomer	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.F4.AP-113	3.3.1.082	C
Expansion Joint	PB	Elastomer	Raw Water (Int)	Hardening and loss of strength	Open-Cycle Cooling Water System (B2.1.10)	VII.C1.AP-75	3.3.1.032a	C
Expansion Joint	PB	Elastomer	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.10)	VII.C1.AP-76	3.3.1.032a	C
Expansion Joint	PB	Stainless Steel	Diesel Exhaust (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.H2.AP-104	3.3.1.088	B
Expansion Joint	PB	Stainless Steel	Diesel Exhaust (Int)	Cracking	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.H2.AP-128	3.3.1.083	B
Expansion Joint	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	C
Filter	LBS, PB, SIA	Carbon Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.H2.A-23	3.3.1.089	D
Filter	SIA	Carbon Steel	Dry Gas (Int)	None	None	VII.J.AP-4	3.3.1.121	C

Table 3.3.2-22 Auxiliary Systems – Summary of Aging Management Evaluation – Standby Diesel Generator Engine System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Filter	PB	Carbon Steel	Fuel Oil (Int)	Loss of material	Fuel Oil Chemistry (B2.1.16) and One-Time Inspection (B2.1.18)	VII.H2.AP-105	3.3.1.070	C
Filter	PB	Carbon Steel	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.24) and One-Time Inspection (B2.1.18)	VII.H2.AP-127	3.3.1.097	C
Filter	LBS, PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Filter	PB	Stainless Steel	Dry Gas (Int)	None	None	VII.J.AP-20	3.3.1.120	C
Filter	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	C
Flex Connectors	PB	Elastomer	Closed Cycle Cooling Water (Int)	Hardening and loss of strength	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.C2.AP-259	3.3.1.085	D
Flex Connectors	PB	Elastomer	Plant Indoor Air (Ext)	Hardening and loss of strength	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.F4.AP-102	3.3.1.076	C
Flex Connectors	PB	Elastomer	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.F4.AP-113	3.3.1.082	C
Flex Connectors	PB	Elastomer	Raw Water (Int)	Hardening and loss of strength	Open-Cycle Cooling Water System (B2.1.10)	VII.C1.AP-75	3.3.1.032a	C

Table 3.3.2-22 Auxiliary Systems – Summary of Aging Management Evaluation – Standby Diesel Generator Engine System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Flex Connectors	PB	Elastomer	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.10)	VII.C1.AP-76	3.3.1.032a	C
Flow Orifice	PB, TH	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.H2.AP-202	3.3.1.045	A
Flow Orifice	PB, TH	Carbon Steel	Fuel Oil (Int)	Loss of material	Fuel Oil Chemistry (B2.1.16) and One-Time Inspection (B2.1.18)	VII.H2.AP-105	3.3.1.070	A
Flow Orifice	PB, TH	Carbon Steel	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.24) and One-Time Inspection (B2.1.18)	VII.H2.AP-127	3.3.1.097	A
Flow Orifice	PB, TH	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Heat Exchanger (DG Aftercooler)	LBS, SIA	Carbon Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.H2.A-23	3.3.1.089	D
Heat Exchanger (DG Aftercooler)	LBS, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.H2.AP-41	3.3.1.080	A
Heat Exchanger (DG Intercooler)	PB	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.H2.AP-202	3.3.1.045	C

Table 3.3.2-22 Auxiliary Systems – Summary of Aging Management Evaluation – Standby Diesel Generator Engine System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Heat Exchanger (DG Intercooler)	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.H2.AP-41	3.3.1.080	A
Heat Exchanger (DG Intercooler)	HT, PB	Copper Alloy	Closed Cycle Cooling Water (Ext)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.C2.AP-199	3.3.1.046	C
Heat Exchanger (DG Intercooler)	HT, PB	Copper Alloy	Closed Cycle Cooling Water (Ext)	Reduction of heat transfer	Closed Treated Water Systems (B2.1.11)	VII.C2.AP-205	3.3.1.050	A
Heat Exchanger (DG Intercooler)	HT, PB	Copper Alloy	Raw Water (Int)	Reduction of heat transfer	Open-Cycle Cooling Water System (B2.1.10)	VII.C1.A-72	3.3.1.042	A
Heat Exchanger (DG Intercooler)	HT, PB	Copper Alloy	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.10)	VII.C1.AP-179	3.3.1.038	A
Heat Exchanger (DG Jacket Water)	PB	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.H2.AP-202	3.3.1.045	C
Heat Exchanger (DG Jacket Water)	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.H2.AP-41	3.3.1.080	A
Heat Exchanger (DG Jacket Water)	HT, PB	Stainless Steel	Closed Cycle Cooling Water (Ext)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.C2.A-52	3.3.1.049	C
Heat Exchanger (DG Jacket Water)	HT, PB	Stainless Steel	Closed Cycle Cooling Water (Ext)	Reduction of heat transfer	Closed Treated Water Systems (B2.1.11)	VII.C2.AP-188	3.3.1.050	A

Table 3.3.2-22 Auxiliary Systems – Summary of Aging Management Evaluation – Standby Diesel Generator Engine System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Heat Exchanger (DG Jacket Water)	HT, PB	Stainless Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.10)	VII.H2.AP-55	3.3.1.041	C
Heat Exchanger (DG Jacket Water)	HT, PB	Stainless Steel	Raw Water (Int)	Reduction of heat transfer	Open-Cycle Cooling Water System (B2.1.10)	VII.H2.AP-187	3.3.1.042	A
Heat Exchanger (DG Lube Oil)	PB	Carbon Steel	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.24) and One-Time Inspection (B2.1.18)	VII.H2.AP-131	3.3.1.098	A
Heat Exchanger (DG Lube Oil)	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.H2.AP-41	3.3.1.080	A
Heat Exchanger (DG Lube Oil)	HT, PB	Stainless Steel	Lubricating Oil (Ext)	Loss of material	Lubricating Oil Analysis (B2.1.24) and One-Time Inspection (B2.1.18)	VII.H2.AP-138	3.3.1.100	C
Heat Exchanger (DG Lube Oil)	HT, PB	Stainless Steel	Lubricating Oil (Ext)	Reduction of heat transfer	Lubricating Oil Analysis (B2.1.24) and One-Time Inspection (B2.1.18)	VIII.G.SP-102	3.4.1.046	A
Heat Exchanger (DG Lube Oil)	HT, PB	Stainless Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.10)	VII.H2.AP-55	3.3.1.041	C
Heat Exchanger (DG Lube Oil)	HT, PB	Stainless Steel	Raw Water (Int)	Reduction of heat transfer	Open-Cycle Cooling Water System (B2.1.10)	VII.H2.AP-187	3.3.1.042	A
Heater	PB	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.H2.AP-202	3.3.1.045	C

Table 3.3.2-22 Auxiliary Systems – Summary of Aging Management Evaluation – Standby Diesel Generator Engine System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Heater	PB	Carbon Steel	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.24) and One-Time Inspection (B2.1.18)	VII.H2.AP-127	3.3.1.097	C
Heater	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Insulation	INS	Aluminum	Plant Indoor Air (Ext)	None	None	VII.J.AP-135	3.3.1.113	A
Insulation	INS	Insulation Calcium Silicate	Plant Indoor Air (Ext)	None	None	None	None	J, 1
Insulation	INS	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	C
Piping	LBS, SIA	Carbon Steel	Atmosphere/ Weather (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-78	3.3.1.078	A
Piping	SIA	Carbon Steel	Atmosphere/ Weather (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VIII.B1.SP-59	3.4.1.036	B
Piping	LBS, PB, SIA	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.H2.AP-202	3.3.1.045	A

Table 3.3.2-22 Auxiliary Systems – Summary of Aging Management Evaluation – Standby Diesel Generator Engine System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Piping	LBS, PB, SIA	Carbon Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.H2.A-23	3.3.1.089	B
Piping	PB	Carbon Steel	Diesel Exhaust (Int)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	None	None	H, 2
Piping	PB, SIA	Carbon Steel	Diesel Exhaust (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.H2.AP-104	3.3.1.088	B
Piping	PB	Carbon Steel	Dry Gas (Int)	None	None	VII.J.AP-4	3.3.1.121	A
Piping	LBS, PB, SIA	Carbon Steel	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.24) and One-Time Inspection (B2.1.18)	VII.H2.AP-127	3.3.1.097	A
Piping	LBS, PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Piping	LBS, PB, SIA	Carbon Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.10)	VII.H2.AP-194	3.3.1.037	A
Piping	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A

Table 3.3.2-22 Auxiliary Systems – Summary of Aging Management Evaluation – Standby Diesel Generator Engine System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Piping	PB	Stainless Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.10)	VII.H2.AP-55	3.3.1.041	A
Pump	PB	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.H2.AP-202	3.3.1.045	A
Pump	PB	Carbon Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.H2.A-23	3.3.1.089	B
Pump	PB	Carbon Steel	Fuel Oil (Int)	Loss of material	Fuel Oil Chemistry (B2.1.16) and One-Time Inspection (B2.1.18)	VII.H2.AP-105	3.3.1.070	A
Pump	PB	Carbon Steel	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.24) and One-Time Inspection (B2.1.18)	VII.H2.AP-127	3.3.1.097	A
Pump	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Pump	PB	Stainless Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.C2.A-52	3.3.1.049	A
Pump	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Sight Gauge	LBS, SIA	Copper Alloy	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.H2.AP-199	3.3.1.046	A

Table 3.3.2-22 Auxiliary Systems – Summary of Aging Management Evaluation – Standby Diesel Generator Engine System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Sight Gauge	LBS, SIA	Copper Alloy	Plant Indoor Air (Ext)	None	None	VII.J.AP-144	3.3.1.114	A
Sight Gauge	LBS, SIA	Glass	Closed Cycle Cooling Water (Int)	None	None	VII.J.AP-51	3.3.1.117	A
Sight Gauge	LBS, SIA	Glass	Plant Indoor Air (Ext)	None	None	VII.J.AP-14	3.3.1.117	A
Silencer	PB	Carbon Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.H2.A-23	3.3.1.089	B
Silencer	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Solenoid Valve	PB	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.H2.AP-202	3.3.1.045	A
Solenoid Valve	PB	Carbon Steel	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.24) and One-Time Inspection (B2.1.18)	VII.H2.AP-127	3.3.1.097	A
Solenoid Valve	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A

Table 3.3.2-22 Auxiliary Systems – Summary of Aging Management Evaluation – Standby Diesel Generator Engine System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Solenoid Valve	LBS, SIA	Copper Alloy	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.G.AP-143	3.3.1.089	B
Solenoid Valve	SIA	Copper Alloy	Dry Gas (Int)	None	None	VII.J.AP-8	3.3.1.114	A
Solenoid Valve	LBS, SIA	Copper Alloy	Plant Indoor Air (Ext)	None	None	VII.J.AP-144	3.3.1.114	A
Solenoid Valve	PB	Stainless Steel	Dry Gas (Int)	None	None	VII.J.AP-20	3.3.1.120	A
Solenoid Valve	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Strainer	PB	Carbon Steel	Dry Gas (Int)	None	None	VII.J.AP-4	3.3.1.121	A
Strainer	PB	Carbon Steel	Fuel Oil (Int)	Loss of material	Fuel Oil Chemistry (B2.1.16) and One-Time Inspection (B2.1.18)	VII.H2.AP-105	3.3.1.070	A
Strainer	PB	Carbon Steel	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.24) and One-Time Inspection (B2.1.18)	VII.H2.AP-127	3.3.1.097	A
Strainer	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Strainer Element	FIL	Carbon Steel	Dry Gas (Ext)	None	None	VII.J.AP-4	3.3.1.121	A

Table 3.3.2-22 Auxiliary Systems – Summary of Aging Management Evaluation – Standby Diesel Generator Engine System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Strainer Element	FIL	Carbon Steel	Fuel Oil (Ext)	Loss of material	Fuel Oil Chemistry (B2.1.16) and One-Time Inspection (B2.1.18)	VII.H2.AP-105	3.3.1.070	A
Strainer Element	FIL	Carbon Steel	Lubricating Oil (Ext)	Loss of material	Lubricating Oil Analysis (B2.1.24) and One-Time Inspection (B2.1.18)	VII.H2.AP-127	3.3.1.097	A
Tank	PB	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.H2.AP-202	3.3.1.045	A
Tank	LBS, SIA	Carbon Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.H2.A-23	3.3.1.089	D
Tank	PB	Carbon Steel	Dry Gas (Int)	None	None	VII.J.AP-4	3.3.1.121	C
Tank	PB	Carbon Steel	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.24) and One-Time Inspection (B2.1.18)	VII.H2.AP-127	3.3.1.097	C
Tank	LBS, PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Thermowell	PB	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.H2.AP-202	3.3.1.045	A

Table 3.3.2-22 Auxiliary Systems – Summary of Aging Management Evaluation – Standby Diesel Generator Engine System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Thermowell	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Thermowell	PB	Carbon Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.10)	VII.H2.AP-194	3.3.1.037	A
Thermowell	PB	Stainless Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.C2.A-52	3.3.1.049	A
Thermowell	PB	Stainless Steel	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.24) and One-Time Inspection (B2.1.18)	VII.H2.AP-138	3.3.1.100	A
Thermowell	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Thermowell	PB	Stainless Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.10)	VII.H2.AP-55	3.3.1.041	A
Trap	LBS, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Trap	LBS, SIA	Carbon Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.10)	VII.H2.AP-194	3.3.1.037	C
Tubing	PB	Copper Alloy	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.H2.AP-199	3.3.1.046	A

Table 3.3.2-22 Auxiliary Systems – Summary of Aging Management Evaluation – Standby Diesel Generator Engine System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Tubing	PB	Copper Alloy	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.G.AP-143	3.3.1.089	B
Tubing	PB	Copper Alloy	Dry Gas (Int)	None	None	VII.J.AP-8	3.3.1.114	A
Tubing	PB	Copper Alloy	Fuel Oil (Int)	Loss of material	Fuel Oil Chemistry (B2.1.16) and One-Time Inspection (B2.1.18)	VII.H2.AP-132	3.3.1.069	A
Tubing	PB	Copper Alloy	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.24) and One-Time Inspection (B2.1.18)	VII.H2.AP-133	3.3.1.099	A
Tubing	PB	Copper Alloy	Plant Indoor Air (Ext)	None	None	VII.J.AP-144	3.3.1.114	A
Tubing	PB	Copper Alloy	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.10)	VII.H2.AP-193	3.3.1.035	A
Tubing	PB	Stainless Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.C2.A-52	3.3.1.049	A
Tubing	PB	Stainless Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.E5.AP-273	3.3.1.095	B
Tubing	PB	Stainless Steel	Dry Gas (Int)	None	None	VII.J.AP-20	3.3.1.120	A

Table 3.3.2-22 Auxiliary Systems – Summary of Aging Management Evaluation – Standby Diesel Generator Engine System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Tubing	PB	Stainless Steel	Fuel Oil (Int)	Loss of material	Fuel Oil Chemistry (B2.1.16) and One-Time Inspection (B2.1.18)	VII.H2.AP-136	3.3.1.071	A
Tubing	PB	Stainless Steel	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.24) and One-Time Inspection (B2.1.18)	VII.H2.AP-138	3.3.1.100	A
Tubing	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Tubing	PB	Stainless Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.10)	VII.H2.AP-55	3.3.1.041	A
Valve	PB	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.H2.AP-202	3.3.1.045	A
Valve	LBS, PB, SIA	Carbon Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.H2.A-23	3.3.1.089	B
Valve	PB, SIA	Carbon Steel	Dry Gas (Int)	None	None	VII.J.AP-4	3.3.1.121	A
Valve	PB	Carbon Steel	Fuel Oil (Int)	Loss of material	Fuel Oil Chemistry (B2.1.16) and One-Time Inspection (B2.1.18)	VII.H2.AP-105	3.3.1.070	A
Valve	PB	Carbon Steel	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.24) and One-Time Inspection (B2.1.18)	VII.H2.AP-127	3.3.1.097	A

Table 3.3.2-22 Auxiliary Systems – Summary of Aging Management Evaluation – Standby Diesel Generator Engine System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Valve	LBS, PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Valve	LBS, PB, SIA	Carbon Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.10)	VII.H2.AP-194	3.3.1.037	A
Valve	LBS, PB, SIA	Copper Alloy	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.H2.AP-199	3.3.1.046	A
Valve	LBS, SIA	Copper Alloy	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.G.AP-143	3.3.1.089	B
Valve	PB, SIA	Copper Alloy	Dry Gas (Int)	None	None	VII.J.AP-8	3.3.1.114	A
Valve	PB	Copper Alloy	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.24) and One-Time Inspection (B2.1.18)	VII.H2.AP-133	3.3.1.099	A
Valve	LBS, PB, SIA	Copper Alloy	Plant Indoor Air (Ext)	None	None	VII.J.AP-144	3.3.1.114	A
Valve	PB	Stainless Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.C2.A-52	3.3.1.049	A

Table 3.3.2-22 Auxiliary Systems – Summary of Aging Management Evaluation – Standby Diesel Generator Engine System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Valve	LBS, PB, SIA	Stainless Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.E5.AP-273	3.3.1.095	B
Valve	PB	Stainless Steel	Dry Gas (Int)	None	None	VII.J.AP-20	3.3.1.120	A
Valve	PB	Stainless Steel	Fuel Oil (Int)	Loss of material	Fuel Oil Chemistry (B2.1.16) and One-Time Inspection (B2.1.18)	VII.H2.AP-136	3.3.1.071	A
Valve	PB	Stainless Steel	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.24) and One-Time Inspection (B2.1.18)	VII.H2.AP-138	3.3.1.100	A
Valve	LBS, PB, SIA	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Valve	LBS, PB	Stainless Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.10)	VII.H2.AP-55	3.3.1.041	A
Vent	LBS	Carbon Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.H2.A-23	3.3.1.089	B
Vent	LBS	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A

Notes for Table 3.3.2-22:

Standard Notes:

- A Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.
- B Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.
- C Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.
- D Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.
- H Aging Effect not in NUREG-1801 for this component, material and environment combination.
- J Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant Specific Notes:

1 Based on plant operating experience, there are no aging effects requiring management for calcium silicate insulation in a metal jacket in a plant indoor air environment. The insulation does not experience aging effects unless exposed to temperatures, radiation, or chemicals capable of attacking the specific chemical composition of the insulation. The insulation is contained in metal jacket with a vapor barrier to prevent moisture intrusion and is in a non-aggressive air environment that does not experience significant aging effects.

2 This TLAA is applicable to the standby diesel generator engine exhaust piping. Section 4.3.5 describes the evaluation of this TLAA.

Table 3.3.2-23 Auxiliary Systems – Summary of Aging Management Evaluation EOF and TSC Diesels, Security Building System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Closure Bolting	PB	Carbon Steel	Atmosphere/ Weather (Ext)	Loss of material	Bolting Integrity (B2.1.8)	VII.I.AP-126	3.3.1.012	A
Closure Bolting	PB	Carbon Steel	Atmosphere/ Weather (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	VII.I.AP-263	3.3.1.015	A
Closure Bolting	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	VII.I.AP-124	3.3.1.015	A
Closure Bolting	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.8)	VII.I.AP-125	3.3.1.012	A
Closure Bolting	PB	Stainless Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	VII.I.AP-124	3.3.1.015	A
Closure Bolting	PB	Stainless Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.8)	VII.I.AP-125	3.3.1.012	A
Expansion Joint	PB	Carbon Steel	Fuel Oil (Int)	Loss of material	Fuel Oil Chemistry (B2.1.16) and One-Time Inspection (B2.1.18)	VII.G.AP-234	3.3.1.068	A
Expansion Joint	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Expansion Joint	PB	Elastomer	Fuel Oil (Int)	Hardening and loss of strength	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	None	None	G

Table 3.3.2-23 Auxiliary Systems – Summary of Aging Management Evaluation EOF and TSC Diesels, Security Building System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Expansion Joint	PB	Elastomer	Plant Indoor Air (Ext)	Hardening and loss of strength	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.F4.AP-102	3.3.1.076	A
Flame Arrestor	PB	Carbon Steel	Atmosphere/ Weather (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.H1.A-24	3.3.1.080	C
Flame Arrestor	PB	Carbon Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.H2.A-23	3.3.1.089	D
Flexible Hoses	PB	Elastomer	Fuel Oil (Int)	Hardening and loss of strength	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	None	None	G
Flexible Hoses	PB	Elastomer	Plant Indoor Air (Ext)	Hardening and loss of strength	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.F4.AP-102	3.3.1.076	A
Flexible Hoses	PB	Stainless Steel	Fuel Oil (Int)	Loss of material	Fuel Oil Chemistry (B2.1.16) and One-Time Inspection (B2.1.18)	VII.H2.AP-136	3.3.1.071	A

Table 3.3.2-23 Auxiliary Systems – Summary of Aging Management Evaluation EOF and TSC Diesels, Security Building System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Flexible Hoses	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Piping	PB	Carbon Steel	Atmosphere/ Weather (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.H1.A-24	3.3.1.080	A
Piping	PB	Carbon Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.H2-A-23	3.3.1.089	B
Piping	PB	Carbon Steel	Diesel Exhaust (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.H2.AP-104	3.3.1.088	B
Piping	PB	Carbon Steel	Fuel Oil (Int)	Loss of material	Fuel Oil Chemistry (B2.1.16) and One-Time Inspection (B2.1.18)	VII.G.AP-234	3.3.1.068	A
Piping	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A

Table 3.3.2-23 Auxiliary Systems – Summary of Aging Management Evaluation EOF and TSC Diesels, Security Building System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Piping	PB	Stainless Steel	Diesel Exhaust (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.H2.AP-104	3.3.1.088	B
Piping	PB	Stainless Steel	Diesel Exhaust (Int)	Cracking	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.H2.AP-128	3.3.1.083	B
Piping	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Silencer	PB	Carbon Steel	Atmosphere/ Weather (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.H1.A-24	3.3.1.080	A
Silencer	PB	Carbon Steel	Diesel Exhaust (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.H2.AP-104	3.3.1.088	B
Tank	PB	Carbon Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.H2.A-23	3.3.1.089	D

Table 3.3.2-23 Auxiliary Systems – Summary of Aging Management Evaluation EOF and TSC Diesels, Security Building System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Tank	PB	Carbon Steel	Fuel Oil (Int)	Loss of material	Fuel Oil Chemistry (B2.1.16) and One-Time Inspection (B2.1.18)	VII.G.AP-234	3.3.1.068	C
Tank	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Valve	PB	Carbon Steel	Fuel Oil (Int)	Loss of material	Fuel Oil Chemistry (B2.1.16) and One-Time Inspection (B2.1.18)	VII.G.AP-234	3.3.1.068	A
Valve	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A

Notes for Table 3.3.2-23:

Standard Notes:

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

B Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.

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

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

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

Plant Specific Notes:

None

Table 3.3.2-24 Auxiliary Systems – Summary of Aging Management Evaluation – Liquid Radwaste System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Closure Bolting	PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	VII.I.AP-124	3.3.1.015	A
Closure Bolting	PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.8)	VII.I.AP-125	3.3.1.012	A
Closure Bolting	LBS, PB, SIA	Stainless Steel	Borated Water Leakage (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	IV.C2.R-12	3.1.1.066	A
Closure Bolting	PB	Stainless Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	VII.I.AP-124	3.3.1.015	A
Closure Bolting	PB	Stainless Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.8)	VII.I.AP-125	3.3.1.012	A
Flow Element	LBS, PB, SIA, TH	Stainless Steel	Borated Water Leakage (Ext)	None	None	VII.J.AP-18	3.3.1.120	A
Flow Element	LBS, SIA	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Flow Element	LBS, PB, SIA, TH	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-82	3.3.1.028	E, 1
Flow Element	LBS, PB, SIA, TH	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-79	3.3.1.029	E, 1
Heat Exchanger (RCDT Heat Exchanger)	PB	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.C2.AP-189	3.3.1.046	A

Table 3.3.2-24 Auxiliary Systems – Summary of Aging Management Evaluation – Liquid Radwaste System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Heat Exchanger (RCDT Heat Exchanger)	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Heat Exchanger (RCDT Heat Exchanger)	LBS, SIA	Stainless Steel	Borated Water Leakage (Ext)	None	None	VII.J.AP-18	3.3.1.120	A
Heat Exchanger (RCDT Heat Exchanger)	PB	Stainless Steel	Closed Cycle Cooling Water (Ext)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.C2.A-52	3.3.1.049	C
Heat Exchanger (RCDT Heat Exchanger)	PB	Stainless Steel	Closed Cycle Cooling Water (Ext)	Cracking	Closed Treated Water Systems (B2.1.11)	VII.C2.AP-186	3.3.1.043	C
Heat Exchanger (RCDT Heat Exchanger)	PB	Stainless Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.C2.A-52	3.3.1.049	C
Heat Exchanger (RCDT Heat Exchanger)	PB	Stainless Steel	Closed Cycle Cooling Water (Int)	Cracking	Closed Treated Water Systems (B2.1.11)	VII.C2.AP-186	3.3.1.043	C

Table 3.3.2-24 Auxiliary Systems – Summary of Aging Management Evaluation – Liquid Radwaste System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Heat Exchanger (RCDT Heat Exchanger)	PB	Stainless Steel	Treated Borated Water (Ext)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-79	3.3.1.029	E, 1
Heat Exchanger (RCDT Heat Exchanger)	PB	Stainless Steel	Treated Borated Water (Ext)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-118	3.3.1.020	A
Heat Exchanger (RCDT Heat Exchanger)	LBS, PB, SIA	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-79	3.3.1.029	E, 1
Heat Exchanger (RCDT Heat Exchanger)	LBS, PB, SIA	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-118	3.3.1.020	A
Instrument Bellows	LBS, SIA	Stainless Steel	Borated Water Leakage (Ext)	None	None	VII.J.AP-18	3.3.1.120	A
Instrument Bellows	LBS, SIA	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-79	3.3.1.029	E, 1
Instrument Bellows	LBS, SIA	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-82	3.3.1.028	E, 1
Piping	LBS, PB, SIA	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.C2.AP-202	3.3.1.045	A

Table 3.3.2-24 Auxiliary Systems – Summary of Aging Management Evaluation – Liquid Radwaste System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Piping	PB	Carbon Steel	Concrete (Ext)	None	None	VII.J.AP-282	3.3.1.112	A
Piping	SIA	Carbon Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.E5.AP-280	3.3.1.095	B
Piping	PB, SIA	Carbon Steel	Dry Gas (Int)	None	None	VII.J.AP-6	3.3.1.121	A
Piping	LBS, PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Piping	LBS, PB, SIA	Stainless Steel	Borated Water Leakage (Ext)	None	None	VII.J.AP-18	3.3.1.120	A
Piping	LBS, SIA	Stainless Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.E5.AP-273	3.3.1.095	B
Piping	LBS	Stainless Steel	Demineralized Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.E.SP-87	3.4.1.016	A
Piping	SIA	Stainless Steel	Dry Gas (Int)	None	None	VII.J.AP-22	3.3.1.120	A
Piping	LBS, SIA	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A

Table 3.3.2-24 Auxiliary Systems – Summary of Aging Management Evaluation – Liquid Radwaste System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Piping	LBS, PB, SIA	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-79	3.3.1.029	E, 1
Piping	LBS, PB, SIA	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-82	3.3.1.028	E, 1
Piping	LBS	Stainless Steel	Waste Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.E5.AP-278	3.3.1.095	B
Piping	LBS	Stainless Steel Cast Austenitic	Borated Water Leakage (Ext)	None	None	VII.J.AP-18	3.3.1.120	A
Piping	LBS	Stainless Steel Cast Austenitic	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-79	3.3.1.029	E, 1
Piping	LBS	Stainless Steel Cast Austenitic	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-82	3.3.1.028	E, 1
Pump	LBS, SIA	Stainless Steel Cast Austenitic	Borated Water Leakage (Ext)	None	None	VII.J.AP-18	3.3.1.120	A
Pump	LBS, SIA	Stainless Steel Cast Austenitic	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-79	3.3.1.029	E, 1

Table 3.3.2-24 Auxiliary Systems – Summary of Aging Management Evaluation – Liquid Radwaste System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Pump	LBS, SIA	Stainless Steel Cast Austenitic	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-82	3.3.1.028	E, 1
Tank	LBS, SIA	Stainless Steel	Borated Water Leakage (Ext)	None	None	VII.J.AP-18	3.3.1.120	C
Tank	SIA	Stainless Steel	Dry Gas (Int)	None	None	VII.J.AP-22	3.3.1.120	C
Tank	SIA	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	C
Tank	LBS, SIA	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-79	3.3.1.029	E, 1
Tank	LBS, SIA	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-82	3.3.1.028	E, 1
Thermowell	LBS	Stainless Steel	Borated Water Leakage (Ext)	None	None	VII.J.AP-18	3.3.1.120	A
Thermowell	PB	Stainless Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.C2.A-52	3.3.1.049	A
Thermowell	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Thermowell	LBS	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-79	3.3.1.029	E, 1

Table 3.3.2-24 Auxiliary Systems – Summary of Aging Management Evaluation – Liquid Radwaste System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Thermowell	LBS	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-82	3.3.1.028	E, 1
Tubing	LBS	Stainless Steel	Borated Water Leakage (Ext)	None	None	VII.J.AP-18	3.3.1.120	A
Tubing	PB	Stainless Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.C2.A-52	3.3.1.049	A
Tubing	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Tubing	LBS	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-79	3.3.1.029	E, 1
Tubing	LBS	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-82	3.3.1.028	E, 1
Valve	PB	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.C2.AP-202	3.3.1.045	A
Valve	PB, SIA	Carbon Steel	Dry Gas (Int)	None	None	VII.J.AP-6	3.3.1.121	A
Valve	PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A

Table 3.3.2-24 Auxiliary Systems – Summary of Aging Management Evaluation – Liquid Radwaste System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Valve	LBS, PB, SIA	Stainless Steel	Borated Water Leakage (Ext)	None	None	VII.J.AP-18	3.3.1.120	A
Valve	PB	Stainless Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.C2.A-52	3.3.1.049	A
Valve	LBS	Stainless Steel	Demineralized Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.E.SP-87	3.4.1.016	A
Valve	LBS, PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Valve	LBS, PB, SIA	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-79	3.3.1.029	E, 1
Valve	LBS, PB, SIA	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-82	3.3.1.028	E, 1
Valve	LBS, PB, SIA	Stainless Steel Cast Austenitic	Borated Water Leakage (Ext)	None	None	VII.J.AP-18	3.3.1.120	A
Valve	SIA	Stainless Steel Cast Austenitic	Dry Gas (Int)	None	None	VII.J.AP-22	3.3.1.120	A
Valve	LBS, SIA	Stainless Steel Cast Austenitic	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A

Table 3.3.2-24 Auxiliary Systems – Summary of Aging Management Evaluation – Liquid Radwaste System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Valve	LBS, PB, SIA	Stainless Steel Cast Austenitic	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-79	3.3.1.029	E, 1
Valve	LBS, PB, SIA	Stainless Steel Cast Austenitic	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-82	3.3.1.028	E, 1

Notes for Table 3.3.2-24:

Standard Notes:

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

B Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.

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

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

Plant Specific Notes:

1 The One-Time Inspection program (B2.1.18) verifies the effectiveness of the Water Chemistry program (B2.1.2) in managing the aging of stainless steel components exposed to treated borated water

Table 3.3.2-25 Auxiliary Systems – Summary of Aging Management Evaluation – Decontamination System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Closure Bolting	LBS, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	VII.I.AP-124	3.3.1.015	A
Closure Bolting	LBS, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.8)	VII.I.AP-125	3.3.1.012	A
Closure Bolting	LBS, SIA	Stainless Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	VII.I.AP-124	3.3.1.015	A
Closure Bolting	LBS, SIA	Stainless Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.8)	VII.I.AP-125	3.3.1.012	A
Piping	LBS	Carbon Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VIII.B1.SP-60	3.4.1.037	B
Piping	LBS, PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Piping	PB	Carbon Steel	Steam (Int)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	VIII.B1.S-08	3.4.1.001	A
Piping	LBS, PB, SIA	Carbon Steel	Steam (Int)	Wall thinning	Flow-Accelerated Corrosion (B2.1.7)	VIII.B1.S-15	3.4.1.005	A
Piping	LBS, PB, SIA	Carbon Steel	Steam (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.B1.SP-71	3.4.1.014	A

Table 3.3.2-25 Auxiliary Systems – Summary of Aging Management Evaluation – Decontamination System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Piping	LBS	Stainless Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VIII.B1.SP-110	3.4.1.039	B
Piping	LBS	Stainless Steel	Demineralized Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.B1.SP-87	3.4.1.016	A
Piping	LBS	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Spray Nozzle	LBS	Stainless Steel	Demineralized Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.B1.SP-87	3.4.1.016	A
Spray Nozzle	LBS	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Valve	LBS, PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Valve	LBS, PB, SIA	Carbon Steel	Steam (Int)	Wall thinning	Flow-Accelerated Corrosion (B2.1.7)	VIII.B1.S-15	3.4.1.005	A
Valve	LBS, PB, SIA	Carbon Steel	Steam (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.B1.SP-71	3.4.1.014	A
Valve	LBS	Stainless Steel	Demineralized Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.B1.SP-87	3.4.1.016	A

Table 3.3.2-25 Auxiliary Systems – Summary of Aging Management Evaluation – Decontamination System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Valve	LBS	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A

Notes for Table 3.3.2-25:

Standard Notes:

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

B Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.

Plant Specific Notes:

None

Table 3.3.2-26 Auxiliary Systems – Summary of Aging Management Evaluation – Oily Waste System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Closure Bolting	LBS	Carbon Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	VII.I.AP-124	3.3.1.015	A
Closure Bolting	LBS	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.8)	VII.I.AP-125	3.3.1.012	A
Closure Bolting	LBS	Stainless Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	VII.I.AP-124	3.3.1.015	A
Closure Bolting	LBS	Stainless Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.8)	VII.I.AP-125	3.3.1.012	A
Piping	LBS	Carbon Steel	Concrete (Ext)	None	None	VII.J.AP-282	3.3.1.112	A
Piping	LBS	Carbon Steel	Waste Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.E5.AP-281	3.3.1.091	B
Piping	LBS, PB	Carbon Steel (Galvanized)	Concrete (Ext)	None	None	VII.J.AP-282	3.3.1.112	A
Piping	LBS, PB	Carbon Steel (Galvanized)	Plant Indoor Air (Ext)	None	None	VII.J.AP-13	3.3.1.116	A
Piping	LBS, PB	Carbon Steel (Galvanized)	Waste Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.E5.AP-281	3.3.1.091	B
Piping	LBS	Cast Iron	Concrete (Ext)	None	None	VII.J.AP-282	3.3.1.112	A

Table 3.3.2-26 Auxiliary Systems – Summary of Aging Management Evaluation – Oily Waste System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Piping	LBS, PB	Cast Iron	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Piping	LBS, PB	Cast Iron	Waste Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.E5.AP-281	3.3.1.091	B
Piping	LBS	Stainless Steel	Concrete (Ext)	None	None	VII.J.AP-19	3.3.1.120	A
Piping	LBS	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Piping	LBS	Stainless Steel	Waste Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.E5.AP-278	3.3.1.095	B
Pump	PB	Cast Iron (Gray Cast Iron)	Waste Water (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.E5.AP-281	3.3.1.091	E, 1
Pump	PB	Cast Iron(Gray Cast Iron)	Waste Water (Ext)	Loss of material	Selective Leaching (B2.1.19)	None	None	G, 3
Pump	PB	Cast Iron(Gray Cast Iron)	Waste Water (Int)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.E5.AP-281	3.3.1.091	E, 2

Table 3.3.2-26 Auxiliary Systems – Summary of Aging Management Evaluation – Oily Waste System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Pump	PB	Cast Iron(Gray Cast Iron)	Waste Water (Int)	Loss of material	Selective Leaching (B2.1.19)	None	None	G, 3
Pump	LBS	Stainless Steel	Waste Water (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.E5.AP-278	3.3.1.095	E, 1
Pump	LBS	Stainless Steel	Waste Water (Int)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.E5.AP-278	3.3.1.095	E, 2
Tank	LBS	Stainless Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.E5.AP-273	3.3.1.095	D
Tank	LBS	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	C
Tank	LBS	Stainless Steel	Waste Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.E5.AP-278	3.3.1.095	B
Valve	LBS	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A

Table 3.3.2-26 Auxiliary Systems – Summary of Aging Management Evaluation – Oily Waste System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Valve	LBS	Carbon Steel	Waste Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.E5.AP-281	3.3.1.091	B
Valve	LBS, PB	Cast Iron(Gray Cast Iron)	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Valve	LBS, PB	Cast Iron(Gray Cast Iron)	Waste Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.E5.AP-281	3.3.1.091	B
Valve	LBS, PB	Cast Iron(Gray Cast Iron)	Waste Water (Int)	Loss of material	Selective Leaching (B2.1.19)	None	None	G, 3
Valve	LBS	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Valve	LBS	Stainless Steel	Waste Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.E5.AP-278	3.3.1.095	B

Notes for Table 3.3.2-26:

Standard Notes:

- A Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.
- B Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.
- C Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.
- D Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.
- E Consistent with NUREG-1801 for material, environment, and aging effect, but a different aging management program is credited or NUREG-1801 identifies a plant-specific aging management program.
- G Environment not in NUREG-1801 for this component and material.

Plant Specific Notes:

1 The External Surfaces Monitoring of Mechanical Components program (B2.1.21) is credited since the component's external surface is exposed to waste water.

2 Since the internal and external environments for this component are the same, the External Surfaces Monitoring of Mechanical Components program (B2.1.21) is credited to manage the aging of the internal surfaces of this component.

3 Gray Cast Iron SSCs with surfaces exposed to Waste Water are subject to loss of material due to selective leaching.

Table 3.3.2-27 Auxiliary Systems – Summary of Aging Management Evaluation – Floor and Equipment Drainage System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Closure Bolting	LBS, PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	VII.I.AP-124	3.3.1.015	A
Closure Bolting	LBS, PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.8)	VII.I.AP-125	3.3.1.012	A
Closure Bolting	LBS, PB, SIA	Stainless Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	VII.I.AP-124	3.3.1.015	A
Closure Bolting	LBS, PB, SIA	Stainless Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.8)	VII.I.AP-125	3.3.1.012	A
Drain	PB	Stainless Steel	Concrete (Ext)	None	None	VII.J.AP-19	3.3.1.120	A
Drain	PB	Stainless Steel	Waste Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.E5.AP-278	3.3.1.095	B
Flame Arrestor	PB	Carbon Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.E5.AP-280	3.3.1.095	B
Flame Arrestor	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A

Table 3.3.2-27 Auxiliary Systems – Summary of Aging Management Evaluation – Floor and Equipment Drainage System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Flame Arrestor	PB	Stainless Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.E5.AP-273	3.3.1.095	B
Flame Arrestor	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Flexible Hoses	PB	Stainless Steel	Lubricating Oil (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.G.AP-138	3.3.1.100	E, 1
Flexible Hoses	LBS, PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Flexible Hoses	LBS	Stainless Steel	Waste Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.E5.AP-278	3.3.1.095	B
Piping	PB	Carbon Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.E5.AP-280	3.3.1.095	B

Table 3.3.2-27 Auxiliary Systems – Summary of Aging Management Evaluation – Floor and Equipment Drainage System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Piping	PB	Carbon Steel	Lubricating Oil (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.G.AP-117	3.3.1.097	E, 1
Piping	LBS, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Piping	LBS, PB	Carbon Steel	Waste Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.E5.AP-281	3.3.1.091	B
Piping	PB	Carbon Steel (Galvanized)	Concrete (Ext)	None	None	VII.J.AP-282	3.3.1.112	A
Piping	PB	Carbon Steel (Galvanized)	Lubricating Oil (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.G.AP-117	3.3.1.097	E, 1
Piping	LBS, PB, SIA	Carbon Steel (Galvanized)	Plant Indoor Air (Ext)	None	None	VII.J.AP-13	3.3.1.116	A
Piping	LBS, PB, SIA	Carbon Steel (Galvanized)	Waste Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.E5.AP-281	3.3.1.091	B

Table 3.3.2-27 Auxiliary Systems – Summary of Aging Management Evaluation – Floor and Equipment Drainage System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Piping	LBS, PB, SIA	Stainless Steel	Borated Water Leakage (Ext)	None	None	VII.J.AP-18	3.3.1.120	A
Piping	PB	Stainless Steel	Concrete (Ext)	None	None	VII.J.AP-19	3.3.1.120	A
Piping	LBS, PB	Stainless Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.E5.AP-273	3.3.1.095	B
Piping	PB	Stainless Steel	Lubricating Oil (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.G.AP-138	3.3.1.100	E, 1
Piping	LBS, PB, SIA	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Piping	LBS	Stainless Steel	Waste Water (Ext)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.E5.AP-278	3.3.1.095	B
Piping	LBS, PB, SIA	Stainless Steel	Waste Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.E5.AP-278	3.3.1.095	B

Table 3.3.2-27 Auxiliary Systems – Summary of Aging Management Evaluation – Floor and Equipment Drainage System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Piping	PB	Stainless Steel Cast Austenitic	Concrete (Ext)	None	None	VII.J.AP-19	3.3.1.120	A
Piping	PB	Stainless Steel Cast Austenitic	Waste Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.E5.AP-278	3.3.1.095	B
Pump	LBS, SIA	Stainless Steel	Waste Water (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.E5.AP-278	3.3.1.095	E, 2
Pump	LBS, SIA	Stainless Steel	Waste Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.E5.AP-278	3.3.1.095	B
Sight Gauge	PB	Glass	Condensation (Int)	None	None	VII.J.AP-97	3.3.1.117	A
Sight Gauge	PB	Glass	Lubricating Oil (Int)	None	None	VII.J.AP-15	3.3.1.117	A
Sight Gauge	PB	Glass	Plant Indoor Air (Ext)	None	None	VII.J.AP-14	3.3.1.117	A
Splash Guard	DF	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A

Table 3.3.2-27 Auxiliary Systems – Summary of Aging Management Evaluation – Floor and Equipment Drainage System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Tank	PB	Stainless Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.E5.AP-273	3.3.1.095	D
Tank	PB	Stainless Steel	Lubricating Oil (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.G.AP-138	3.3.1.100	E, 1
Tank	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Tubing	PB	Stainless Steel	Lubricating Oil (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.G.AP-138	3.3.1.100	E, 1
Tubing	LBS, PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Tubing	LBS	Stainless Steel	Waste Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.E5.AP-278	3.3.1.095	B

Table 3.3.2-27 Auxiliary Systems – Summary of Aging Management Evaluation – Floor and Equipment Drainage System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Valve	PB	Carbon Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.E5.AP-280	3.3.1.095	B
Valve	PB	Carbon Steel	Lubricating Oil (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.G.AP-117	3.3.1.097	E, 1
Valve	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Valve	PB	Stainless Steel	Lubricating Oil (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.G.AP-138	3.3.1.100	E, 1
Valve	LBS, PB, SIA	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Valve	LBS, PB, SIA	Stainless Steel	Waste Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.E5.AP-278	3.3.1.095	B

Table 3.3.2-27 Auxiliary Systems – Summary of Aging Management Evaluation – Floor and Equipment Drainage System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Valve	LBS, PB, SIA	Stainless Steel Cast Austenitic	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Valve	LBS, PB, SIA	Stainless Steel Cast Austenitic	Waste Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.E5.AP-278	3.3.1.095	B

Notes for Table 3.3.2-27:

Standard Notes:

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

B Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.

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

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

Plant Specific Notes:

1 Components associated with the reactor coolant pump oil collection system do not normally contain lubricating oil. Any oil or water that is found during operator visual inspections is documented and reviewed. If there is an accumulation of liquid, it is removed and discarded during the outage inspection. The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program (B2.1.23) inspects the piping, valves and tank for loss of material to maintain these components' intended function.

2 The External Surfaces Monitoring of Mechanical Components program (B2.1.21) is credited since the component's external surface is exposed to waste water.

Table 3.3.2-28 Auxiliary Systems – Summary of Aging Management Evaluation – Miscellaneous Systems in scope ONLY for Criterion 10 CFR 54.4(a)(2)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Chiller	SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Chiller	SIA	Carbon Steel	Raw Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VIII.G.SP-136	3.4.1.038	D
Closure Bolting	LBS	Carbon Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	VII.I.AP-124	3.3.1.015	A
Closure Bolting	LBS	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.8)	VII.I.AP-125	3.3.1.012	A
Closure Bolting	LBS	Carbon Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	VIII.H.SP-83	3.4.1.010	A
Closure Bolting	LBS	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.8)	VIII.H.SP-84	3.4.1.008	A
Closure Bolting	LBS	Copper Alloy	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	VII.I.AP-261	3.3.1.015	A
Closure Bolting	LBS	Stainless Steel	Borated Water Leakage (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	IV.C2.R-12	3.1.1.066	A
Closure Bolting	LBS, SIA	Stainless Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	VII.I.AP-124	3.3.1.015	A

Table 3.3.2-28 Auxiliary Systems – Summary of Aging Management Evaluation – Miscellaneous Systems in scope ONLY for Criterion 10 CFR 54.4(a)(2) (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Closure Bolting	LBS, SIA	Stainless Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.8)	VII.I.AP-125	3.3.1.012	A
Eyewash Station	LBS	Copper Alloy	Plant Indoor Air (Ext)	None	None	VII.J.AP-144	3.3.1.114	C
Eyewash Station	LBS	Copper Alloy	Potable Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.E5.AP-271	3.3.1.093	D
Flexible Hoses	LBS	Elastomer	Demineralized Water (Int)	Hardening and loss of strength	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	None	None	G, 2
Flexible Hoses	LBS	Elastomer	Plant Indoor Air (Ext)	Hardening and loss of strength	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.F2.AP-102	3.3.1.076	A
Flow Orifice	LBS	Stainless Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.C2.A-52	3.3.1.049	A
Flow Orifice	LBS	Stainless Steel	Closed Cycle Cooling Water (Int)	Cracking	Closed Treated Water Systems (B2.1.11)	VII.C2.AP-186	3.3.1.043	A
Flow Orifice	LBS	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A

Table 3.3.2-28 Auxiliary Systems – Summary of Aging Management Evaluation – Miscellaneous Systems in scope ONLY for Criterion 10 CFR 54.4(a)(2) (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Flow Orifice	LBS	Stainless Steel	Waste Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.E5.AP-278	3.3.1.095	B
Instrument Bellows	LBS	Stainless Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.E5.AP-273	3.3.1.095	B
Instrument Bellows	LBS	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Piping	LBS	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.C2.AP-202	3.3.1.045	A
Piping	LBS	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.F1.AP-202	3.3.1.045	A
Piping	LBS	Carbon Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.E5.AP-280	3.3.1.095	B
Piping	LBS, SIA	Carbon Steel	Demineralized Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.E.SP-73	3.4.1.014	A
Piping	SIA	Carbon Steel	Dry Gas (Int)	None	None	VII.J.AP-6	3.3.1.121	A

Table 3.3.2-28 Auxiliary Systems – Summary of Aging Management Evaluation – Miscellaneous Systems in scope ONLY for Criterion 10 CFR 54.4(a)(2) (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Piping	LBS, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Piping	LBS, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VIII.H.S-29	3.4.1.034	A
Piping	SIA	Carbon Steel	Raw Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VIII.G.SP-136	3.4.1.038	B
Piping	LBS, SIA	Carbon Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.E.SP-73	3.4.1.014	A
Piping	LBS	Carbon Steel	Waste Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.E5.AP-281	3.3.1.091	B
Piping	LBS	Carbon Steel (Galvanized)	Plant Indoor Air (Ext)	None	None	VII.J.AP-13	3.3.1.116	A
Piping	LBS	Carbon Steel (Galvanized)	Waste Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.E5.AP-281	3.3.1.091	B

Table 3.3.2-28 Auxiliary Systems – Summary of Aging Management Evaluation – Miscellaneous Systems in scope ONLY for Criterion 10 CFR 54.4(a)(2) (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Piping	LBS	Cast Iron	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Piping	LBS	Cast Iron	Waste Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.E5.AP-281	3.3.1.091	B
Piping	LBS	Copper Alloy	Plant Indoor Air (Ext)	None	None	VII.J.AP-144	3.3.1.114	A
Piping	LBS	Copper Alloy	Potable Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.E5.AP-271	3.3.1.093	B
Piping	LBS, SIA	Stainless Steel	Borated Water Leakage (Ext)	None	None	VII.J.AP-18	3.3.1.120	A
Piping	LBS, SIA	Stainless Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.E5.AP-273	3.3.1.095	B
Piping	LBS, SIA	Stainless Steel	Demineralized Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.E.SP-87	3.4.1.016	A
Piping	SIA	Stainless Steel	Dry Gas (Int)	None	None	VII.J.AP-22	3.3.1.120	A

Table 3.3.2-28 Auxiliary Systems – Summary of Aging Management Evaluation – Miscellaneous Systems in scope ONLY for Criterion 10 CFR 54.4(a)(2) (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Piping	LBS, SIA	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Piping	LBS	Stainless Steel	Potable Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.E5.AP-270	3.3.1.088	B
Piping	LBS, SIA	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-79	3.3.1.029	E, 1
Piping	LBS, SIA	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-82	3.3.1.028	E, 1
Piping	LBS	Stainless Steel	Waste Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.E5.AP-278	3.3.1.095	B
Pump	LBS	Cast Iron (Gray Cast Iron)	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.F1.AP-202	3.3.1.045	A
Pump	LBS	Cast Iron (Gray Cast Iron)	Closed Cycle Cooling Water (Int)	Loss of material	Selective Leaching (B2.1.19)	VII.C2.AP-50	3.3.1.072	B
Pump	LBS	Cast Iron (Gray Cast Iron)	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A

Table 3.3.2-28 Auxiliary Systems – Summary of Aging Management Evaluation – Miscellaneous Systems in scope ONLY for Criterion 10 CFR 54.4(a)(2) (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Pump	LBS	Stainless Steel Cast Austenitic	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Pump	LBS	Stainless Steel Cast Austenitic	Waste Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.E5.AP-278	3.3.1.095	B
Sight Gauge	LBS	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Sight Gauge	LBS	Carbon Steel	Waste Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.E5.AP-281	3.3.1.091	B
Sight Gauge	LBS	Glass	Plant Indoor Air (Ext)	None	None	VII.J.AP-14	3.3.1.117	A
Sight Gauge	LBS	Glass	Waste Water (Int)	None	None	VII.J.AP-277	3.3.1.119	A
Sight Gauge	LBS	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Sight Gauge	LBS	Stainless Steel	Waste Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.E5.AP-278	3.3.1.095	B

Table 3.3.2-28 Auxiliary Systems – Summary of Aging Management Evaluation – Miscellaneous Systems in scope ONLY for Criterion 10 CFR 54.4(a)(2) (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Strainer	LBS	Copper Alloy	Plant Indoor Air (Ext)	None	None	VII.J.AP-144	3.3.1.114	A
Strainer	LBS	Copper Alloy	Potable Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.E5.AP-271	3.3.1.093	B
Strainer	LBS	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Strainer	LBS	Stainless Steel	Waste Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.E5.AP-278	3.3.1.095	B
Tank	LBS	Stainless Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.E5.AP-273	3.3.1.095	D
Tank	LBS	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	C
Tank	LBS	Stainless Steel	Waste Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.E5.AP-278	3.3.1.095	B

Table 3.3.2-28 Auxiliary Systems – Summary of Aging Management Evaluation – Miscellaneous Systems in scope ONLY for Criterion 10 CFR 54.4(a)(2) (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Trap	LBS	Carbon Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.E5.AP-280	3.3.1.095	B
Trap	LBS	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Tubing	LBS	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.C2.AP-202	3.3.1.045	A
Tubing	LBS	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Tubing	LBS	Stainless Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.E5.AP-273	3.3.1.095	B
Tubing	LBS	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Tubing	LBS	Stainless Steel	Waste Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.E5.AP-278	3.3.1.095	B

Table 3.3.2-28 Auxiliary Systems – Summary of Aging Management Evaluation – Miscellaneous Systems in scope ONLY for Criterion 10 CFR 54.4(a)(2) (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Valve	LBS, SIA	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.C2.AP-202	3.3.1.045	A
Valve	LBS	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed Treated Water Systems (B2.1.11)	VII.F1.AP-202	3.3.1.045	A
Valve	LBS	Carbon Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.E5.AP-280	3.3.1.095	B
Valve	LBS, SIA	Carbon Steel	Demineralized Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.E.SP-73	3.4.1.014	A
Valve	LBS, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.I.A-77	3.3.1.078	A
Valve	LBS, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VIII.H.S-29	3.4.1.034	A
Valve	LBS, SIA	Carbon Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.E.SP-73	3.4.1.014	A

Table 3.3.2-28 Auxiliary Systems – Summary of Aging Management Evaluation – Miscellaneous Systems in scope ONLY for Criterion 10 CFR 54.4(a)(2) (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Valve	LBS	Carbon Steel	Waste Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.E5.AP-281	3.3.1.091	B
Valve	LBS	Copper Alloy	Plant Indoor Air (Ext)	None	None	VII.J.AP-144	3.3.1.114	A
Valve	LBS	Copper Alloy	Potable Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.E5.AP-271	3.3.1.093	B
Valve	LBS, SIA	Stainless Steel	Borated Water Leakage (Ext)	None	None	VII.J.AP-18	3.3.1.120	A
Valve	LBS, SIA	Stainless Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.E5.AP-273	3.3.1.095	B
Valve	LBS	Stainless Steel	Demineralized Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.E.SP-87	3.4.1.016	A
Valve	LBS, SIA	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Valve	LBS, SIA	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-79	3.3.1.029	E, 1

Table 3.3.2-28 Auxiliary Systems – Summary of Aging Management Evaluation – Miscellaneous Systems in scope ONLY for Criterion 10 CFR 54.4(a)(2) (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Valve	LBS, SIA	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VII.E1.AP-82	3.3.1.028	E, 1
Valve	LBS	Stainless Steel	Waste Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.E5.AP-278	3.3.1.095	B
Valve	LBS, SIA	Stainless Steel Cast Austenitic	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.E5.AP-273	3.3.1.095	B
Valve	LBS, SIA	Stainless Steel Cast Austenitic	Plant Indoor Air (Ext)	None	None	VII.J.AP-17	3.3.1.120	A
Valve	LBS	Stainless Steel Cast Austenitic	Waste Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.E5.AP-278	3.3.1.095	B

Notes for Table 3.3.2-28:

Standard Notes:

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

B Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.

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

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

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

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

Plant Specific Notes:

1 The Water Chemistry program (B2.1.2) and the One-Time Inspection program (B2.1.18) manage loss of material due to pitting and crevice corrosion and cracking due to stress corrosion cracking. The One-Time Inspection program (B2.1.18) includes selected components at susceptible locations.

2 The environment evaluated is the internal surface of the flexible hose. Therefore, the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program (B2.1.23) is credited.

3.4 AGING MANAGEMENT OF STEAM AND POWER CONVERSION SYSTEM

3.4.1 Introduction

Section 3.4 provides the results of the aging management reviews (AMRs) for those component types identified in Section 2.3.4, *Steam and Power Conversion System*, subject to AMR. These systems are described in the following sections:

- Main Turbine System (Section 2.3.4.1)
- Main Steam Supply System (Section 2.3.4.2)
- Main Feedwater System (Section 2.3.4.3)
- Steam Generator Blowdown System (Section 2.3.4.4)
- Auxiliary Feedwater System (Section 2.3.4.5)
- Condensate Storage and Transfer System (Section 2.3.4.6)

Table 3.4-1, *Summary of Aging Management Programs in Chapter VIII of NUREG-1801 for Steam and Power Conversion System*, provides the summary of the programs evaluated in NUREG-1801 that are applicable to the component types in this section. Table 3.4-1 uses the format of Table 1 described in Section 3.0, *Aging Management Review*.

3.4.2 Results

The following tables summarize the results of the aging management review for the systems in the Steam and Power Conversion System area:

- Table 3.4.2-1, *Steam and Power Conversion System – Summary of Aging Management Evaluation – Main Turbine System*
- Table 3.4.2-2, *Steam and Power Conversion System – Summary of Aging Management Evaluation – Main Steam Supply System*
- Table 3.4.2-3, *Steam and Power Conversion System – Summary of Aging Management Evaluation – Main Feedwater System*
- Table 3.4.2-4, *Steam and Power Conversion System – Summary of Aging Management Evaluation – Steam Generator Blowdown System*
- Table 3.4.2-5, Steam and Power Conversion System – *Summary of Aging Management Evaluation – Auxiliary Feedwater System*

- Table 3.4.2-6, *Steam and Power Conversion System – Summary of Aging Management Evaluation – Condensate Storage and Transfer System*

These tables use the format of Table 2 discussed in Section 3.0, *Aging Management Review*.

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

The materials from which the component types are fabricated, the environments to which they are exposed, the potential aging effects requiring management, and the aging management programs used to manage these aging effects are provided for each of the above systems in the following sections.

3.4.2.1.1 Main Turbine System

Materials

The materials of construction for the main turbine system component types are:

- Carbon Steel
- Stainless Steel

Environment

The main turbine system components are exposed to the following environments:

- Plant Indoor Air
- Steam

Aging Effects Requiring Management

The following main turbine system aging effects require management:

- Cracking
- Loss of material
- Loss of preload
- Wall thinning

Aging Management Programs

The following aging management programs manage the aging effects for the main turbine system component types:

- Bolting Integrity (B2.1.8)
- External Surfaces Monitoring of Mechanical Components (B2.1.21)
- Flow-Accelerated Corrosion (B2.1.7)
- One-Time Inspection (B2.1.18)
- Water Chemistry (B2.1.2)

3.4.2.1.2 Main Steam Supply System

Materials

The materials of construction for the main steam supply system component types are:

- Aluminum
- Carbon Steel
- Copper Alloy
- Insulation Calcium Silicate
- Stainless Steel

Environment

The main steam supply system components are exposed to the following environments:

- Atmosphere/ Weather
- Condensation
- Demineralized Water
- Dry Gas
- Plant Indoor Air
- Secondary Water
- Steam

Aging Effects Requiring Management

The following main steam supply system aging effects require management:

- Cracking
- Loss of material
- Loss of preload

- Wall thinning

Aging Management Programs

The following aging management programs manage the aging effects for the main steam supply system component types:

- Bolting Integrity (B2.1.8)
- External Surfaces Monitoring of Mechanical Components (B2.1.21)
- Flow-Accelerated Corrosion (B2.1.7)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)
- One-Time Inspection (B2.1.18)
- Water Chemistry (B2.1.2)

3.4.2.1.3 Main Feedwater System

Materials

The materials of construction for the main feedwater system component types are:

- Aluminum
- Carbon Steel
- Insulation Calcium Silicate
- Stainless Steel
- Stainless Steel Cast Austenitic

Environment

The main feedwater system components are exposed to the following environments:

- Condensation
- Plant Indoor Air
- Secondary Water

Aging Effects Requiring Management

The following main feedwater system aging effects require management:

- Cracking

- Loss of material
- Loss of preload
- Wall thinning

Aging Management Programs

The following aging management programs manage the aging effects for the main feedwater system component types:

- Bolting Integrity (B2.1.8)
- External Surfaces Monitoring of Mechanical Components (B2.1.21)
- Flow-Accelerated Corrosion (B2.1.7)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)
- One-Time Inspection (B2.1.18)
- Water Chemistry (B2.1.2)

3.4.2.1.4 Steam Generator Blowdown System

Materials

The materials of construction for the steam generator blowdown system component types are:

- Carbon Steel
- Copper Alloy
- Stainless Steel

Environment

The steam generator blowdown system components are exposed to the following environments:

- Condensation
- Dry Gas
- Plant Indoor Air
- Secondary Water
- Steam

Aging Effects Requiring Management

The following steam generator blowdown system aging effects require management:

- Cracking
- Loss of material
- Loss of preload
- Wall thinning

Aging Management Programs

The following aging management programs manage the aging effects for the steam generator blowdown system component types:

- Bolting Integrity (B2.1.8)
- External Surfaces Monitoring of Mechanical Components (B2.1.21)
- Flow-Accelerated Corrosion (B2.1.7)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)
- One-Time Inspection (B2.1.18)
- Water Chemistry (B2.1.2)

3.4.2.1.5 Auxiliary Feedwater System

Materials

The materials of construction for the auxiliary feedwater system component types are:

- Aluminum
- Carbon Steel
- Cast Iron
- Elastomer
- Insulation Calcium Silicate
- Stainless Steel

Environment

The auxiliary feedwater system components are exposed to the following environments:

- Atmosphere/ Weather

- Buried
- Condensation
- Lubricating Oil
- Plant Indoor Air
- Secondary Water
- Steam

Aging Effects Requiring Management

The following auxiliary feedwater system aging effects require management:

- Cracking
- Hardening and loss of strength
- Loss of material
- Loss of preload
- Reduction of heat transfer
- Wall thinning

Aging Management Programs

The following aging management programs manage the aging effects for the auxiliary feedwater system component types:

- Bolting Integrity (B2.1.8)
- Buried and Underground Piping and Tanks (B2.1.25)
- External Surfaces Monitoring of Mechanical Components (B2.1.21)
- Flow-Accelerated Corrosion (B2.1.7)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)
- Lubricating Oil Analysis (B2.1.24)
- One-Time Inspection (B2.1.18)
- Water Chemistry (B2.1.2)

3.4.2.1.6 Condensate Storage and Transfer System

Materials

The materials of construction for the condensate storage and transfer system component types are:

- Acrylic/Urethane
- Aluminum
- Carbon Steel
- Insulation Foamglas (glass dust)
- Stainless Steel
- Stainless Steel Cast Austenitic

Environment

The condensate storage and transfer system components are exposed to the following environments:

- Atmosphere/ Weather
- Concrete
- Condensation
- Dry Gas
- Plant Indoor Air
- Secondary Water

Aging Effects Requiring Management

The following condensate storage and transfer system aging effects require management:

- Cracking
- Cracking, blistering, change in color
- Loss of material
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for the condensate storage and transfer system component types:

- Aboveground Metallic Tanks (B2.1.15)
- Bolting Integrity (B2.1.8)
- External Surfaces Monitoring of Mechanical Components (B2.1.21)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)
- One-Time Inspection (B2.1.18)
- Water Chemistry (B2.1.2)

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

NUREG-1801 provides the basis for identifying those programs that warrant further evaluation. For the Steam and Power Conversion System, those evaluations are addressed in the following sections.

3.4.2.2.1 Cumulative Fatigue Damage

Callaway piping, outside the reactor coolant pressure boundary, is designed to ASME III Class 2, Class 3, and ANSI B31.1, all of which require a reduction in the allowable secondary stress range if more than 7,000 full-range thermal cycles are expected in a design lifetime. Section 4.3.5 describes the evaluation of these cyclic design TLAAs.

3.4.2.2.2 Cracking due to Stress Corrosion Cracking (SCC)

Cracking due to stress corrosion cracking could occur for stainless steel piping, piping components, piping elements, insulation fasteners, and tanks exposed to outdoor air. The External Surfaces Monitoring of Mechanical Components program (B2.1.21) manages cracking from stress corrosion cracking for stainless steel external surfaces exposed to outdoor environment. For the condensate storage tank, the Aboveground Metallic Tanks program (B2.1.15) manages cracking from stress corrosion cracking for stainless steel external surfaces exposed to outdoor environment.

3.4.2.2.3 Loss of Material due to Pitting and Crevice Corrosion

Loss of material due to pitting and crevice corrosion could occur for stainless steel piping, piping components, piping elements, insulation fasteners, and tanks exposed to outdoor air. The External Surfaces Monitoring of Mechanical Components program (B2.1.21) manages the loss of material due to pitting and crevice corrosion for stainless steel external surfaces exposed to outdoor environment. For the condensate storage tank, the Aboveground Metallic Tanks program (B2.1.15) manages loss of material due to pitting and crevice corrosion for stainless steel external surfaces exposed to outdoor environment.

3.4.2.2.4 Quality Assurance for Aging Management of Nonsafety-Related Components

Quality Assurance Program and Administrative Controls are discussed in Section B1.3, *Quality Assurance Program and Administrative Controls*.

3.4.2.3 Time-Limited Aging Analyses

The time-limited aging analyses identified below are associated with the Steam and Power Conversion System component types. The section within Chapter 4, *Time-Limited Aging Analyses*, is indicated in parenthesis.

- Cumulative Fatigue Damage (Section 4.3, *Metal Fatigue*)

3.4.3 Conclusions

The Steam and Power Conversion System component types that are subject to AMR have been evaluated. The aging management programs selected to manage the aging effects for the Steam and Power Conversion System component types are identified in the summary Tables and in Section 3.4.2.1.

A description of these aging management programs is provided in Appendix B, *Aging Management Programs*, along with a demonstration that the identified aging effects will be managed for the period of extended operation.

Therefore, based on the demonstration provided in Appendix B, *Aging Management Programs*, the effects of aging associated with the Steam and Power Conversion System component types will be adequately managed so that there is reasonable assurance that the intended functions will be maintained consistent with the current licensing basis during the period of extended operation.

Table 3.4-1 Summary of Aging Management Programs in Chapter VIII of NUREG-1801 for Steam and Power Conversion System

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.4.1.001	Steel Piping, piping components, and piping elements exposed to Steam or Treated water	Cumulative fatigue damage due to fatigue	Fatigue is a time-limited aging analysis (TLAA) to be evaluated for the period of extended operation. See the SRP, Section 4.3 Metal Fatigue, for acceptable methods for meeting the requirements of 10 CFR 54.21(c)(1).	Yes, TLAA	Fatigue of metal components is a TLAA. See further evaluation in Section 3.4.2.2.1.
3.4.1.002	Stainless steel Piping, piping components, and piping elements; tanks exposed to Air – outdoor	Cracking due to stress corrosion cracking	External Surfaces Monitoring of Mechanical Components (B2.1.21)	Yes, environmental conditions need to be evaluated	The External Surfaces Monitoring of Mechanical Components program (B2.1.21) manages cracking from stress corrosion cracking for stainless steel external surfaces exposed to outdoor environment. For the condensate storage tank, the Aboveground Metallic Tanks program (B2.1.15) manages cracking from stress corrosion cracking for stainless steel external surfaces exposed to outdoor environment. See further evaluation in Section 3.4.2.2.2.

Table 3.4-1 Summary of Aging Management Programs in Chapter VIII of NUREG-1801 for Steam and Power Conversion System (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.4.1.003	Stainless steel Piping, piping components, and piping elements; tanks exposed to Air – outdoor	Loss of material due to pitting and crevice corrosion	External Surfaces Monitoring of Mechanical Components (B2.1.21)	Yes, environmental conditions need to be evaluated	The External Surfaces Monitoring of Mechanical Components program (B2.1.21) manages the loss of material due to pitting and crevice corrosion for stainless steel external surfaces exposed to outdoor environment. For the condensate storage tank, the Aboveground Metallic Tanks program (B2.1.15) manages loss of material due to pitting and crevice corrosion for stainless steel external surfaces exposed to outdoor environment. See further evaluation in Section 3.4.2.2.3.
3.4.1.004	Steel External surfaces, Bolting exposed to Air with borated water leakage	Loss of material due to boric acid corrosion	Boric Acid Corrosion (B2.1.4)	No	Not applicable. Callaway has no in-scope components exposed to borated water leakage in the steam and power conversion systems, so the applicable NUREG-1801 lines were not used.

Table 3.4-1 Summary of Aging Management Programs in Chapter VIII of NUREG-1801 for Steam and Power Conversion System (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.4.1.005	Steel Piping, piping components, and piping elements exposed to Steam, Treated water	Wall thinning due to flow-accelerated corrosion	Flow-Accelerated Corrosion (B2.1.7)	No	Consistent with NUREG-1801.
3.4.1.006	Steel, Stainless Steel Bolting exposed to Soil	Loss of preload	Bolting Integrity (B2.1.8)	No	Not applicable. Callaway has no in-scope steel or stainless steel bolting exposed to soil in the steam and power conversion systems, so the applicable NUREG-1801 lines were not used.
3.4.1.007	High-strength steel Closure bolting exposed to Air with steam or water leakage	Cracking due to cyclic loading, stress corrosion cracking	Bolting Integrity (B2.1.8)	No	Not applicable. Callaway has no in-scope high strength bolting in the steam and power conversion systems, so the applicable NUREG-1801 line was not used.
3.4.1.008	Steel; stainless steel Bolting, Closure bolting exposed to Air – outdoor (External), Air – indoor, uncontrolled (External)	Loss of material due to general (steel only), pitting, and crevice corrosion	Bolting Integrity (B2.1.8)	No	Consistent with NUREG-1801.

Table 3.4-1 Summary of Aging Management Programs in Chapter VIII of NUREG-1801 for Steam and Power Conversion System (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.4.1.009	Steel Closure bolting exposed to Air with steam or water leakage	Loss of material due to general corrosion	Bolting Integrity (B2.1.8)	No	Not applicable. The plant indoor air environment is used to evaluate closure bolting. NUREG-1800, Table 3.4-1 lines 3.4.1.008 and 3.4.1.010 are used to evaluate steel closure bolting exposed to an air-indoor uncontrolled environment instead of the NUREG-1800, Table 3.4-1 line 3.4.1.009. NUREG-1800, Table 3.4-1 lines 3.4.1.008, 3.4.1.009 and 3.4.1.010 all manage loss of material due to general (steel only), pitting, and crevice corrosion for steel closure bolting using Bolting Integrity (B2.1.8). Steam or water leakage is considered to be event driven and requires corrective action consistent with the Bolting Integrity program. Therefore, a plant indoor air environment (NUREG-1801, item VIII.H.SP-84) was used rather than an air with steam or water leakage environment.

Table 3.4-1 Summary of Aging Management Programs in Chapter VIII of NUREG-1801 for Steam and Power Conversion System (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.4.1.010	Copper alloy, Nickel alloy, Steel; stainless steel, Steel; stainless steel Bolting, Closure bolting exposed to Any environment, Air – outdoor (External), Air – indoor, uncontrolled (External)	Loss of preload due to thermal effects, gasket creep, and self-loosening	Bolting Integrity (B2.1.8)	No	Consistent with NUREG-1801.
3.4.1.011	Stainless steel Piping, piping components, and piping elements, Tanks, Heat exchanger components exposed to Steam, Treated water >60°C (>140°F)	Cracking due to stress corrosion cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	No	Consistent with NUREG-1801.
3.4.1.012	Steel; stainless steel Tanks exposed to Treated water	Loss of material due to general (steel only), pitting, and crevice corrosion	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	No	Consistent with NUREG-1801.

Table 3.4-1 Summary of Aging Management Programs in Chapter VIII of NUREG-1801 for Steam and Power Conversion System (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.4.1.013	Steel Piping, piping components, and piping elements exposed to Treated water	Loss of material due to general, pitting, and crevice corrosion	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	No	Consistent with NUREG-1801.
3.4.1.014	Steel Piping, piping components, and piping elements, PWR heat exchanger components exposed to Steam, Treated water	Loss of material due to general, pitting, and crevice corrosion	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	No	Consistent with NUREG-1801.
3.4.1.015	Steel Heat exchanger components exposed to Treated water	Loss of material due to general, pitting, crevice, and galvanic corrosion	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	No	Consistent with NUREG-1801.

Table 3.4-1 Summary of Aging Management Programs in Chapter VIII of NUREG-1801 for Steam and Power Conversion System (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.4.1.016	Copper alloy, Stainless steel, Nickel alloy, Aluminum Piping, piping components, and piping elements, Heat exchanger components and tubes, PWR heat exchanger components exposed to Treated water, Steam	Loss of material due to pitting and crevice corrosion	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	No	Consistent with NUREG-1801.
3.4.1.017	Copper alloy Heat exchanger tubes exposed to Treated water	Reduction of heat transfer due to fouling	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	No	Not applicable. Callaway has no in-scope copper alloy heat exchanger tubes exposed to treated water in the steam and power conversion systems, so the applicable NUREG-1801 lines were not used.
3.4.1.018	Copper alloy, Stainless steel Heat exchanger tubes exposed to Treated water	Reduction of heat transfer due to fouling	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	No	Consistent with NUREG-1801.

Table 3.4-1 Summary of Aging Management Programs in Chapter VIII of NUREG-1801 for Steam and Power Conversion System (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.4.1.019	Stainless steel, Steel Heat exchanger components exposed to Raw water	Loss of material due to general, pitting, crevice, galvanic, and microbiologically-influenced corrosion; fouling that leads to corrosion	Open-Cycle Cooling Water System (B2.1.10)	No	Not applicable. Callaway has no in-scope stainless steel or steel heat exchanger components exposed to raw water in the steam and power conversion systems, so the applicable NUREG-1801 lines were not used.
3.4.1.020	Copper alloy, Stainless steel Piping, piping components, and piping elements exposed to Raw water	Loss of material due to pitting, crevice, and microbiologically-influenced corrosion	Open-Cycle Cooling Water System (B2.1.10)	No	Not applicable. Callaway has no in-scope copper alloy, stainless steel piping, piping components, and piping elements exposed to raw water in the steam and power conversion systems, so the applicable NUREG-1801 lines were not used.
3.4.1.021	Stainless steel Heat exchanger components exposed to Raw water	Loss of material due to pitting, crevice, and microbiologically-influenced corrosion; fouling that leads to corrosion	Open-Cycle Cooling Water System (B2.1.10)	No	Not applicable. Callaway has no in-scope stainless steel heat exchanger components exposed to raw water in the steam and power conversion systems, so the applicable NUREG-1801 lines were not used.

Table 3.4-1 Summary of Aging Management Programs in Chapter VIII of NUREG-1801 for Steam and Power Conversion System (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.4.1.022	Stainless steel, Copper alloy, Steel Heat exchanger tubes, Heat exchanger components exposed to Raw water	Reduction of heat transfer due to fouling	Open-Cycle Cooling Water System (B2.1.10)	No	Not applicable. Callaway has no in-scope stainless steel, copper alloy, steel heat exchanger tubes, heat exchanger components exposed to raw water in the steam and power conversion systems, so the applicable NUREG-1801 lines were not used.
3.4.1.023	Stainless steel Piping, piping components, and piping elements exposed to Closed-cycle cooling water >60°C (>140°F)	Cracking due to stress corrosion cracking	Closed Treated Water Systems (B2.1.11)	No	Not applicable. Callaway has no in-scope stainless steel piping, piping components, and piping elements exposed to closed-cycle cooling water >60°C (>140°F) in the steam and power conversion systems, so the applicable NUREG-1801 lines were not used.
3.4.1.024	Steel Heat exchanger components exposed to Closed-cycle cooling water	Loss of material due to general, pitting, crevice, and galvanic corrosion	Closed Treated Water Systems (B2.1.11)	No	Not applicable. Callaway has no in-scope steel heat exchanger components exposed to closed cycle cooling water in the steam and power conversion systems, so the applicable NUREG-1801 lines were not used.

Table 3.4-1 Summary of Aging Management Programs in Chapter VIII of NUREG-1801 for Steam and Power Conversion System (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.4.1.025	Steel Heat exchanger components exposed to Closed-cycle cooling water	Loss of material due to general, pitting, crevice, and galvanic corrosion	Closed Treated Water Systems (B2.1.11)	No	Not applicable. Callaway has no in-scope steel heat exchanger components exposed to closed cycle cooling water in the steam and power conversion systems, so the applicable NUREG-1801 lines were not used.
3.4.1.026	Stainless steel Heat exchanger components, Piping, piping components, and piping elements exposed to Closed-cycle cooling water	Loss of material due to pitting and crevice corrosion	Closed Treated Water Systems (B2.1.11)	No	Not applicable. Callaway has no in-scope stainless steel heat exchanger components, piping, piping components, and piping elements exposed to closed cycle cooling water in the steam and power conversion systems, so the applicable NUREG-1801 lines were not used.
3.4.1.027	Copper alloy Piping, piping components, and piping elements exposed to Closed-cycle cooling water	Loss of material due to pitting, crevice, and galvanic corrosion	Closed Treated Water Systems (B2.1.11)	No	Not applicable. Callaway has no in-scope copper alloy piping, piping components, and piping elements exposed to closed cycle cooling water in the steam and power conversion systems, so the applicable NUREG-1801 lines were not used.

Table 3.4-1 Summary of Aging Management Programs in Chapter VIII of NUREG-1801 for Steam and Power Conversion System (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.4.1.028	Steel, Stainless steel, Copper alloy Heat exchanger components and tubes, Heat exchanger tubes exposed to Closed-cycle cooling water	Reduction of heat transfer due to fouling	Closed Treated Water Systems (B2.1.11)	No	Not applicable. Callaway has no in-scope steel, stainless steel, copper alloy heat exchanger components and tubes, heat exchanger tubes exposed to closed-cycle cooling water in the steam and power conversion systems, so the applicable NUREG-1801 lines were not used.
3.4.1.029	Steel Tanks exposed to Air – outdoor (External)	Loss of material due to general, pitting, and crevice corrosion	Aboveground Metallic Tanks (B2.1.15)	No	Not applicable. Callaway has no in-scope steel tanks exposed to air – outdoor (external) in the steam and power conversion systems, so the applicable NUREG-1801 lines were not used.
3.4.1.030	Steel, Stainless Steel, Aluminum Tanks exposed to Soil or Concrete, Air – outdoor (External)	Loss of material due to general, pitting, and crevice corrosion	Aboveground Metallic Tanks (B2.1.15)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Aboveground Metallic Tanks (B2.1.15)

Table 3.4-1 Summary of Aging Management Programs in Chapter VIII of NUREG-1801 for Steam and Power Conversion System (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.4.1.031	Stainless steel, Aluminum Tanks exposed to Soil or Concrete	Loss of material due to pitting, and crevice corrosion	Aboveground Metallic Tanks (B2.1.15)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Aboveground Metallic Tanks (B2.1.15).
3.4.1.032	Gray cast iron Piping, piping components, and piping elements exposed to Soil	Loss of material due to selective leaching	Selective Leaching (B2.1.19)	No	Not applicable. Callaway has no in-scope gray cast iron piping, piping components, and piping elements exposed to soil in the steam and power conversion systems, so the applicable NUREG-1801 lines were not used.
3.4.1.033	Gray cast iron, Copper alloy (>15% Zn or >8% Al) Piping, piping components, and piping elements exposed to Treated water, Raw water, Closed-cycle cooling water	Loss of material due to selective leaching	Selective Leaching (B2.1.19)	No	Not applicable. Callaway has no in-scope gray cast iron, copper alloy (>15% Zn or >8% Al) piping, piping components, and piping elements exposed to treated water, raw water, closed-cycle cooling water in the steam and power conversion systems, so the applicable NUREG-1801 lines were not used.

Table 3.4-1 Summary of Aging Management Programs in Chapter VIII of NUREG-1801 for Steam and Power Conversion System (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.4.1.034	Steel External surfaces exposed to Air – indoor, uncontrolled (External), Air – outdoor (External), Condensation (External)	Loss of material due to general corrosion	External Surfaces Monitoring of Mechanical Components (B2.1.21)	No	Consistent with NUREG-1801.
3.4.1.035	Aluminum Piping, piping components, and piping elements exposed to Air - outdoor	Loss of material due to pitting and crevice corrosion	External Surfaces Monitoring of Mechanical Components (B2.1.21)	No	Consistent with NUREG-1801.
3.4.1.036	Steel Piping, piping components, and piping elements exposed to Air – outdoor (Internal)	Loss of material due to general, pitting, and crevice corrosion	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)

Table 3.4-1 Summary of Aging Management Programs in Chapter VIII of NUREG-1801 for Steam and Power Conversion System (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.4.1.037	Steel Piping, piping components, and piping elements exposed to Condensation (Internal)	Loss of material due to general, pitting, and crevice corrosion	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)
3.4.1.038	Steel Piping, piping components, and piping elements exposed to Raw water	Loss of material due to general, pitting, crevice, galvanic, and microbiologically-influenced corrosion; fouling that leads to corrosion	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)
3.4.1.039	Stainless steel Piping, piping components, and piping elements exposed to Condensation (Internal)	Loss of material due to pitting and crevice corrosion	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)

Table 3.4-1 Summary of Aging Management Programs in Chapter VIII of NUREG-1801 for Steam and Power Conversion System (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.4.1.040	Steel Piping, piping components, and piping elements exposed to Lubricating oil	Loss of material due to general, pitting, and crevice corrosion	Lubricating Oil Analysis (B2.1.24) and One-Time Inspection (B2.1.18)	No	Consistent with NUREG-1801.
3.4.1.041	Steel Heat exchanger components exposed to Lubricating oil	Loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion	Lubricating Oil Analysis (B2.1.24) and One-Time Inspection (B2.1.18)	No	Consistent with NUREG-1801.
3.4.1.042	Aluminum Piping, piping components, and piping elements exposed to Lubricating oil	Loss of material due to pitting and crevice corrosion	Lubricating Oil Analysis (B2.1.24) and One-Time Inspection (B2.1.18)	No	Not applicable. Callaway has no in-scope aluminum piping, piping components, and piping elements exposed to lubricating oil in the auxiliary feedwater system, so the applicable NUREG-1801 line was not used.
3.4.1.043	Copper alloy Piping, piping components, and piping elements exposed to Lubricating oil	Loss of material due to pitting and crevice corrosion	Lubricating Oil Analysis (B2.1.24) and One-Time Inspection (B2.1.18)	No	Not applicable. Callaway has no in-scope copper alloy piping, piping components, and piping elements exposed to lubricating oil in the steam and power conversion systems, so the applicable NUREG-1801 lines were not used.

Table 3.4-1 Summary of Aging Management Programs in Chapter VIII of NUREG-1801 for Steam and Power Conversion System (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.4.1.044	Stainless steel Piping, piping components, and piping elements, Heat exchanger components exposed to Lubricating oil	Loss of material due to pitting, crevice, and microbiologically-influenced corrosion	Lubricating Oil Analysis (B2.1.24) and One-Time Inspection (B2.1.18)	No	Consistent with NUREG-1801.
3.4.1.045	Aluminum Heat exchanger components and tubes exposed to Lubricating oil	Reduction of heat transfer due to fouling	Lubricating Oil Analysis (B2.1.24) and One-Time Inspection (B2.1.18)	No	Not applicable. Callaway has no in-scope aluminum heat exchanger components exposed to lubricating oil in the auxiliary feedwater system, so the applicable NUREG-1801 line was not used.
3.4.1.046	Stainless steel, Steel, Copper alloy Heat exchanger tubes exposed to Lubricating oil	Reduction of heat transfer due to fouling	Lubricating Oil Analysis (B2.1.24) and One-Time Inspection (B2.1.18)	No	Consistent with NUREG-1801.
3.4.1.047	Steel (with coating or wrapping) Piping, piping components, and piping elements; tanks exposed to Soil or Concrete	Loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion	Buried and Underground Piping and Tanks (B2.1.25)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Buried and Underground Piping and Tanks (B2.1.25)

Table 3.4-1 Summary of Aging Management Programs in Chapter VIII of NUREG-1801 for Steam and Power Conversion System (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.4.1.048	Stainless Steel Bolting exposed to Soil	Loss of material due to pitting and crevice corrosion	Buried and Underground Piping and Tanks (B2.1.25)	No	Not applicable. Callaway has no in-scope stainless steel bolting exposed to soil in the steam and power conversion systems, so the applicable NUREG-1801 line was not used.
3.4.1.049	Stainless steel Piping, piping components, and piping elements exposed to Soil or Concrete	Loss of material due to pitting and crevice corrosion	Buried and Underground Piping and Tanks (B2.1.25)	No	Not applicable. Callaway has no in-scope stainless steel piping, piping components, and piping elements exposed to soil or concrete in the steam and power conversion systems, so the applicable NUREG-1801 lines were not used.
3.4.1.050	Steel Bolting exposed to Soil	Loss of material due to general, pitting and crevice corrosion	Buried and Underground Piping and Tanks (B2.1.25)	No	Not applicable. Callaway has no in-scope steel bolting exposed to soil in the steam and power conversion systems, so the applicable NUREG-1801 line was not used.
3.4.1.050a	Underground Stainless Steel and Steel Piping, piping components, and piping elements	Loss of material due to general (steel only), pitting and crevice corrosion	Buried and Underground Piping and Tanks (B2.1.25)	No	Not applicable. Callaway has no in-scope underground stainless steel and steel piping, piping components, and piping elements in the steam and power conversion systems, so the applicable NUREG-1801 line was not used.

Table 3.4-1 Summary of Aging Management Programs in Chapter VIII of NUREG-1801 for Steam and Power Conversion System (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.4.1.051	Steel Piping, piping components, and piping elements exposed to Concrete	None	None, provided 1) attributes of the concrete are consistent with ACI 318 or ACI 349 (low water-to-cement ratio, low permeability and adequate air entrainment) as cited in NUREG-1557 and 2) plant OE indicates no degradation of the concrete	No, if conditions are met.	Not applicable. Callaway has no in-scope steel piping, piping components, and piping elements exposed to concrete in the steam and power conversion systems, so the applicable NUREG-1801 line was not used.
3.4.1.052	Aluminum Piping, piping components, and piping elements exposed to Gas, Air – indoor, uncontrolled (Internal/External)	None	None	NA - No AEM or AMP	Consistent with NUREG-1801.
3.4.1.053	Copper alloy (≤15% Zn and ≤8% Al) Piping, piping components, and piping elements exposed to Air with borated water leakage	None	None	NA - No AEM or AMP	Not applicable. Callaway has no in-scope copper alloy (≤15% Zn and ≤8% Al) piping, piping components, and piping elements exposed to air with borated water leakage in the steam and power conversion systems, so the applicable NUREG-1801 line was not used.

Table 3.4-1 Summary of Aging Management Programs in Chapter VIII of NUREG-1801 for Steam and Power Conversion System (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.4.1.054	Copper alloy Piping, piping components, and piping elements exposed to Gas, Air – indoor, uncontrolled (External)	None	None	NA - No AEM or AMP	Consistent with NUREG-1801.
3.4.1.055	Glass Piping elements exposed to Lubricating oil, Air – outdoor, Condensation (Internal/External), Raw water, Treated water, Air with borated water leakage, Gas, Closed-cycle cooling water, Air – indoor, uncontrolled (External)	None	None	NA - No AEM or AMP	Not applicable. Callaway has no in-scope glass piping elements exposed to lubricating oil, air – outdoor, condensation (internal/external), raw water, treated water, air with borated water leakage, gas, closed-cycle cooling water, air – indoor, uncontrolled (external) in the steam and power conversion systems, so the applicable NUREG-1801 lines were not used.

Table 3.4-1 Summary of Aging Management Programs in Chapter VIII of NUREG-1801 for Steam and Power Conversion System (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.4.1.056	Nickel alloy Piping, piping components, and piping elements exposed to Air – indoor, uncontrolled (External)	None	None	NA - No AEM or AMP	Not applicable. Callaway has no in-scope nickel alloy piping, piping components, and piping elements exposed to air – indoor, uncontrolled (external) in the steam and power conversion systems, so the applicable NUREG-1801 line was not used.
3.4.1.057	Nickel alloy, PVC Piping, piping components, and piping elements exposed to Air with borated water leakage, Air – indoor, uncontrolled, Condensation (Internal)	None	None	NA - No AEM or AMP	Not applicable. Callaway has no in-scope nickel alloy, PVC piping, piping components, and piping elements exposed to air with borated water leakage, air – indoor, uncontrolled, condensation (internal) in the steam and power conversion systems, so the applicable NUREG-1801 lines were not used.

Table 3.4-1 Summary of Aging Management Programs in Chapter VIII of NUREG-1801 for Steam and Power Conversion System (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.4.1.058	Stainless steel Piping, piping components, and piping elements exposed to Air – indoor, uncontrolled (External), Concrete, Gas, Air – indoor, uncontrolled (Internal)	None	None	NA - No AEM or AMP	Consistent with NUREG-1801.
3.4.1.059	Steel Piping, piping components, and piping elements exposed to Air – indoor controlled (External), Gas	None	None	NA - No AEM or AMP	Consistent with NUREG-1801.

Table 3.4.2-1 Steam and Power Conversion System – Summary of Aging Management Evaluation – Main Turbine System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Closure Bolting	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	VIII.H.SP-83	3.4.1.010	A
Closure Bolting	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.8)	VIII.H.SP-84	3.4.1.008	A
Piping	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VIII.H.S-29	3.4.1.034	A
Piping	PB	Carbon Steel	Steam (Int)	Wall thinning	Flow-Accelerated Corrosion (B2.1.7)	VIII.A.S-15	3.4.1.005	A
Piping	PB	Carbon Steel	Steam (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.A.SP-71	3.4.1.014	A
Piping	PB	Carbon Steel	Steam (Int)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	VIII.B1.S-08	3.4.1.001	A
Tubing	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VIII.I.SP-12	3.4.1.058	A
Tubing	PB	Stainless Steel	Steam (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.A.SP-98	3.4.1.011	A
Tubing	PB	Stainless Steel	Steam (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.A.SP-155	3.4.1.016	A

Table 3.4.2-1 Steam and Power Conversion System – Summary of Aging Management Evaluation – Main Turbine System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Valve	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VIII.H.S-29	3.4.1.034	A
Valve	PB	Carbon Steel	Steam (Int)	Wall thinning	Flow-Accelerated Corrosion (B2.1.7)	VIII.A.S-15	3.4.1.005	A
Valve	PB	Carbon Steel	Steam (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.A.SP-71	3.4.1.014	A

Notes for Table 3.4.2-1:

Standard Notes:
A Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

Plant Specific Notes:
None

Table 3.4.2-2 Steam and Power Conversion System – Summary of Aging Management Evaluation – Main Steam Supply System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Closure Bolting	LBS, PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	VIII.H.SP-83	3.4.1.010	A
Closure Bolting	LBS, PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.8)	VIII.H.SP-84	3.4.1.008	A
Flow Orifice	LBS	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VIII.H.S-29	3.4.1.034	A
Flow Orifice	LBS	Carbon Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.B1.SP-74	3.4.1.013	A
Insulation	INS	Aluminum	Plant Indoor Air (Ext)	None	None	VIII.I.SP-93	3.4.1.052	C
Insulation	INS	Insulation Calcium Silicate	Plant Indoor Air (Ext)	None	None	None	None	J, 1
Insulation	INS	Stainless Steel	Plant Indoor Air (Ext)	None	None	VIII.I.SP-12	3.4.1.058	C
Piping	LBS, SIA	Carbon Steel	Atmosphere/ Weather (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VIII.B1.SP-59	3.4.1.036	B
Piping	LBS, SIA	Carbon Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VIII.B1.SP-60	3.4.1.037	B

Table 3.4.2-2 Steam and Power Conversion System – Summary of Aging Management Evaluation – Main Steam Supply System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Piping	LBS, PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VIII.H.S-29	3.4.1.034	A
Piping	LBS, PB, SIA	Carbon Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.B1.SP-74	3.4.1.013	A
Piping	LBS	Carbon Steel	Secondary Water (Int)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	VIII.G.S-11	3.4.1.001	A
Piping	PB	Carbon Steel	Steam (Int)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	VIII.B1.S-08	3.4.1.001	A
Piping	LBS, PB, SIA	Carbon Steel	Steam (Int)	Wall thinning	Flow-Accelerated Corrosion (B2.1.7)	VIII.B1.S-15	3.4.1.005	A
Piping	LBS, PB, SIA	Carbon Steel	Steam (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.B1.SP-71	3.4.1.014	A
Pump	LBS	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VIII.H.S-29	3.4.1.034	A
Pump	LBS	Carbon Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.B1.SP-74	3.4.1.013	A

Table 3.4.2-2 Steam and Power Conversion System – Summary of Aging Management Evaluation – Main Steam Supply System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Silencer	LBS, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VIII.H.S-29	3.4.1.034	A
Silencer	LBS, SIA	Carbon Steel	Steam (Int)	Wall thinning	Flow-Accelerated Corrosion (B2.1.7)	VIII.B1.S-15	3.4.1.005	A
Silencer	LBS, SIA	Carbon Steel	Steam (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.B1.SP-71	3.4.1.014	A
Strainer	LBS	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VIII.H.S-29	3.4.1.034	A
Strainer	LBS	Carbon Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.B1.SP-74	3.4.1.013	A
Tank	LBS, SIA	Carbon Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VIII.B1.SP-60	3.4.1.037	D
Tank	LBS	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VIII.H.S-29	3.4.1.034	A
Tank	SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VIII.H.S-29	3.4.1.034	C

Table 3.4.2-2 Steam and Power Conversion System – Summary of Aging Management Evaluation – Main Steam Supply System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Tank	LBS	Carbon Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.B1.SP-74	3.4.1.013	C
Trap	LBS, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VIII.H.S-29	3.4.1.034	A
Trap	LBS, SIA	Carbon Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.B1.SP-74	3.4.1.013	A
Trap	LBS	Carbon Steel	Steam (Int)	Wall thinning	Flow-Accelerated Corrosion (B2.1.7)	VIII.B1.S-15	3.4.1.005	A
Trap	LBS	Carbon Steel	Steam (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.B1.SP-71	3.4.1.014	A
Tubing	LBS	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VIII.H.S-29	3.4.1.034	A
Tubing	LBS	Carbon Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.B1.SP-74	3.4.1.013	A
Tubing	PB	Stainless Steel	Dry Gas (Int)	None	None	VIII.I.SP-15	3.4.1.058	A
Tubing	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VIII.I.SP-12	3.4.1.058	A

Table 3.4.2-2 Steam and Power Conversion System – Summary of Aging Management Evaluation – Main Steam Supply System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Tubing	PB	Stainless Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.B1.SP-87	3.4.1.016	A
Tubing	PB	Stainless Steel	Secondary Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.B1.SP-88	3.4.1.011	A
Valve	LBS	Carbon Steel	Demineralized Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.B1.SP-74	3.4.1.013	A
Valve	PB	Carbon Steel	Dry Gas (Int)	None	None	VIII.I.SP-4	3.4.1.059	A
Valve	LBS, PB, PR, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VIII.H.S-29	3.4.1.034	A
Valve	LBS, PB, SIA	Carbon Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.B1.SP-74	3.4.1.013	A
Valve	LBS, PB, PR, SIA	Carbon Steel	Steam (Int)	Wall thinning	Flow-Accelerated Corrosion (B2.1.7)	VIII.B1.S-15	3.4.1.005	A
Valve	LBS, PB, PR, SIA	Carbon Steel	Steam (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.B1.SP-71	3.4.1.014	A
Valve	FIL, PB	Copper Alloy	Dry Gas (Int)	None	None	VIII.I.SP-5	3.4.1.054	A
Valve	FIL, PB	Copper Alloy	Plant Indoor Air (Ext)	None	None	VIII.I.SP-6	3.4.1.054	A

Table 3.4.2-2 Steam and Power Conversion System – Summary of Aging Management Evaluation – Main Steam Supply System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Valve	PB	Stainless Steel	Dry Gas (Int)	None	None	VIII.I.SP-15	3.4.1.058	A
Valve	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VIII.I.SP-12	3.4.1.058	A
Valve	PB	Stainless Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.B1.SP-87	3.4.1.016	A
Valve	PB	Stainless Steel	Secondary Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.B1.SP-88	3.4.1.011	A
Valve	PB	Stainless Steel	Steam (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.B1.SP-98	3.4.1.011	A
Valve	PB	Stainless Steel	Steam (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.B1.SP-155	3.4.1.016	A

Notes for Table 3.4.2-2:

Standard Notes:

A	Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.
B	Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.
C	Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.
D	Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.
J	Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant Specific Notes:

1	Based on plant operating experience, there are no aging effects requiring management for calcium silicate insulation in a metal jacket in a plant indoor air environment. The insulation does not experience aging effects unless exposed to temperatures, radiation, or chemicals capable of attacking the specific chemical composition of the insulation. The insulation is contained in metal jacket with a vapor barrier to prevent moisture intrusion and is in a non-aggressive air environment that does not experience significant aging effects.

Table 3.4.2-3 Steam and Power Conversion System – Summary of Aging Management Evaluation – Main Feedwater System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Closure Bolting	LBS, PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	VIII.H.SP-83	3.4.1.010	A
Closure Bolting	LBS, PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.8)	VIII.H.SP-84	3.4.1.008	A
Flow Element	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VIII.I.SP-12	3.4.1.058	A
Flow Element	PB	Stainless Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.D1.SP-87	3.4.1.016	A
Flow Element	PB	Stainless Steel	Secondary Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.D1.SP-88	3.4.1.011	A
Flow Orifice	SIA	Carbon Steel	Secondary Water (Ext)	Wall thinning	Flow-Accelerated Corrosion (B2.1.7)	VIII.D1.S-16	3.4.1.005	A
Flow Orifice	SIA	Carbon Steel	Secondary Water (Ext)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.D1.SP-74	3.4.1.013	A
Flow Orifice	SIA	Carbon Steel	Secondary Water (Int)	Wall thinning	Flow-Accelerated Corrosion (B2.1.7)	VIII.D1.S-16	3.4.1.005	A
Flow Orifice	SIA	Carbon Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.D1.SP-74	3.4.1.013	A
Heat Exchanger (Feedwater Heater)	SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VIII.H.S-29	3.4.1.034	A

Table 3.4.2-3 Steam and Power Conversion System – Summary of Aging Management Evaluation – Main Feedwater System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Heat Exchanger (Feedwater Heater)	SIA	Carbon Steel	Secondary Water (Int)	Wall thinning	Flow-Accelerated Corrosion (B2.1.7)	VIII.D1.S-16	3.4.1.005	C
Heat Exchanger (Feedwater Heater)	SIA	Carbon Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.D1.SP-74	3.4.1.013	C
Insulation	INS	Aluminum	Plant Indoor Air (Ext)	None	None	VIII.I.SP-93	3.4.1.052	C
Insulation	INS	Insulation Calcium Silicate	Plant Indoor Air (Ext)	None	None	None	None	J, 1
Insulation	INS	Stainless Steel	Plant Indoor Air (Ext)	None	None	VIII.I.SP-12	3.4.1.058	C
Piping	LBS	Carbon Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VIII.G.SP-60	3.4.1.037	B
Piping	LBS, PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VIII.H.S-29	3.4.1.034	A

Table 3.4.2-3 Steam and Power Conversion System – Summary of Aging Management Evaluation – Main Feedwater System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Piping	PB, SIA	Carbon Steel	Secondary Water (Int)	Wall thinning	Flow-Accelerated Corrosion (B2.1.7)	VIII.D1.S-16	3.4.1.005	A
Piping	LBS, PB, SIA	Carbon Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.D1.SP-74	3.4.1.013	A
Pump	SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VIII.H.S-29	3.4.1.034	A
Pump	SIA	Carbon Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.D1.SP-74	3.4.1.013	A
Pump	SIA	Stainless Steel Cast Austenitic	Plant Indoor Air (Ext)	None	None	VIII.I.SP-12	3.4.1.058	A
Pump	SIA	Stainless Steel Cast Austenitic	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.D1.SP-87	3.4.1.016	A
Pump	SIA	Stainless Steel Cast Austenitic	Secondary Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.D1.SP-88	3.4.1.011	A
Solenoid Valve	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VIII.H.S-29	3.4.1.034	A

Table 3.4.2-3 Steam and Power Conversion System – Summary of Aging Management Evaluation – Main Feedwater System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Solenoid Valve	PB	Carbon Steel	Secondary Water (Int)	Wall thinning	Flow-Accelerated Corrosion (B2.1.7)	VIII.D1.S-16	3.4.1.005	A
Solenoid Valve	PB	Carbon Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.D1.SP-74	3.4.1.013	A
Tubing	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VIII.I.SP-12	3.4.1.058	A
Tubing	PB	Stainless Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.D1.SP-87	3.4.1.016	A
Tubing	PB	Stainless Steel	Secondary Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.D1.SP-88	3.4.1.011	A
Valve	PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VIII.H.S-29	3.4.1.034	A
Valve	PB, SIA	Carbon Steel	Secondary Water (Int)	Wall thinning	Flow-Accelerated Corrosion (B2.1.7)	VIII.D1.S-16	3.4.1.005	A
Valve	PB, SIA	Carbon Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.D1.SP-74	3.4.1.013	A
Valve	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VIII.I.SP-12	3.4.1.058	A

Table 3.4.2-3 Steam and Power Conversion System – Summary of Aging Management Evaluation – Main Feedwater System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Valve	PB	Stainless Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.D1.SP-87	3.4.1.016	A
Valve	PB	Stainless Steel	Secondary Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.D1.SP-88	3.4.1.011	A
Valve	PB	Stainless Steel Cast Austenitic	Plant Indoor Air (Ext)	None	None	VIII.I.SP-12	3.4.1.058	A
Valve	PB	Stainless Steel Cast Austenitic	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.D1.SP-87	3.4.1.016	A
Valve	PB	Stainless Steel Cast Austenitic	Secondary Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.D1.SP-88	3.4.1.011	A

Notes for Table 3.4.2-3:

Standard Notes:

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

B Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.

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

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

Plant Specific Notes:

1 Based on plant operating experience, there are no aging effects requiring management for calcium silicate insulation in a metal jacket in a plant indoor air environment. The insulation does not experience aging effects unless exposed to temperatures, radiation, or chemicals capable of attacking the specific chemical composition of the insulation. The insulation is contained in metal jacket with a vapor barrier to prevent moisture intrusion and is in a non-aggressive air environment that does not experience significant aging effects.

Table 3.4.2-4 Steam and Power Conversion System – Summary of Aging Management Evaluation – Steam Generator Blowdown System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Closure Bolting	LBS, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	VIII.H.SP-83	3.4.1.010	A
Closure Bolting	LBS, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.8)	VIII.H.SP-84	3.4.1.008	A
Piping	LBS, SIA	Carbon Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VIII.B1.SP-60	3.4.1.037	B
Piping	LBS, PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VIII.H.S-29	3.4.1.034	A
Piping	LBS, PB, SIA	Carbon Steel	Secondary Water (Int)	Wall thinning	Flow-Accelerated Corrosion (B2.1.7)	VIII.F.S-16	3.4.1.005	A
Piping	LBS, PB, SIA	Carbon Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.F.SP-74	3.4.1.013	A
Piping	PB	Carbon Steel	Secondary Water (Int)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	VIII.B1.S-08	3.4.1.001	A
Piping	SIA	Stainless Steel	Plant Indoor Air (Ext)	None	None	VIII.I.SP-12	3.4.1.058	A

Table 3.4.2-4 Steam and Power Conversion System – Summary of Aging Management Evaluation – Steam Generator Blowdown System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Piping	SIA	Stainless Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.F.SP-87	3.4.1.016	A
Piping	SIA	Stainless Steel	Secondary Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.F.SP-88	3.4.1.011	A
Pump	LBS	Stainless Steel	Plant Indoor Air (Ext)	None	None	VIII.I.SP-12	3.4.1.058	A
Pump	LBS	Stainless Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.F.SP-87	3.4.1.016	A
Pump	LBS	Stainless Steel	Secondary Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.F.SP-88	3.4.1.011	A
Solenoid Valve	LBS, PB, SIA	Stainless Steel	Plant Indoor Air (Ext)	None	None	VIII.I.SP-12	3.4.1.058	A
Solenoid Valve	LBS, PB, SIA	Stainless Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.F.SP-87	3.4.1.016	A
Solenoid Valve	LBS, PB, SIA	Stainless Steel	Secondary Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.F.SP-88	3.4.1.011	A
Tank	SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VIII.H.S-29	3.4.1.034	A

Table 3.4.2-4 Steam and Power Conversion System – Summary of Aging Management Evaluation – Steam Generator Blowdown System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Tank	SIA	Carbon Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.F.SP-74	3.4.1.013	C
Tank	SIA	Carbon Steel	Steam (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.B1.SP-71	3.4.1.014	C
Tubing	LBS, PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VIII.I.SP-12	3.4.1.058	A
Tubing	LBS, PB	Stainless Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.F.SP-87	3.4.1.016	A
Tubing	LBS, PB	Stainless Steel	Secondary Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.F.SP-88	3.4.1.011	A
Valve	PB, SS	Carbon Steel	Dry Gas (Int)	None	None	VIII.I.SP-4	3.4.1.059	A
Valve	LBS, PB, SIA, SS	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VIII.H.S-29	3.4.1.034	A
Valve	LBS, PB, SIA	Carbon Steel	Secondary Water (Int)	Wall thinning	Flow-Accelerated Corrosion (B2.1.7)	VIII.F.S-16	3.4.1.005	A
Valve	LBS, PB, SIA	Carbon Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.F.SP-74	3.4.1.013	A
Valve	PB	Copper Alloy	Dry Gas (Int)	None	None	VIII.I.SP-5	3.4.1.054	A

Table 3.4.2-4 Steam and Power Conversion System – Summary of Aging Management Evaluation – Steam Generator Blowdown System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Valve	PB	Copper Alloy	Plant Indoor Air (Ext)	None	None	VIII.I.SP-6	3.4.1.054	A

Notes for Table 3.4.2-4:

Standard Notes:

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

B Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.

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

Plant Specific Notes:

None

Table 3.4.2-5 Steam and Power Conversion System – Summary of Aging Management Evaluation – Auxiliary Feedwater System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Closure Bolting	LBS, PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	VIII.H.SP-83	3.4.1.010	A
Closure Bolting	LBS, PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.8)	VIII.H.SP-84	3.4.1.008	A
Closure Bolting	LBS, PB, SIA	Stainless Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	VIII.H.SP-83	3.4.1.010	A
Closure Bolting	LBS, PB, SIA	Stainless Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.8)	VIII.H.SP-84	3.4.1.008	A
Filter	FIL, PB	Carbon Steel	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.24) and One-Time Inspection (B2.1.18)	VIII.G.SP-91	3.4.1.040	A
Filter	FIL, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VIII.H.S-29	3.4.1.034	A
Flexible Hoses	LBS	Elastomer	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VII.F2.AP-103	3.3.1.096	B
Flexible Hoses	LBS	Elastomer	Plant Indoor Air (Ext)	Hardening and loss of strength	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VII.F2.AP-102	3.3.1.076	A

Table 3.4.2-5 Steam and Power Conversion System – Summary of Aging Management Evaluation – Auxiliary Feedwater System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Flow Element	PB, TH	Stainless Steel	Plant Indoor Air (Ext)	None	None	VIII.I.SP-12	3.4.1.058	A
Flow Element	PB, TH	Stainless Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.G.SP-87	3.4.1.016	A
Flow Orifice	PB, TH	Carbon Steel	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.24) and One-Time Inspection (B2.1.18)	VIII.G.SP-91	3.4.1.040	A
Flow Orifice	PB, TH	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VIII.H.S-29	3.4.1.034	A
Flow Orifice	PB, TH	Stainless Steel	Plant Indoor Air (Ext)	None	None	VIII.I.SP-12	3.4.1.058	A
Flow Orifice	PB, TH	Stainless Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.G.SP-87	3.4.1.016	A
Flow Orifice	PB, TH	Stainless Steel	Steam (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.B1.SP-98	3.4.1.011	A
Flow Orifice	PB, TH	Stainless Steel	Steam (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.B1.SP-155	3.4.1.016	A

Table 3.4.2-5 Steam and Power Conversion System – Summary of Aging Management Evaluation – Auxiliary Feedwater System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Heat Exchanger (AF Turbine Oil Cooler)	PB	Carbon Steel	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.24) and One-Time Inspection (B2.1.18)	VIII.G.SP-76	3.4.1.041	A
Heat Exchanger (AF Turbine Oil Cooler)	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VIII.H.S-29	3.4.1.034	A
Heat Exchanger (AF Turbine Oil Cooler)	HT, PB	Stainless Steel	Lubricating Oil (Ext)	Loss of material	Lubricating Oil Analysis (B2.1.24) and One-Time Inspection (B2.1.18)	VIII.G.SP-79	3.4.1.044	A
Heat Exchanger (AF Turbine Oil Cooler)	HT, PB	Stainless Steel	Lubricating Oil (Ext)	Reduction of heat transfer	Lubricating Oil Analysis (B2.1.24) and One-Time Inspection (B2.1.18)	VIII.G.SP-102	3.4.1.046	A
Heat Exchanger (AF Turbine Oil Cooler)	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VIII.I.SP-12	3.4.1.058	A
Heat Exchanger (AF Turbine Oil Cooler)	HT, PB	Stainless Steel	Secondary Water (Int)	Reduction of heat transfer	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.E.SP-96	3.4.1.018	A

Table 3.4.2-5 Steam and Power Conversion System – Summary of Aging Management Evaluation – Auxiliary Feedwater System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Heat Exchanger (AF Turbine Oil Cooler)	HT, PB	Stainless Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.G.SP-87	3.4.1.016	C
Insulation	INS	Aluminum	Plant Indoor Air (Ext)	None	None	VIII.I.SP-93	3.4.1.052	C
Insulation	INS	Insulation Calcium Silicate	Plant Indoor Air (Ext)	None	None	None	None	J, 1
Insulation	INS	Stainless Steel	Plant Indoor Air (Ext)	None	None	VIII.I.SP-12	3.4.1.058	C
Piping	LBS, PB, SIA	Carbon Steel	Atmosphere/ Weather (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VIII.B1.SP-59	3.4.1.036	B
Piping	PB, SIA	Carbon Steel	Buried (Ext)	Loss of material	Buried and Underground Piping and Tanks (B2.1.25)	VIII.G.SP-145	3.4.1.047	B
Piping	LBS, SIA	Carbon Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VIII.G.SP-60	3.4.1.037	B

Table 3.4.2-5 Steam and Power Conversion System – Summary of Aging Management Evaluation – Auxiliary Feedwater System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Piping	LBS, PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VIII.H.S-29	3.4.1.034	A
Piping	PB	Carbon Steel	Secondary Water (Int)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	VIII.D1.S-11	3.4.1.001	A
Piping	LBS, PB, SIA	Carbon Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.G.SP-74	3.4.1.013	A
Piping	PB	Carbon Steel	Steam (Int)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	VIII.B1.S-08	3.4.1.001	A
Piping	LBS, PB, SIA	Carbon Steel	Steam (Int)	Wall thinning	Flow-Accelerated Corrosion (B2.1.7)	VIII.B1.S-15	3.4.1.005	A
Piping	LBS, PB, SIA	Carbon Steel	Steam (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.B1.SP-71	3.4.1.014	A
Piping	LBS, SIA	Stainless Steel	Plant Indoor Air (Ext)	None	None	VIII.I.SP-12	3.4.1.058	A
Piping	LBS, SIA	Stainless Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.G.SP-87	3.4.1.016	A

Table 3.4.2-5 Steam and Power Conversion System – Summary of Aging Management Evaluation – Auxiliary Feedwater System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Pump	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VIII.H.S-29	3.4.1.034	A
Pump	PB	Carbon Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.G.SP-74	3.4.1.013	A
Pump	PB	Cast Iron	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.24) and One-Time Inspection (B2.1.18)	VIII.G.SP-91	3.4.1.040	A
Pump	PB	Cast Iron	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VIII.H.S-29	3.4.1.034	A
Sight Gauge	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VIII.I.SP-12	3.4.1.058	C
Sight Gauge	PB	Stainless Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.G.SP-87	3.4.1.016	A
Strainer	FIL, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VIII.H.S-29	3.4.1.034	A
Strainer	FIL, PB	Carbon Steel	Steam (Int)	Wall thinning	Flow-Accelerated Corrosion (B2.1.7)	VIII.B1.S-15	3.4.1.005	A
Strainer	FIL, PB	Carbon Steel	Steam (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.B1.SP-71	3.4.1.014	A

Table 3.4.2-5 Steam and Power Conversion System – Summary of Aging Management Evaluation – Auxiliary Feedwater System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Trap	LBS, PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VIII.H.S-29	3.4.1.034	C
Trap	LBS, SIA	Carbon Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.G.SP-74	3.4.1.013	C
Trap	PB	Carbon Steel	Steam (Int)	Wall thinning	Flow-Accelerated Corrosion (B2.1.7)	VIII.B1.S-15	3.4.1.005	A
Trap	PB	Carbon Steel	Steam (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.B1.SP-71	3.4.1.014	A
Tubing	PB	Carbon Steel	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.24) and One-Time Inspection (B2.1.18)	VIII.G.SP-91	3.4.1.040	A
Tubing	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VIII.H.S-29	3.4.1.034	A
Tubing	LBS	Stainless Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VIII.B1.SP-110	3.4.1.039	B
Tubing	PB	Stainless Steel	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.24) and One-Time Inspection (B2.1.18)	VIII.G.SP-95	3.4.1.044	A

Table 3.4.2-5 Steam and Power Conversion System – Summary of Aging Management Evaluation – Auxiliary Feedwater System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Tubing	LBS, PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VIII.I.SP-12	3.4.1.058	A
Tubing	LBS	Stainless Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.B1.SP-87	3.4.1.016	A
Tubing	PB	Stainless Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.G.SP-87	3.4.1.016	A
Turbine	PB	Carbon Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VIII.G.SP-60	3.4.1.037	D
Turbine	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VIII.H.S-29	3.4.1.034	A
Valve	FIL, LBS, PB, PR, SIA	Carbon Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VIII.G.SP-60	3.4.1.037	B
Valve	PB	Carbon Steel	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.24) and One-Time Inspection (B2.1.18)	VIII.G.SP-91	3.4.1.040	A

Table 3.4.2-5 Steam and Power Conversion System – Summary of Aging Management Evaluation – Auxiliary Feedwater System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Valve	FIL, LBS, PB, PR, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VIII.H.S-29	3.4.1.034	A
Valve	LBS, PB	Carbon Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.G.SP-74	3.4.1.013	A
Valve	PB	Carbon Steel	Steam (Int)	Wall thinning	Flow-Accelerated Corrosion (B2.1.7)	VIII.B1.S-15	3.4.1.005	A
Valve	PB	Carbon Steel	Steam (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.B1.SP-71	3.4.1.014	A
Valve	PB, PR	Cast Iron	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.24) and One-Time Inspection (B2.1.18)	VIII.G.SP-91	3.4.1.040	A
Valve	PB, PR	Cast Iron	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VIII.H.S-29	3.4.1.034	A
Valve	PB	Stainless Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VIII.B1.SP-110	3.4.1.039	B
Valve	LBS, PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VIII.I.SP-12	3.4.1.058	A

Table 3.4.2-5 Steam and Power Conversion System – Summary of Aging Management Evaluation – Auxiliary Feedwater System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Valve	LBS, PB	Stainless Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.G.SP-87	3.4.1.016	A
Valve	PB	Stainless Steel	Steam (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.B1.SP-98	3.4.1.011	A
Valve	PB	Stainless Steel	Steam (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.B1.SP-155	3.4.1.016	A

Notes for Table 3.4.2-5:

Standard Notes:

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

B Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.

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

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

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

Plant Specific Notes:

1 Based on plant operating experience, there are no aging effects requiring management for calcium silicate insulation in a metal jacket in a plant indoor air environment. The insulation does not experience aging effects unless exposed to temperatures, radiation, or chemicals capable of attacking the specific chemical composition of the insulation. The insulation is contained in metal jacket with a vapor barrier to prevent moisture intrusion and is in a non-aggressive air environment that does not experience significant aging effects.

Table 3.4.2-6 Steam and Power Conversion System – Summary of Aging Management Evaluation – Condensate Storage and Transfer System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Closure Bolting	PB	Carbon Steel	Atmosphere/ Weather (Ext)	Loss of material	Bolting Integrity (B2.1.8)	VIII.H.SP-82	3.4.1.008	A
Closure Bolting	PB	Carbon Steel	Atmosphere/ Weather (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	VIII.H.SP-151	3.4.1.010	A
Closure Bolting	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	VIII.H.SP-83	3.4.1.010	A
Closure Bolting	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.8)	VIII.H.SP-84	3.4.1.008	A
Closure Bolting	PB	Stainless Steel	Atmosphere/ Weather (Ext)	Loss of material	Bolting Integrity (B2.1.8)	VIII.H.SP-82	3.4.1.008	A
Closure Bolting	PB	Stainless Steel	Atmosphere/ Weather (Ext)	Loss of preload	Bolting Integrity (B2.1.8)	VIII.H.SP-151	3.4.1.010	A
Insulation	INS	Acrylic/Urethane	Atmosphere/ Weather (Ext)	Cracking, blistering, change in color	Aboveground Metallic Tanks (B2.1.15)	None	None	J, 3
Insulation	INS	Aluminum	Atmosphere/ Weather (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VIII.H.SP-147	3.4.1.035	C
Insulation	INS	Insulation Foamglas (glass dust)	Atmosphere/ Weather (Ext)	None	None	None	None	J, 2
Insulation	INS	Stainless Steel	Atmosphere/ Weather (Ext)	Cracking	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VIII.G.SP-118	3.4.1.002	C

Table 3.4.2-6 Steam and Power Conversion System – Summary of Aging Management Evaluation – Condensate Storage and Transfer System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Insulation	INS	Stainless Steel	Atmosphere/ Weather (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VIII.G.SP-127	3.4.1.003	C
Piping	PB	Carbon Steel	Atmosphere/ Weather (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VIII.H.S-41	3.4.1.034	A
Piping	PB	Carbon Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VIII.G.SP-60	3.4.1.037	B
Piping	LBS, PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VIII.H.S-29	3.4.1.034	A
Piping	LBS, PB, SIA	Carbon Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.G.SP-74	3.4.1.013	A
Piping	PB	Stainless Steel	Atmosphere/ Weather (Ext)	Cracking	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VIII.G.SP-118	3.4.1.002	A
Piping	PB	Stainless Steel	Atmosphere/ Weather (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VIII.G.SP-127	3.4.1.003	A

Table 3.4.2-6 Steam and Power Conversion System – Summary of Aging Management Evaluation – Condensate Storage and Transfer System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Piping	PB	Stainless Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VIII.B1.SP-110	3.4.1.039	B
Piping	PB	Stainless Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.G.SP-87	3.4.1.016	A
Tank	PB	Stainless Steel	Atmosphere/ Weather (Ext)	Cracking	Aboveground Metallic Tanks (B2.1.15)	VIII.G.SP-118	3.4.1.002	E, 1
Tank	PB	Stainless Steel	Atmosphere/ Weather (Ext)	Loss of material	Aboveground Metallic Tanks (B2.1.15)	VIII.G.SP-127	3.4.1.003	E, 1
Tank	PB	Stainless Steel	Concrete (Ext)	Loss of material	Aboveground Metallic Tanks (B2.1.15)	VIII.E.SP-137	3.4.1.031	B
Tank	PB	Stainless Steel	Condensation (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	VIII.B1.SP-110	3.4.1.039	D
Tank	PB	Stainless Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.G.SP-75	3.4.1.012	A
Valve	PB	Carbon Steel	Atmosphere/ Weather (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VIII.H.S-41	3.4.1.034	A

Table 3.4.2-6 Steam and Power Conversion System – Summary of Aging Management Evaluation – Condensate Storage and Transfer System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Valve	PB	Carbon Steel	Dry Gas (Int)	None	None	VIII.I.SP-4	3.4.1.059	A
Valve	LBS, PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VIII.H.S-29	3.4.1.034	A
Valve	LBS, PB, SIA	Carbon Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.G.SP-74	3.4.1.013	A
Valve	PB	Stainless Steel Cast Austenitic	Atmosphere/ Weather (Ext)	Cracking	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VIII.G.SP-118	3.4.1.002	A
Valve	PB	Stainless Steel Cast Austenitic	Atmosphere/ Weather (Ext)	Loss of material	External Surfaces Monitoring of Mechanical Components (B2.1.21)	VIII.G.SP-127	3.4.1.003	A
Valve	PB	Stainless Steel Cast Austenitic	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.18)	VIII.G.SP-87	3.4.1.016	A

Notes for Table 3.4.2-6:

Standard Notes:

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

B Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.

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

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

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

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

Plant Specific Notes:

1 The bottom of this tank rests on a concrete foundation. Therefore the Aboveground Metallic Tanks program (B2.1.15) is credited.

2 The mechanical properties FOAMGLAS (glass dust) are consistent with other glass materials and is evaluated consistent with other glass-like materials in an atmosphere/weather environment in NUREG-1801.

3 Acrylic/Urethane in an Atmosphere/Weather (Ext.) environment is subjected to UV radiation, moisture and thermal exposure. The acrylic rubber sealant coating provides UV radiation protection for the urethane foam tank insulation. The dome of the stainless steel tank is prepped with a low halogen (<200 ppm) primer prior to the application of the foam urethane. The Aboveground Metallic Tanks program (B2.1.15) manages cracking blistering or changes in color of the acrylic/urethane insulation. The acrylic rubber sealant is inspected for aging and damage as an indicator for the urethane foam underneath it.

3.5 AGING MANAGEMENT OF CONTAINMENTS, STRUCTURES AND COMPONENT SUPPORTS

3.5.1 Introduction

Section 3.5 provides the results of the aging management reviews (AMRs) for those component types identified in Section 2.4, *Scoping and Screening Results – Struc*tures, subject to AMR. The structures are described in the following sections:

- Reactor Building (Section 2.4.1)
- Control Building (Section 2.4.2)
- Auxiliary Building (Section 2.4.3)
- Turbine Building (Section 2.4.4)
- Diesel Generator Building (Section 2.4.5)
- Miscellaneous In-Scope Structures (Section 2.4.6)
- In-Scope Tank Foundations and Structures (Section 2.4.7)
- Electrical Foundations and Structures (Section 2.4.8)
- Radwaste Building (Section 2.4.9)
- Fuel Building (Section 2.4.10)
- Essential Service Water Structures (Section 2.4.11)
- Supports (Section 2.4.12)

Table 3.5-1, *Summary of Aging Management Programs in Chapters II and III of NUREG-1801 for Containments, Structures, and Component Supports*, provides the summary of the programs evaluated in NUREG-1801 that are applicable to component types in this section. Table 3.5-1 uses the format of Table 1 described in Section 3.0, *Aging Management Review*.

3.5.2 Results

The following tables summarize the results of the AMR for the structures and commodities in the containments, structures and component supports area:

- Table 3.5.2-1,*Containments, Structures, and Component Supports - Summary of Aging Management Evaluation - Reactor Building*

- Table 3.5.2-2, *Containments, Structures, and Component Supports - Summary of Aging Management Evaluation - Control Building*
- Table 3.5.2-3, *Containments, Structures, and Component Supports - Summary of Aging Management Evaluation - Auxiliary Building*
- Table 3.5.2-4, *Containments, Structures, and Component Supports - Summary of Aging Management Evaluation - Turbine Building*
- Table 3.5.2-5, *Containments, Structures, and Component Supports - Summary of Aging Management Evaluation - Diesel Generator Building*
- Table 3.5.2-6, *Containments, Structures, and Component Supports - Summary of Aging Management Evaluation - Miscellaneous In-Scope Structures*
- Table 3.5.2-7,*Containments, Structures, and Component Supports - Summary of Aging Management Evaluation – In-Scope Tank Foundations and Structures*
- Table 3.5.2-8, *Containments, Structures, and Component Supports - Summary of Aging Management Evaluation – Electrical Foundations and Structures*
- Table 3.5.2-9, *Containments, Structures, and Component Supports* - Summary of Aging Management Evaluation – Radwaste Building
- Table 3.5.2-10, *Containments, Structures, and Component Supports - Summary of Aging Management Evaluation – Fuel Building*
- Table 3.5.2-11, *Containments, Structures, and Component Supports - Summary of Aging Management Evaluation – Essential Service Water Structures*
- Table 3.5.2-12, *Containments, Structures, and Component Supports - Summary of Aging Management Evaluation - Supports*

These tables use the format of Table 2 discussed in Section 3.0, *Aging Management Review*.

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

The materials from which the component types are fabricated, the environments to which they are exposed, the potential aging effects requiring management, and the aging management programs used to manage these aging effects are provided for each of the above structures and commodities in the following sections.

3.5.2.1.1 Reactor Building

Materials

The materials of construction for the reactor building component types are:

- Carbon Steel
- Coatings
- Concrete
- Elastomer
- Fire Barrier (Cementitious Coating)
- High Strength Low Alloy Steel (Bolting)
- Stainless Steel
- Stainless Steel; Dissimilar Metal Welds

Environment

The reactor building component types are exposed to the following environments:

- Atmosphere/ Weather (Structural)
- Buried (Structural)
- Concrete
- Concrete (Structural)
- Plant Indoor Air (Structural)
- Submerged (Structural)

Aging Effects Requiring Management

The following reactor building aging effects require management:

- Concrete cracking and spalling
- Cracking
- Cracking and distortion
- Cracking, loss of material
- Cracking; loss of bond; and loss of material (spalling, scaling)
- Increase in porosity and permeability; cracking; loss of material (spalling, scaling)

- Increase in porosity and permeability; loss of strength
- Loss of coating integrity
- Loss of leak tightness
- Loss of material
- Loss of material (spalling, scaling) and cracking
- Loss of preload
- Loss of sealing

Aging Management Programs

The following aging management programs manage the aging effects for the reactor building component types:

- 10 CFR Part 50, Appendix J (B2.1.29)
- ASME Section XI, Subsection IWE (B2.1.26)
- ASME Section XI, Subsection IWL (B2.1.27)
- Fire Protection (B2.1.13)
- Protective Coating Monitoring and Maintenance (B2.1.33)
- Structures Monitoring (B2.1.31)
- Water Chemistry (B2.1.2)

3.5.2.1.2 Control Building

Materials

The materials of construction for the control building component types are:

- Carbon Steel
- Concrete
- Concrete Block (Masonry Walls)
- Elastomer
- Fire Barrier (Cementitious Coating)
- Fire Barrier (Ceramic Fiber)
- High Strength Low Alloy Steel (Bolting)

Environment

The control building component types are exposed to the following environments:

- Atmosphere/ Weather (Structural)
- Buried (Structural)
- Concrete (Structural)
- Plant Indoor Air (Structural)

Aging Effects Requiring Management

The following control building aging effects require management:

- Concrete cracking and spalling
- Cracking
- Cracking and distortion
- Cracking, loss of material
- Cracking; loss of bond; and loss of material (spalling, scaling)
- Increase in porosity and permeability; cracking; loss of material (spalling, scaling)
- Increase in porosity and permeability; loss of strength
- Increased hardness; shrinkage; loss of strength
- Loss of material
- Loss of material (spalling, scaling) and cracking
- Loss of preload
- Loss of sealing

Aging Management Programs

The following aging management programs manage the aging effects for the control building component types:

- Fire Protection (B2.1.13)
- Masonry Walls (B2.1.30)
- Structures Monitoring Program (B2.1.31)

3.5.2.1.3 Auxiliary Building

Materials

The materials of construction for the auxiliary building component types are:

- Carbon Steel
- Concrete
- Concrete Block (Masonry Walls)
- Elastomer
- Fire Barrier (Cementitious Coating)
- High Strength Low Alloy Steel (Bolting)

Environment

The auxiliary building component types are exposed to the following environments:

- Atmosphere/ Weather (Structural)
- Buried (Structural)
- Concrete (Structural)
- Plant Indoor Air (Structural)

Aging Effects Requiring Management

The following auxiliary building aging effects require management:

- Concrete cracking and spalling
- Cracking
- Cracking and distortion
- Cracking, loss of material
- Cracking; loss of bond; and loss of material (spalling, scaling)
- Increase in porosity and permeability; cracking; loss of material (spalling, scaling)
- Increase in porosity and permeability; loss of strength
- Increased hardness; shrinkage; loss of strength
- Loss of material
- Loss of material (spalling, scaling) and cracking

- Loss of preload
- Loss of sealing

Aging Management Programs

The following aging management programs manage the aging effects for the auxiliary building component types:

- Fire Protection (B2.1.13)
- Masonry Walls (B2.1.30)
- Structures Monitoring (B2.1.31)

3.5.2.1.4 Turbine Building

Materials

The materials of construction for the turbine building component types are:

- Carbon Steel
- Concrete
- Concrete Block (Masonry Walls)
- Elastomer
- Fire Barrier (Cementitious Coating)
- High Strength Low Alloy Steel (Bolting)

Environment

The turbine building component types are exposed to the following environments:

- Atmosphere/ Weather (Structural)
- Buried (Structural)
- Concrete (Structural)
- Plant Indoor Air (Structural)

Aging Effects Requiring Management

The following turbine building aging effects require management:

- Concrete cracking and spalling
- Cracking

- Cracking and distortion
- Cracking, loss of material
- Cracking; loss of bond; and loss of material (spalling, scaling)
- Increase in porosity and permeability; cracking; loss of material (spalling, scaling)
- Increase in porosity and permeability; loss of strength
- Increased hardness; shrinkage; loss of strength
- Loss of material
- Loss of material (spalling, scaling) and cracking
- Loss of preload
- Loss of sealing

Aging Management Programs

The following aging management programs manage the aging effects for the turbine building component types:

- Fire Protection (B2.1.13)
- Masonry Walls (B2.1.30)
- Structures Monitoring (B2.1.31)

3.5.2.1.5 Diesel Generator Building

Materials

The materials of construction for the diesel generator building component types are:

- Carbon Steel
- Concrete
- Elastomer
- Fire Barrier (Cementitious Coating)
- High Strength Low Alloy Steel (Bolting)

Environment

The diesel generator building component types are exposed to the following environments:

- Atmosphere/ Weather (Structural)

- Buried (Structural)
- Concrete (Structural)
- Plant Indoor Air (Structural)

Aging Effects Requiring Management

The following diesel generator building aging effects require management:

- Concrete cracking and spalling
- Cracking
- Cracking and distortion
- Cracking, loss of material
- Cracking; loss of bond; and loss of material (spalling, scaling)
- Increase in porosity and permeability; cracking; loss of material (spalling, scaling)
- Increase in porosity and permeability; loss of strength
- Increased hardness; shrinkage; loss of strength
- Loss of material
- Loss of material (spalling, scaling) and cracking
- Loss of preload
- Loss of sealing

Aging Management Programs

The following aging management programs manage the aging effects for the diesel generator building component types:

- Fire Protection (B2.1.13)
- Structures Monitoring (B2.1.31)

3.5.2.1.6 Miscellaneous In-Scope Structures

Materials

The materials of construction for the miscellaneous in-scope structures component types are:

- Carbon Steel

- Concrete
- Concrete Block (Masonry Walls)
- Elastomer
- Glass

Environment

The miscellaneous in-scope structures component types are exposed to the following environments:

- Atmosphere/ Weather (Structural)
- Buried
- Buried (Structural)
- Concrete (Structural)
- Plant Indoor Air (Structural)
- Submerged (Structural)

Aging Effects Requiring Management

The following miscellaneous in-scope structures aging effects require management:

- Cracking
- Cracking and distortion
- Cracking; loss of bond; and loss of material (spalling, scaling)
- Increase in porosity and permeability; cracking; loss of material (spalling, scaling)
- Increase in porosity and permeability; loss of strength
- Loss of material
- Loss of material (spalling, scaling) and cracking
- Loss of preload
- Loss of sealing

Aging Management Programs

The following aging management programs manage the aging effects for the miscellaneous in-scope structures component types:

- Fire Protection (B2.1.13)

- Masonry Walls (B2.1.30)
- Structures Monitoring (B2.1.31)

3.5.2.1.7 In-Scope Tank Foundations and Structures

Materials

The materials of construction for the in-scope tank foundations and structures component types are:

- Carbon Steel
- Concrete
- Concrete Block (Masonry Walls)
- Elastomer
- High Strength Low Alloy Steel (Bolting)
- Stainless Steel

Environment

The in-scope tank foundations and structures component types are exposed to the following environments:

- Atmosphere/ Weather (Structural)
- Buried (Structural)
- Concrete (Structural)
- Plant Indoor Air (Structural)

Aging Effects Requiring Management

The following in-scope tank foundations and structures aging effects require management:

- Cracking
- Cracking and distortion
- Cracking; loss of bond; and loss of material (spalling, scaling)
- Increase in porosity and permeability; cracking; loss of material (spalling, scaling)
- Increase in porosity and permeability; loss of strength
- Loss of material

- Loss of material (spalling, scaling) and cracking
- Loss of preload
- Loss of sealing

Aging Management Programs

The following aging management programs manage the aging effects for the in-scope tank foundations and structures component types:

- Masonry Walls (B2.1.30)
- Structures Monitoring (B2.1.31)

3.5.2.1.8 Electrical Foundations and Structures

Materials

The materials of construction for the electrical foundations and structures component types are:

- Carbon Steel
- Concrete
- Elastomer

Environment

The electrical foundations and structures component types are exposed to the following environments:

- Atmosphere/ Weather (Structural)
- Buried (Structural)
- Concrete (Structural)
- Plant Indoor Air (Structural)

Aging Effects Requiring Management

The following electrical foundations and structures aging effects require management:

- Cracking
- Cracking and distortion
- Cracking, loss of material
- Cracking; loss of bond; and loss of material (spalling, scaling)

- Increase in porosity and permeability; cracking; loss of material (spalling, scaling)
- Increase in porosity and permeability; loss of strength
- Loss of material
- Loss of material (spalling, scaling) and cracking
- Loss of preload
- Loss of sealing

Aging Management Programs

The following aging management programs manage the aging effects for the electrical foundations and structures component types:

- Fire Protection (B2.1.13)
- Structures Monitoring (B2.1.31)

3.5.2.1.9 Radwaste Building

Materials

The materials of construction for the radwaste building component types are:

- Carbon Steel
- Concrete
- Concrete Block (Masonry Walls)
- Elastomer
- Fire Barrier (Cementitious Coating)
- High Strength Low Alloy Steel (Bolting)

Environment

The radwaste building component types are exposed to the following environments:

- Atmosphere/ Weather (Structural)
- Buried (Structural)
- Concrete (Structural)
- Plant Indoor Air (Structural)

Aging Effects Requiring Management

The following radwaste building aging effects require management:

- Concrete cracking and spalling
- Cracking
- Cracking and distortion
- Cracking, loss of material
- Cracking; loss of bond; and loss of material (spalling, scaling)
- Increase in porosity and permeability; cracking; loss of material (spalling, scaling)
- Increase in porosity and permeability; loss of strength
- Increased hardness; shrinkage; loss of strength
- Loss of material
- Loss of material (spalling, scaling) and cracking
- Loss of preload
- Loss of sealing

Aging Management Programs

The following aging management programs manage the aging effects for the radwaste building component types:

- Fire Protection (B2.1.13)
- Masonry Walls (B2.1.30)
- Structures Monitoring (B2.1.31)

3.5.2.1.10 Fuel Building

Materials

The materials of construction for the fuel building component types are:

- Aluminum
- Carbon Steel
- Concrete
- Elastomer

- Fire Barrier (Cementitious Coating)
- High Strength Low Alloy Steel (Bolting)
- Stainless Steel

Environment

The fuel building component types are exposed to the following environments:

- Atmosphere/ Weather (Structural)
- Buried (Structural)
- Concrete (Structural)
- Plant Indoor Air (Structural)
- Submerged (Structural)

Aging Effects Requiring Management

The following fuel building aging effects require management:

- Concrete cracking and spalling
- Cracking
- Cracking and distortion
- Cracking, loss of material
- Cracking; loss of bond; and loss of material (spalling, scaling)
- Increase in porosity and permeability; cracking; loss of material (spalling, scaling)
- Increase in porosity and permeability; loss of strength
- Increased hardness; shrinkage; loss of strength
- Loss of material
- Loss of material (spalling, scaling) and cracking
- Loss of preload
- Loss of sealing

Aging Management Programs

The following aging management programs manage the aging effects for the fuel building component types:

- Fire Protection (B2.1.13)
- Structures Monitoring (B2.1.31)
- Water Chemistry (B2.1.2)

3.5.2.1.11 Essential Service Water Structures

Materials

The materials of construction for the essential service water structures component types are:

- Carbon Steel
- Concrete
- Concrete Block (Masonry Walls)
- Earthfill (rip-rap, stone, soil)
- Elastomer
- Fiberglass Reinforced Plastic
- Stainless Steel

Environment

The essential service water structures component types are exposed to the following environments:

- Atmosphere/ Weather (Structural)
- Buried (Structural)
- Concrete (Structural)
- Plant Indoor Air (Structural)
- Submerged (Structural)

Aging Effects Requiring Management

The following essential service water structures aging effects require management:

- Concrete cracking and spalling
- Cracking
- Cracking and distortion
- Cracking, blistering, change in color
- Cracking, loss of material

- Cracking; loss of bond; and loss of material (spalling, scaling)
- Increase in porosity and permeability; cracking; loss of material (spalling, scaling)
- Increase in porosity and permeability; loss of strength
- Increased hardness; shrinkage; loss of strength
- Loss of material
- Loss of material (spalling, scaling) and cracking
- Loss of material; loss of form
- Loss of preload
- Loss of sealing

Aging Management Programs

The following aging management programs manage the aging effects for the essential service water structures component types:

- Fire Protection (B2.1.13)
- Masonry Walls (B2.1.30)
- RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.32)
- Structures Monitoring (B2.1.31)

3.5.2.1.12 Supports

Materials

The materials of construction for the supports component types are:

- Carbon Steel
- Concrete
- High Strength Low Alloy Steel (Bolting)
- Lubrite
- Stainless Steel

Environment

The supports component types are exposed to the following environments:

- Atmosphere/ Weather (Structural)
- Borated Water Leakage
- Plant Indoor Air (Structural)
- Submerged (Structural)

Aging Effects Requiring Management

The following supports aging effects require management:

- Cracking
- Loss of material
- Loss of mechanical function
- Loss of mechanical function and fatigue
- Loss of preload
- Reduction in concrete anchor capacity

Aging Management Programs

The following aging management programs manage the aging effects for the supports component types:

- ASME Section XI, Subsection IWF (B2.1.28)
- Boric Acid Corrosion (B2.1.4)
- RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.32)
- Structures Monitoring (B2.1.31)

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

NUREG-1801 provides the basis for identifying those programs that warrant further evaluation. For the containments, structures and component supports areas, those evaluations are addressed in the following sections.

3.5.2.2.1 PWR and BWR Containments

3.5.2.2.1.1 Cracking and Distortion due to Increased Stress Levels from Settlement; Reduction of Foundation Strength and Cracking Due to Differential Settlement and Erosion of Porous Concrete Subfoundations

Settlement:

FSAR Section 2.5.4.10.2 SA discusses predicted, measured, and allowable settlements for the structures at Callaway. Potential total and differential settlements have been addressed in the design of foundations at the site. A settlement monitoring program has been established to monitor settlements of the structures during plant construction and thereafter. Accessible concrete components are monitored by the Structures Monitoring program (B2.1.31) or the ASME Section XI, Subsection IWL program (B2.1.27) to confirm the absence of any visible effects due to settlement. No permanent dewatering systems are installed or planned at Callaway.

Porous Concrete Subfoundations:

Callaway does not have porous concrete subfoundations. Therefore, further evaluation for this aging effect is not required.

3.5.2.2.1.2 Reduction of Strength and Modulus due to Elevated Temperature

Elevated Temperatures:

High energy line penetrations have been designed to dissipate the heat from process pipes to limit the exposure of the concrete to temperatures below 150°F in general areas and below 200°F locally. All high energy containment penetrations are flued integrally-forged piped fittings. The main steam and main feedwater lines outside the containment have flued integrally-forged pipe fitting whip restraints. (See FSAR Table 3.6-2, B.1.b.(5) SP). Therefore, the aging effects due to elevated temperatures are not applicable, and a plant-specific aging management program is not required.

3.5.2.2.1.3 Loss of Material due to General, Pitting, and Crevice Corrosion

3.5.2.2.1.3.1 Loss of material due to general, pitting, and crevice corrosion in steel elements of inaccessible areas

General, Pitting and Crevice Corrosion:

The ASME Section XI, Subsection IWE program (B2.1.26) manages aging of the steel liner of the concrete containment building. The 10 CFR Part 50, Appendix J program (B2.1.29) manages loss of leak tightness, loss of sealing, and leakage through containment to assure that allowable leakage rate limits specified in the Technical Specifications are not exceeded. As required by 10 CFR 50.55a (b)(2)(ix)(A), an evaluation of the acceptability of the inaccessible areas is completed whenever conditions are detected in accessible areas that could indicate the presence of, or result in, degradation to such inaccessible areas.

Reinforced concrete structures at Callaway were designed, constructed, and inspected in accordance with ACI and ASTM standards, which provide for a good quality, dense, well-cured, and low permeability concrete. The mix proportions were established in accordance with ACI 301. The mix designs contain an air-entraining admixture capable of entraining three to six percent air in accordance with ASTM C260, and maximum water content was controlled by placing the concrete at specified slumps. (See FSAR Section 3.8.1.6.1 SP.) Procedural controls ensured quality throughout the batching, mixing, and placement processes. The ASME Section XI, Subsection IWE program (B2.1.26) manages aging of the moisture barrier at the interface between the liner and the concrete. The ASME Section XI, Subsection IWL program (B2.1.27) identifies and manages any cracks in the containment concrete that could potentially provide a pathway for water to reach inaccessible portions of the steel containment liner. Crack control was achieved through proper sizing, spacing, and distribution of reinforcing steel in accordance with ACI 318-71. (See FSAR Section 3.8.1.2.2 SP.) Procedural controls ensure that borated water spills are not common, and when detected are cleaned up in a timely manner. Therefore, a plant-specific aging management program to manage the effects of general, pitting and crevice corrosion is not required.

3.5.2.2.1.3.2 Loss of material due to general, pitting, and crevice corrosion in steel torus shell of Mark I containments

Not applicable. This aging effect is specific to BWRs and is not applicable to Callaway.

3.5.2.2.1.3.3 Loss of material due to general, pitting, and crevice corrosion in Mark I and Mark II containments

Not applicable. This aging effect is specific to BWRs and is not applicable to Callaway.

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

Loss of prestress forces due to relaxation, shrinkage, creep, and elevated temperature for PWR prestressed concrete containments is a TLAA. The Callaway containment is a prestressed concrete pressure vessel with ungrouted tendons. Section 4.5 describes the evaluation of this TLAA.

3.5.2.2.1.5 Cumulative Fatigue Damage

Callaway main steam line containment penetrations are supported by an elastic-plastic fatigue analysis. Section 4.6.1 describes the evaluation of this TLAA. Section 4.6.2 describes the evaluation of the fatigue waiver TLAAs for the equipment hatch and leak chase channels.

3.5.2.2.1.6 Cracking due to Stress Corrosion Cracking

Callaway does not have any stainless steel penetration bellows in scope as part of the containment pressure boundary. Stainless steel high energy pipes that penetrate the containment are connected to carbon steel penetration sleeves with dissimilar metal welds. Plant operating experience has not identified any stress corrosion cracking associated with these welds. The ASME Section XI, Subsection IWE program (B2.1.26) and the 10 CFR Part 50, Appendix J program (B2.1.29) manage the aging of these dissimilar metal welds. Visual examinations are augmented with additional examinations, as necessary, to detect cracking in these welds.

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

Freeze-Thaw:

At Callaway, temperatures over 100°F are rare but have occurred. In the summer, temperatures rise to 90°F or higher on the average of 35 days per year, while in the winter temperatures below 0°F are observed on the average of seven days per year. There are an average of 28 days per year when the daily maximum temperature is less than 32°F and 103 days when the daily minimum temperature is less than 32°F. (See FSAR Section 2.3.2.1.2.1 SA.) Reinforced concrete structures at Callaway were designed, constructed, and inspected in accordance with ACI and ASTM standards, which provide for a good quality, dense, well-cured, and low permeability concrete. The mix proportions were established in accordance with ACI 301. The mix designs contain an air-entraining admixture capable of entraining three to six percent air in accordance with ASTM C260, and maximum water content was controlled by placing the concrete at specified slumps. (See FSAR Section 3.8.1.6.1 SP.) Procedural controls ensured quality throughout the batching, mixing, and placement processes. FSAR Section 3.8 SP discusses the design requirements for each major structure. Plant operating experience has not identified any aging effects related to freeze-thaw in accessible areas and the Structures Monitoring program (B2.1.31) confirms the absence of aging effects by examining normally inaccessible structural components when scheduled maintenance work and planned plant modifications permit access. Therefore, aging effects due to freeze-thaw are not applicable, and a plant-specific aging management program is not required.

3.5.2.2.1.8 Cracking due to Expansion from Reaction with Aggregates

Reaction with Aggregates:

At Callaway, all aggregates conform to the Specification for Concrete Aggregate (ASTM C33). The potential reactivity of the aggregate is established in accordance with ASTM C289. A petrographic examination of the aggregate was performed in accordance with ASTM C295. (See FSAR Section 3.8.1.6.1.1 SP.) FSAR Section 3.8 SP discusses the design requirements for each major structure. Reinforced concrete structures at Callaway were designed, constructed, and inspected in accordance with applicable ACI and ASTM standards, which provide for a good quality, dense, well-cured, and low permeability concrete. Therefore, the aging effect of reaction with aggregates is not applicable, and a plant-specific aging management program is not required.

3.5.2.2.1.9 Increase in Porosity and Permeability due to Leaching of Calcium Hydroxide and Carbonation

Leaching of Calcium Hydroxide and Carbonation:

Reinforced concrete structures at Callaway were designed, constructed, and inspected in accordance with ACI and ASTM standards, which provide for a good quality, dense, well-cured, and low permeability concrete. Crack control was achieved through proper sizing, spacing, and distribution of reinforcing steel in accordance with ACI 318-71. (See FSAR Section 3.8.1.2.2 SP) Procedural controls ensured quality throughout the batching, mixing, and placement processes. Therefore, the aging effect of leaching of calcium hydroxide and carbonation is not applicable, and a plant-specific aging management program is not required.

3.5.2.2.2 Safety-Related and Other Structures and Component Supports

3.5.2.2.2.1 Aging Management of Inaccessible Areas

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

Freeze-Thaw:

At Callaway, temperatures over 100°F are rare but have occurred. In the summer, temperatures rise to 90°F or higher on the average of 35 days per year, while in the winter temperatures below 0°F are observed on the average of seven days per year. There are an average of 28 days per year when the daily maximum temperature is less than 32°F and 103 days when the daily minimum temperature is less than 32°F. (See FSAR Section 2.3.2.1.2.1 SA.) Reinforced concrete structures at Callaway were designed, constructed, and inspected in accordance with ACI and ASTM standards, which provide for a good quality, dense, well-cured, and low permeability concrete. The mix proportions were established in accordance with ACI 301. The mix designs contain an air-entraining admixture capable of entraining three to six percent air in accordance with ASTM C260, and maximum water content was controlled by placing the concrete at specified slumps. (See FSAR Section 3.8.1.6.1 SP.) Procedural controls ensured quality throughout the batching, mixing, and placement processes. FSAR Section 3.8 SP discusses the design requirements for each major structure. Plant operating experience has not identified any aging effects related to freeze-thaw in accessible areas, and the Structures Monitoring program (B2.1.31) confirms the absence of aging effects by examining normally inaccessible structural components when scheduled maintenance work and planned plant modifications permit access. Therefore, aging effects due to freeze-thaw are not applicable and a plant-specific aging management program is not required.

3.5.2.2.2.1.2 Cracking due to Expansion and Reaction with Aggregates

Reaction with Aggregates:

At Callaway, all aggregates conform to the Specification for Concrete Aggregate (ASTM C33). The potential reactivity of the aggregate is established in accordance with ASTM C289. A petrographic examination of the aggregate is performed in accordance with ASTM C295. (See FSAR Section 3.8.1.6.1.1 SP.) FSAR Section 3.8 SP discusses the design requirements for each major structure. Reinforced concrete structures at Callaway were designed, constructed, and inspected in accordance with applicable ACI and ASTM standards, which provide for a good quality, dense, well-cured, and low permeability concrete. Therefore, the aging effect of reaction with aggregates is not applicable, and a plant-specific aging management program is not required.

3.5.2.2.2.1.3 Settlement and settlement due to erosion of porous concrete subfoundations

Settlement:

FSAR Section 2.5.4.10.2 SA discusses predicted, measured, and allowable settlements for the structures at Callaway. Potential total and differential settlements have been addressed in the design of foundations at the site. A settlement monitoring program has been established to monitor settlements of the structures during plant construction and thereafter. Accessible concrete components will be monitored by the Structures Monitoring program (B2.1.31) or the ASME Section XI, Subsection IWL program (B2.1.27) to confirm the absence of any visible effects due to settlement. No permanent dewatering systems are installed or planned at Callaway.

Porous Concrete Subfoundations:

Callaway does not have porous concrete subfoundations. Therefore, further evaluation for this effect is not required.

3.5.2.2.2.1.4 Increase in porosity and permeability and loss of strength due to leaching of calcium hydroxide and carbonation

Leaching of Calcium Hydroxide and Carbonation:

Reinforced concrete structures at Callaway were designed, constructed, and inspected in accordance with ACI and ASTM standards, which provide for a good quality, dense, well-cured, and low permeability concrete. Crack control was achieved through proper sizing, spacing, and distribution of reinforcing steel in accordance with ACI 318-71. (See FSAR Section 3.8.1.2.2 SP.) Procedural controls ensured quality throughout the batching, mixing, and placement processes. Therefore, the aging effect of leaching of calcium hydroxide and carbonation is not applicable, and a plant-specific aging management program is not required.

3.5.2.2.2.2 Reduction of Strength and Modulus due to Elevated Temperature

During normal plant operation, a thermal loading is generated on the primary shield wall around the reactor cavity. An insulation and cooling system is provided on the inside face of the wall to reduce the severity of this loading by limiting the concrete temperatures to 150°F except for the area directly below the seal ring support which is limited to 300°F. (See FSAR Section 3.8.3.4.2 SP.) An engineering evaluation was performed to ensure that this elevated temperature would not be detrimental to the ability of the concrete to perform its intended functions. The reactor vessel supports are air cooled to maintain the supporting concrete temperature within acceptable levels. (See FSAR Section 5.4.14.2.1 SP.) High energy line penetrations have been designed to dissipate the heat from process pipes to limit the exposure of the concrete to temperatures below 150°F in general areas and below 200°F locally. All high energy containment penetrations are flued integrally-forged piped fittings. The main steam and main feedwater lines outside the containment have flued integrally-forged pipe fitting whip restraints. (See FSAR Table 3.6-2, B.1.b.(5) SP.) Therefore, the aging effects due to elevated temperatures are not applicable and a plant-specific aging management program is not required.

3.5.2.2.2.3 Aging Management of Inaccessible Areas for Group 6 Structures

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

<u>Freeze-Thaw:</u>

At Callaway, temperatures over 100°F are rare but have occurred. In the summer, temperatures rise to 90°F or higher on the average of 35 days per year, while in the winter temperatures below 0°F are observed on the average of seven days per year. There are an average of 28 days per year when the daily maximum temperature is less than 32°F and 103 days when the daily minimum temperature is less than 32°F. (See FSAR Section 2.3.2.1.2.1 SA.) Reinforced concrete structures at Callaway were designed, constructed, and inspected in accordance with ACI and ASTM standards, which provide for a good quality, dense, well-cured, and low permeability concrete. The mix proportions were established in accordance with ACI 301. The mix designs contain an air-entraining admixture capable of entraining three to six percent air in accordance with ASTM C260, and maximum water content was controlled by placing the concrete at specified slumps. (See FSAR Section 3.8.1.6.1 SP.) Procedural controls ensured quality throughout the batching, mixing, and placement processes. FSAR Section 3.8 SP discusses the design requirements for each major structure. Plant operating experience has not identified any aging effects related to freeze-thaw in accessible areas and the Structures Monitoring program (B2.1.31) confirms the absence of aging effects by examining normally inaccessible structural components when scheduled maintenance work and planned plant modifications permit access. Therefore, aging effects due to freeze-thaw are not applicable and a plant-specific aging management program is not required.

3.5.2.2.2.3.2 Cracking due to expansion and reaction with aggregates

Reaction with Aggregates:

At Callaway, all aggregates conform to the Specification for Concrete Aggregate (ASTM C33). The potential reactivity of the aggregate is established in accordance with ASTM C289. A petrographic examination of the aggregate is performed in accordance with ASTM C295. (See FSAR Section 3.8.1.6.1.1 SP.) FSAR Section 3.8 SP discusses the design requirements for each major structure. Reinforced concrete structures at Callaway were designed, constructed, and inspected in accordance with applicable ACI and ASTM standards, which provide for a good quality, dense, well-cured, and low permeability concrete. Therefore, the aging effect of reaction with aggregates is not applicable, and a plant-specific aging management program is not required.

3.5.2.2.2.3.3 Increase in porosity and permeability and loss of strength due to leaching of calcium hydroxide and carbonation (Group 6 Structure)

Leaching of Calcium Hydroxide and Carbonation:

Reinforced concrete structures at Callaway were designed, constructed, and inspected in accordance with ACI and ASTM standards, which provide for a good quality, dense, well-cured, and low permeability concrete. Crack control was achieved through proper sizing, spacing, and distribution of reinforcing steel in accordance with ACI 318-71. (See FSAR Section 3.8.1.2.2 SP.) Procedural controls ensured quality throughout the batching, mixing, and placement processes. Therefore, the aging effect of leaching of calcium hydroxide and carbonation is not applicable and a plant-specific aging management program is not required.

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

Not applicable. The in-scope tank liners at Callaway were evaluated as tanks with their mechanical systems and assigned NUREG-1801 lines from NUREG 1801, Chapters VII and VIII. Therefore, the NUREG-1801 lines from Chapter III were not used.

3.5.2.2.2.5 Cumulative Fatigue Damage due to Fatigue

Analyses of fatigue in component support members, anchor bolts, and welds for Group B1.1, B1.2, and B1.3 component supports (for ASME III Class 1, 2, and 3 piping and components, and for Class MC BWR containment supports) are TLAAs.

Callaway Class 1E electrical raceway included a fatigue evaluation of the effects of operating basis and safe shutdown earthquake loads. Section 4.3.7 describes the evaluation of this TLAA.

Callaway ASME Class 1 piping is designed to code editions and addenda before 1986, which therefore precede cycle limits for allowable stress in supports.

Callaway ASME Class 2 and 3 piping and components require no fatigue or cycle design analysis for their supports, and no other similar analysis exist for supports for those components at Callaway.

Callaway is a PWR and does not have Class MC BWR containment supports.

3.5.2.2.3 Quality Assurance for Aging Management of Nonsafety-Related Components

Quality Assurance Program and Administrative Controls are discussed in Section B1.3, *Quality Assurance Program and Administrative Controls*.

3.5.2.3 Time-Limited Aging Analyses

The time-limited aging analyses identified below are associated with the containments, structures, and component supports component types. The section within Chapter 4, *Time-Limited Aging Analyses* is indicated in parenthesis.

- Cumulative fatigue damage (Section 4.3, *Metal Fatigue* and Section 4.6, *Containment Liner Plate, Metal Containments, And Penetrations Fatigue Analyses*)
- Loss of prestress (Section 4.5, *Concrete Containment Tendon Prestress*)

3.5.3 Conclusions

The Containments, Structures and Component Supports component types that are subject to AMR have been evaluated. The aging management programs selected to manage the aging effects for the Containment, Structures and Component Supports component types are identified in the summary Tables and in Section 3.5.2.1.

A description of these aging management programs is provided in Appendix B, *Aging Management Programs*, along with a demonstration that the identified aging effects will be managed for the period of extended operation.

Therefore, based on the demonstration provided in Appendix B, *Aging Management Programs*, the effects of aging associated with the Containments, Structures and Component Supports component types will be adequately managed so that there is reasonable assurance that the intended functions will be maintained consistent with the current licensing basis during the period of extended operation.

Table 3.5-1 Summary of Aging Management Programs in Chapters II and III of NUREG-1801 for Containments, Structures, and Component Supports

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.5.1.001	Concrete: dome; wall; basemat; ring girders; buttresses, Concrete elements, all	Cracking and distortion due to increased stress levels from settlement	ASME Section XI, Subsection IWL (B2.1.27) or Structure Monitoring (B2.1.31). If a de-watering system is relied upon for control of settlement, then the licensee is to ensure proper functioning of the de-watering system through the period of extended operation.	Yes, if a de-watering system is relied upon to control settlement	Consistent with NUREG-1801. See further evaluation in Section 3.5.2.2.1.1.
3.5.1.002	Concrete: foundation; subfoundation	Reduction of foundation strength and cracking due to differential settlement and erosion of porous concrete subfoundation	Structures Monitoring (B2.1.31). If a de-watering system is relied upon for control of erosion, then the licensee is to ensure proper functioning of the de-watering system through the period of extended operation.	Yes, if a de-watering system is relied upon to control settlement	Not applicable. Callaway has no porous concrete foundations, so the applicable NUREG-1801 lines were not used. See further evaluation in Section 3.5.2.2.1.1.
3.5.1.003	Concrete: dome; wall; basemat; ring girders; buttresses, Concrete: containment; wall; basemat, Concrete: basemat, concrete fill-in annulus	Reduction of strength and modulus due to elevated temperature (>150°F general; >200°F local)	A plant-specific aging management program is to be evaluated.	Yes, if temperature limits are exceeded	Not applicable. These component types are not susceptible to this aging effect at Callaway, so the applicable NUREG-1801 lines were not used. See further evaluation in Section 3.5.2.2.1.2.

Table 3.5-1 Summary of Aging Management Programs in Chapters II and III of NUREG-1801 for Containments, Structures, and Component Supports (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.5.1.004					Not applicable - BWR only
3.5.1.005	Steel elements (inaccessible areas): liner; liner anchors; integral attachments, Steel elements (inaccessible areas): suppression chamber; drywell; drywell head; embedded shell; region shielded by diaphragm floor (as applicable)	Loss of material due to general, pitting, and crevice corrosion	ASME Section XI, Subsection IWE (B2.1.26) and 10 CFR Part 50, Appendix J (B2.1.29)	Yes, if corrosion is indicated from the IWE examinations	Consistent with NUREG-1801. See further evaluation in Section 3.5.2.2.1.3.1.
3.5.1.006					Not applicable - BWR only
3.5.1.007					Not applicable - BWR only
3.5.1.008	Prestressing system: tendons	Loss of prestress due to relaxation; shrinkage; creep; elevated temperature	Yes, TLAA	Yes, TLAA	Loss of prestress of tendons is a TLAA. See further evaluation in Section 3.5.2.2.1.4.

Table 3.5-1 Summary of Aging Management Programs in Chapters II and III of NUREG-1801 for Containments, Structures, and Component Supports (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.5.1.009	Penetration sleeves; penetration bellows, Steel elements: torus; vent line; vent header; vent line bellows; downcomers, Suppression pool shell; unbraced downcomers, Steel elements: vent header; downcomers	Cumulative fatigue damage due to fatigue (Only if CLB fatigue analysis exists)	Yes, TLAA	Yes, TLAA	Fatigue of metal components is a TLAA. See further evaluation in Section 3.5.2.2.1.5.
3.5.1.010	Penetration sleeves; penetration bellows	Cracking due to stress corrosion cracking	ASME Section XI, Subsection IWE (B2.1.26) and 10 CFR Part 50, Appendix J (B2.1.29)	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. See further evaluation in Section 3.5.2.2.1.6.
3.5.1.011	Concrete (inaccessible areas): dome; wall; basemat; ring girders; buttresses, Concrete (inaccessible areas): basemat, Concrete (inaccessible areas): dome; wall; basemat	Loss of material (spalling, scaling) and cracking due to freeze-thaw	Further evaluation is needed for plants that are located in moderate to severe weathering conditions (weathering index >100 day-inch/yr) (NUREG-1557).	Yes, for plants located in moderate to severe weathering conditions	Not applicable. These component types are not susceptible to this aging effect at Callaway, so the applicable NUREG-1801 lines were not used. See further evaluation in Section 3.5.2.2.1.7.

Table 3.5-1 Summary of Aging Management Programs in Chapters II and III of NUREG-1801 for Containments, Structures, and Component Supports (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.5.1.012	Concrete (inaccessible areas): dome; wall; basemat; ring girders; buttresses, Concrete (inaccessible areas): basemat, Concrete (inaccessible areas): containment; wall; basemat, Concrete (inaccessible areas): basemat, concrete fill-in annulus	Cracking due to expansion from reaction with aggregates	Further evaluation is required to determine if a plant-specific aging management program is needed.	Yes, if concrete is not constructed as stated function	Not applicable. These component types are not susceptible to this aging effect at Callaway, so the applicable NUREG-1801 lines were not used. See further evaluation in Section 3.5.2.2.1.8.
3.5.1.013	Concrete (inaccessible areas): basemat, Concrete (inaccessible areas): dome; wall; basemat	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	Further evaluation is required to determine if a plant-specific aging management program is needed.	Yes, if leaching is observed in accessible areas that impact intended function	Not applicable. Callaway is a PWR with a concrete containment. This NUREG-1801 line is applicable only for steel containments or BWRs. See further evaluation in Section 3.5.2.2.1.9.

Table 3.5-1 Summary of Aging Management Programs in Chapters II and III of NUREG-1801 for Containments, Structures, and Component Supports (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.5.1.014	Concrete (inaccessible areas): dome; wall; basemat; ring girders; buttresses, Concrete (inaccessible areas): containment; wall; basemat	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	Further evaluation is required to determine if a plant-specific aging management program is needed.	Yes, if leaching is observed in accessible areas that impact intended function	Not applicable. These component types are not susceptible to this aging effect at Callaway, so the applicable NUREG-1801 lines were not used. See further evaluation in Section 3.5.2.2.1.9.
3.5.1.015	Concrete (accessible areas): basemat	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	ASME Section XI, Subsection IWL (B2.1.27)	No	Not applicable. Callaway is a PWR with a concrete containment. These NUREG-1801 lines are applicable only for steel containments or BWRs.
3.5.1.016	Concrete (accessible areas): basemat, Concrete: containment; wall; basemat	Increase in porosity and permeability; cracking; loss of material (spalling, scaling) due to aggressive chemical attack	ASME Section XI, Subsection IWL (B2.1.27), or Structures Monitoring (B2.1.31)	No	Not applicable. Callaway is a PWR with a concrete containment. This NUREG-1801 line is applicable only for steel containments or BWRs.
3.5.1.017	Concrete (accessible areas): dome; wall; basemat; ring girders; buttresses	Increase in porosity and permeability; cracking; loss of material (spalling, scaling) due to aggressive chemical attack	ASME Section XI, Subsection IWL (B2.1.27)	No	Consistent with NUREG-1801.

Table 3.5-1 Summary of Aging Management Programs in Chapters II and III of NUREG-1801 for Containments, Structures, and Component Supports (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.5.1.018	Concrete (accessible areas): dome; wall; basemat; ring girders; buttresses, Concrete (accessible areas): basemat	Loss of material (spalling, scaling) and cracking due to freeze-thaw	ASME Section XI, Subsection IWL (B2.1.27)	No	Consistent with NUREG-1801.
3.5.1.019	Concrete (accessible areas): dome; wall; basemat; ring girders; buttresses, Concrete (accessible areas): basemat, Concrete (accessible areas): containment; wall; basemat, Concrete (accessible areas): basemat, concrete fill-in annulus	Cracking due to expansion from reaction with aggregates	ASME Section XI, Subsection IWL (B2.1.27)	No	Consistent with NUREG-1801.

Table 3.5-1 Summary of Aging Management Programs in Chapters II and III of NUREG-1801 for Containments, Structures, and Component Supports (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.5.1.020	Concrete (accessible areas): dome; wall; basemat; ring girders; buttresses, Concrete (accessible areas): containment; wall; basemat	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	ASME Section XI, Subsection IWL (B2.1.27)	No	Consistent with NUREG-1801.
3.5.1.021	Concrete (accessible areas): dome; wall; basemat; ring girders; buttresses; reinforcing steel, Concrete (accessible areas): basemat; reinforcing steel, Concrete (accessible areas): dome; wall; basemat; reinforcing steel	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	ASME Section XI, Subsection IWL (B2.1.27)	No	Consistent with NUREG-1801.
3.5.1.022					Not applicable - BWR only

Table 3.5-1 Summary of Aging Management Programs in Chapters II and III of NUREG-1801 for Containments, Structures, and Component Supports (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.5.1.023	Concrete (inaccessible areas): basemat; reinforcing steel, Concrete (inaccessible areas): dome; wall; basemat; reinforcing steel	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	ASME Section XI, Subsection IWL (B2.1.27) or Structures Monitoring (B2.1.31)	No	Not applicable. Callaway is a PWR with a concrete containment. This NUREG-1801 line is applicable only for steel containments or BWRs.
3.5.1.024	Concrete (inaccessible areas): dome; wall; basemat; ring girders; buttresses, Concrete (inaccessible areas): basemat, Concrete (accessible areas): dome; wall; basemat	Increase in porosity and permeability; cracking; loss of material (spalling, scaling) due to aggressive chemical attack	ASME Section XI, Subsection IWL (B2.1.27) or Structures Monitoring (B2.1.31)	No	Consistent with NUREG-1801.
3.5.1.025	Concrete (inaccessible areas): dome; wall; basemat; ring girders; buttresses; reinforcing steel	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	ASME Section XI, Subsection IWL (B2.1.27) or Structures Monitoring (B2.1.31)	No	Not applicable. Callaway has no inaccessible concrete dome, wall, basemat, ring girders, buttresses, or reinforcing steel exposed to an environment of air-indoor or air-outdoor, so the applicable NUREG-1801 lines were not used.

Table 3.5-1 Summary of Aging Management Programs in Chapters II and III of NUREG-1801 for Containments, Structures, and Component Supports (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.5.1.026	Moisture barriers (caulking, flashing, and other sealants)	Loss of sealing due to wear, damage, erosion, tear, surface cracks, or other defects	ASME Section XI, Subsection IWE (B2.1.26)	No	Consistent with NUREG-1801.
3.5.1.027	Penetration sleeves; penetration bellows, Steel elements: torus; vent line; vent header; vent line bellows; downcomers, Suppression pool shell	Cracking due to cyclic loading (CLB fatigue analysis does not exist)	ASME Section XI, Subsection IWE (B2.1.26) and 10 CFR Part 50, Appendix J (B2.1.29)	No	Not applicable. Fatigue of metal components is a TLAA, evaluated in accordance with 10 CFR 54.21(c), so the applicable NUREG-1801 lines were not used. See further evaluation in Section 3.5.2.2.1.5.
3.5.1.028	Personnel airlock, equipment hatch, CRD hatch	Loss of material due to general, pitting, and crevice corrosion	ASME Section XI, Subsection IWE (B2.1.26) and 10 CFR Part 50, Appendix J (B2.1.29)	No	Consistent with NUREG-1801.
3.5.1.029	Personnel airlock, equipment hatch, CRD hatch: locks, hinges, and closure mechanisms	Loss of leak tightness due to mechanical wear of locks, hinges and closure mechanisms	ASME Section XI, Subsection IWE (B2.1.26) and 10 CFR Part 50, Appendix J (B2.1.29)	No	Consistent with NUREG-1801.
3.5.1.030	Pressure-retaining bolting	Loss of preload due to self-loosening	ASME Section XI, Subsection IWE (B2.1.26) and 10 CFR Part 50, Appendix J (B2.1.29)	No	Consistent with NUREG-1801.

Table 3.5-1 Summary of Aging Management Programs in Chapters II and III of NUREG-1801 for Containments, Structures, and Component Supports (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.5.1.031	Pressure-retaining bolting, Steel elements: downcomer pipes	Loss of material due to general, pitting, and crevice corrosion	ASME Section XI, Subsection IWE (B2.1.26)	No	Consistent with NUREG-1801.
3.5.1.032	Prestressing system: tendons; anchorage components	Loss of material due to corrosion	ASME Section XI, Subsection IWL (B2.1.27)	No	Consistent with NUREG-1801.
3.5.1.033	Seals and gaskets	Loss of sealing due to wear, damage, erosion, tear, surface cracks, or other defects	10 CFR Part 50, Appendix J (B2.1.29)	No	Consistent with NUREG-1801.
3.5.1.034	Service Level I coatings	Loss of coating integrity due to blistering, cracking, flaking, peeling, or physical damage	Protective Coating Monitoring and Maintenance (B2.1.33)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Protective Coating Monitoring and Maintenance (B2.1.33)

Table 3.5-1 Summary of Aging Management Programs in Chapters II and III of NUREG-1801 for Containments, Structures, and Component Supports (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.5.1.035	Steel elements (accessible areas): liner; liner anchors; integral attachments, Penetration sleeves, Steel elements (accessible areas): drywell shell; drywell head; drywell shell in sand pocket regions;, Steel elements (accessible areas): suppression chamber; drywell; drywell head; embedded shell; region shielded by diaphragm floor (as applicable), Steel elements (accessible areas): drywell shell; drywell head	Loss of material due to general, pitting, and crevice corrosion	ASME Section XI, Subsection IWE (B2.1.26) and 10 CFR Part 50, Appendix J (B2.1.29)	No	Consistent with NUREG-1801.
3.5.1.036					Not applicable - BWR only

Table 3.5-1 Summary of Aging Management Programs in Chapters II and III of NUREG-1801 for Containments, Structures, and Component Supports (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.5.1.037					Not applicable - BWR only
3.5.1.038					Not applicable - BWR only
3.5.1.039					Not applicable - BWR only
3.5.1.040					Not applicable - BWR only
3.5.1.041					Not applicable - BWR only
3.5.1.042	Groups 1-3, 5, 7-9:Concrete (inaccessible areas): foundation	Loss of material (spalling, scaling) and cracking due to freeze-thaw	Further evaluation is required for plants that are located in moderate to severe weathering conditions (weathering index >100 day-inch/yr) (NUREG-1557)	Yes, for plants located in moderate to severe weathering conditions	Not applicable. Callaway has no inaccessible concrete foundation exposed to an environment of air-outdoor, so the applicable NUREG-1801 lines were not used. See further evaluation in Section 3.5.2.2.2.1.1.
3.5.1.043	All Groups except Group 6:Concrete (inaccessible areas): all	Cracking due to expansion from reaction with aggregates	Further evaluation is required to determine if a plant-specific aging management program is needed.	Yes, if concrete is not constructed as stated	Not applicable. These component types are not susceptible to this aging effect at Callaway, so the applicable NUREG-1801 lines were not used. See further evaluation in Section 3.5.2.2.2.1.2.

Table 3.5-1 Summary of Aging Management Programs in Chapters II and III of NUREG-1801 for Containments, Structures, and Component Supports (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.5.1.044	All Groups: concrete: all	Cracking and distortion due to increased stress levels from settlement	Structures Monitoring (B2.1.31). If a de-watering system is relied upon for control of settlement, then the licensee is to ensure proper functioning of the de-watering system through the period of extended operation.	Yes, if a de-watering system is relied upon to control settlement	Consistent with NUREG-1801. See further evaluation in Section 3.5.2.2.2.1.3.
3.5.1.045					Not applicable - BWR only
3.5.1.046	Groups 1-3, 5-9: concrete: foundation; subfoundation	Reduction of foundation strength and cracking due to differential settlement and erosion of porous concrete subfoundation	Structures Monitoring (B2.1.31). If a de-watering system is relied upon for control of settlement, then the licensee is to ensure proper functioning of the de-watering system through the period of extended operation.	Yes, if a de-watering system is relied upon to control settlement	Not applicable. Callaway has no porous concrete foundations, so the applicable NUREG-1801 lines were not used. See further evaluation in Section 3.5.2.2.2.1.3.
3.5.1.047	Groups 1-5, 7-9: concrete (inaccessible areas): exterior above- and below-grade; foundation	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	Further evaluation is required to determine if a plant-specific aging management program is needed.	Yes, if leaching is observed in accessible areas that impact intended function	Not applicable. These component types are not susceptible to this aging effect at Callaway, so the applicable NUREG-1801 lines were not used. See further evaluation in Section 3.5.2.2.2.1.4.

Table 3.5-1 Summary of Aging Management Programs in Chapters II and III of NUREG-1801 for Containments, Structures, and Component Supports (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.5.1.048	Groups 1-5: concrete: all	Reduction of strength and modulus due to elevated temperature (>150°F general; >200°F local)	A plant-specific aging management program is to be evaluated.	Yes, if temperature limits are exceeded	Not applicable. These component types are not susceptible to this aging effect at Callaway, so the applicable NUREG-1801 lines were not used. See further evaluation in Section 3.5.2.2.2.2.
3.5.1.049	Groups 6 - concrete (inaccessible areas): exterior above- and below-grade; foundation; interior slab	Loss of material (spalling, scaling) and cracking due to freeze-thaw	Further evaluation is required for plants that are located in moderate to severe weathering conditions (weathering index >100 day-inch/yr) (NUREG-1557)	Yes, for plants located in moderate to severe weathering conditions	Not applicable. Callaway has no inaccessible concrete exterior above- and below-grade, foundation, or interior slab exposed to an environment of air-outdoor, so the applicable NUREG-1801 lines were not used. See further evaluation in Section 3.5.2.2.2.3.1.
3.5.1.050	Groups 6: concrete (inaccessible areas): all	Cracking due to expansion from reaction with aggregates	Further evaluation is required to determine if a plant-specific aging management program is needed.	Yes, if concrete is not constructed as stated	Not applicable. These component types are not susceptible to this aging effect at Callaway, so the applicable NUREG-1801 lines were not used. See further evaluation in Section 3.5.2.2.2.3.2.

Table 3.5-1 Summary of Aging Management Programs in Chapters II and III of NUREG-1801 for Containments, Structures, and Component Supports (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.5.1.051	Groups 6: concrete (inaccessible areas): exterior above- and below-grade; foundation; interior slab	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	Further evaluation is required to determine if a plant-specific aging management program is needed.	Yes, if leaching is observed in accessible areas that impact intended function	Not applicable. These component types are not susceptible to this aging effect at Callaway, so the applicable NUREG-1801 lines were not used. See further evaluation in Section 3.5.2.2.2.3.3.
3.5.1.052	Groups 7, 8 - steel components: tank liner	Cracking due to stress corrosion cracking; Loss of material due to pitting and crevice corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant-specific	Not applicable. The in-scope tank liners at Callaway were evaluated as tanks with their mechanical systems and assigned NUREG-1801 lines from Chapters VII and VIII. Therefore, the NUREG-1801 lines from Chapter III were not used for tank liners See further evaluation in Section 3.5.2.2.2.4.
3.5.1.053	Support members; welds; bolted connections; support anchorage to building structure	Cumulative fatigue damage due to fatigue (Only if CLB fatigue analysis exists)	Yes, TLAA	Yes, TLAA	Fatigue of support members is a TLAA. See further evaluation in Section 3.5.2.2.2.5.
3.5.1.054	All groups except 6: concrete (accessible areas): all	Cracking due to expansion from reaction with aggregates	Structures Monitoring (B2.1.31)	No	Consistent with NUREG-1801.

Table 3.5-1 Summary of Aging Management Programs in Chapters II and III of NUREG-1801 for Containments, Structures, and Component Supports (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.5.1.055	Building concrete at locations of expansion and grouted anchors; grout pads for support base plates	Reduction in concrete anchor capacity due to local concrete degradation/ service-induced cracking or other concrete aging mechanisms	Structures Monitoring (B2.1.31)	No	Consistent with NUREG-1801.
3.5.1.056	Concrete: exterior above- and below-grade; foundation; interior slab	Loss of material due to abrasion; cavitation	Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.32) or the FERC/US Army Corp of Engineers dam inspections and maintenance programs.	No	Consistent with NUREG-1801.
3.5.1.057	Constant and variable load spring hangers; guides; stops	Loss of mechanical function due to corrosion, distortion, dirt, overload, fatigue due to vibratory and cyclic thermal loads	ASME Section XI, Subsection IWF (B2.1.28)	No	Consistent with NUREG-1801.
3.5.1.058	Earthen water-control structures: dams; embankments; reservoirs; channels; canals and ponds	Loss of material; loss of form due to erosion, settlement, sedimentation, frost action, waves, currents, surface runoff, seepage	Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.32) or the FERC/US Army Corp of Engineers dam inspections and maintenance programs.	No	Consistent with NUREG-1801.

Table 3.5-1 Summary of Aging Management Programs in Chapters II and III of NUREG-1801 for Containments, Structures, and Component Supports (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.5.1.059	Group 6: concrete (accessible areas): all	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.32) or the FERC/US Army Corp of Engineers dam inspections and maintenance programs.	No	Consistent with NUREG-1801.
3.5.1.060	Group 6: concrete (accessible areas): exterior above- and below-grade; foundation	Loss of material (spalling, scaling) and cracking due to freeze-thaw	Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.32) or the FERC/US Army Corp of Engineers dam inspections and maintenance programs.	No	Consistent with NUREG-1801.
3.5.1.061	Group 6: concrete (accessible areas): exterior above- and below-grade; foundation; interior slab	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.32) or the FERC/US Army Corp of Engineers dam inspections and maintenance programs.	No	Consistent with NUREG-1801.

Table 3.5-1 Summary of Aging Management Programs in Chapters II and III of NUREG-1801 for Containments, Structures, and Component Supports (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.5.1.062	Group 6: Wooden Piles; sheeting	Loss of material; change in material properties due to weathering, chemical degradation, and insect infestation repeated wetting and drying, fungal decay	Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.32) or the FERC/US Army Corp of Engineers dam inspections and maintenance programs.	No	Not applicable. Callaway has no in-scope wood components, so the applicable NUREG-1801 lines were not used.
3.5.1.063	Groups 1-3, 5, 7-9: concrete (accessible areas): exterior above- and below-grade; foundation	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	Structures Monitoring (B2.1.31)	No	Consistent with NUREG-1801.
3.5.1.064	Groups 1-3, 5, 7-9: concrete (accessible areas): exterior above- and below-grade; foundation	Loss of material (spalling, scaling) and cracking due to freeze-thaw	Structures Monitoring (B2.1.31)	No	Consistent with NUREG-1801.

Table 3.5-1 Summary of Aging Management Programs in Chapters II and III of NUREG-1801 for Containments, Structures, and Component Supports (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.5.1.065	Groups 1-3, 5, 7-9: concrete (inaccessible areas): below-grade exterior; foundation, Groups 1-3, 5, 7-9: concrete (accessible areas): below-grade exterior; foundation, Groups 6: concrete (inaccessible areas): all	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	Structures Monitoring (B2.1.31)	No	Consistent with NUREG-1801.
3.5.1.066	Groups 1-5, 7, 9: concrete (accessible areas): interior and above-grade exterior	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	Structures Monitoring (B2.1.31)	No	Consistent with NUREG-1801.
3.5.1.067	Groups 1-5, 7, 9: Concrete: interior; above-grade exterior, Groups 1-3, 5, 7-9 - concrete (inaccessible areas): below-grade exterior; foundation, Group 6: concrete (inaccessible areas): all	Increase in porosity and permeability; cracking; loss of material (spalling, scaling) due to aggressive chemical attack	Structures Monitoring (B2.1.31)	No	Consistent with NUREG-1801.

Table 3.5-1 Summary of Aging Management Programs in Chapters II and III of NUREG-1801 for Containments, Structures, and Component Supports (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.5.1.068	High-strength structural bolting	Cracking due to stress corrosion cracking	ASME Section XI, Subsection IWF (B2.1.28)	No	Consistent with NUREG-1801.
3.5.1.069	High-strength structural bolting	Cracking due to stress corrosion cracking	Structures Monitoring (B2.1.31). Note: ASTM A 325, F 1852 and ASTM A 490 bolts used in civil structures have not shown to be prone to SCC. SCC potential need not be evaluated for these bolts.	No	Consistent with NUREG-1801.
3.5.1.070	Masonry walls: all	Cracking due to restraint shrinkage, creep, and aggressive environment	Masonry Walls (B2.1.30)	No	Consistent with NUREG 1801 for inspections performed under the Masonry Wall Program. NUREG-1801 does not provide a line in which Concrete Masonry is inspected per the Fire Protection program. Therefore, for CMU walls that provide a fire barrier function, the Fire Protection program has been added.
3.5.1.071	Masonry walls: all	Loss of material (spalling, scaling) and cracking due to freeze-thaw	Masonry Walls (B2.1.30)	No	Not applicable. Callaway has no in-scope masonry walls in a Group 5 structure, so the applicable NUREG-1801 lines were not used.

Table 3.5-1 Summary of Aging Management Programs in Chapters II and III of NUREG-1801 for Containments, Structures, and Component Supports (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.5.1.072	Seals; gasket; moisture barriers (caulking, flashing, and other sealants)	Loss of sealing due to deterioration of seals, gaskets, and moisture barriers (caulking, flashing, and other sealants)	Structures Monitoring (B2.1.31)	No	Consistent with NUREG-1801.
3.5.1.073	Service Level I coatings	Loss of coating integrity due to blistering, cracking, flaking, peeling, physical damage	Protective Coating Monitoring and Maintenance (B2.1.33)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Protective Coating Monitoring and Maintenance (B2.1.33)
3.5.1.074	Sliding support bearings; sliding support surfaces	Loss of mechanical function due to corrosion, distortion, dirt, debris, overload, wear	Structures Monitoring (B2.1.31)	No	Consistent with NUREG-1801.
3.5.1.075	Sliding surfaces	Loss of mechanical function due to corrosion, distortion, dirt, debris, overload, wear	ASME Section XI, Subsection IWF (B2.1.28)	No	Consistent with NUREG-1801.
3.5.1.076	Sliding surfaces: radial beam seats in BWR drywell	Loss of mechanical function due to corrosion, distortion, dirt, overload, wear	Structures Monitoring (B2.1.31)	No	Not applicable - BWR only

Table 3.5-1 Summary of Aging Management Programs in Chapters II and III of NUREG-1801 for Containments, Structures, and Component Supports (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.5.1.077	Steel components: all structural steel	Loss of material due to corrosion	Structures Monitoring (B2.1.31). If protective coatings are relied upon to manage the effects of aging, the structures monitoring program is to include provisions to address protective coating monitoring and maintenance.	No	Consistent with NUREG-1801.
3.5.1.078	Steel components: fuel pool liner	Cracking due to stress corrosion cracking; Loss of material due to pitting and crevice corrosion	Water Chemistry (B2.1.2) and Monitoring of the spent fuel pool water level in accordance with technical specifications and leakage from the leak chase channels.	No, unless leakages have been detected through the SFP liner that cannot be accounted for from the leak chase channels	Consistent with NUREG-1801.
3.5.1.079	Steel components: piles	Loss of material due to corrosion	Structures Monitoring (B2.1.31)	No	Not applicable. Callaway has no in-scope piles, so the applicable NUREG-1801 lines were not used.

Table 3.5-1 Summary of Aging Management Programs in Chapters II and III of NUREG-1801 for Containments, Structures, and Component Supports (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.5.1.080	Structural bolting	Loss of material due to general, pitting and crevice corrosion	Structures Monitoring (B2.1.31)	No	Consistent with NUREG-1801 for inspections performed under the Structures Monitoring program. NUREG-1801 does not provide a line in which Bolting (Structural) is inspected per the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems program. Therefore, for structural bolting associated with overhead load handling systems, the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems program (B2.1.12) is credited.
3.5.1.081	Structural bolting	Loss of material due to general, pitting, and crevice corrosion	ASME Section XI, Subsection IWF (B2.1.28)	No	Consistent with NUREG-1801.
3.5.1.082	Structural bolting	Loss of material due to general, pitting, and crevice corrosion	Structures Monitoring (B2.1.31)	No	Consistent with NUREG-1801.

Table 3.5-1 Summary of Aging Management Programs in Chapters II and III of NUREG-1801 for Containments, Structures, and Component Supports (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.5.1.083	Structural bolting	Loss of material due to general, pitting, and crevice corrosion	Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.32) or the FERC/US Army Corp of Engineers dam inspections and maintenance programs.	No	Consistent with NUREG-1801 for components that are evaluated under Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.32). For components that are evaluated under the Structures Monitoring program (B2.1.31), consistent with NUREG-1801 for material, environment, and aging effect, but a different aging management program is credited.
3.5.1.084	Structural bolting	Loss of material due to pitting and crevice corrosion	Water Chemistry (B2.1.2) and ASME Section XI, Subsection IWF (B2.1.28)	No	Not applicable - BWR only
3.5.1.085	Structural bolting	Loss of material due to pitting and crevice corrosion	Water Chemistry (B2.1.2), for BWR water and ASME Section XI, Subsection IWF (B2.1.28)	No	Not applicable. Callaway has no in-scope ASME Class 1, 2, or 3 stainless steel structural bolting in treated water, so the applicable NUREG-1801 lines were not used.
3.5.1.086	Structural bolting	Loss of material due to pitting and crevice corrosion	ASME Section XI, Subsection IWF (B2.1.28)	No	Consistent with NUREG-1801.

Table 3.5-1 Summary of Aging Management Programs in Chapters II and III of NUREG-1801 for Containments, Structures, and Component Supports (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.5.1.087	Structural bolting	Loss of preload due to self-loosening	ASME Section XI, Subsection IWF (B2.1.28)	No	Consistent with NUREG-1801.
3.5.1.088	Structural bolting	Loss of preload due to self-loosening	Structures Monitoring (B2.1.31)	No	Consistent with NUREG-1801 for inspections performed under the Structures Monitoring program. NUREG-1801 does not provide a line in which Bolting (Structural) is inspected per the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems program. Therefore, for structural bolting associated with overhead load handling systems, the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems program (B2.1.12) is credited.
3.5.1.089	Support members; welds; bolted connections; support anchorage to building structure	Loss of material due to boric acid corrosion	Boric Acid Corrosion (B2.1.4)	No	Consistent with NUREG-1801.
3.5.1.090					Not applicable - BWR only

Table 3.5-1 Summary of Aging Management Programs in Chapters II and III of NUREG-1801 for Containments, Structures, and Component Supports (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.5.1.091	Support members; welds; bolted connections; support anchorage to building structure	Loss of material due to general and pitting corrosion	ASME Section XI, Subsection IWF (B2.1.28)	No	Consistent with NUREG-1801.
3.5.1.092	Support members; welds; bolted connections; support anchorage to building structure	Loss of material due to general and pitting corrosion	Structures Monitoring (B2.1.31)	No	Consistent with NUREG-1801.
3.5.1.093	Support members; welds; bolted connections; support anchorage to building structure	Loss of material due to pitting and crevice corrosion	Structures Monitoring (B2.1.31)	No	Consistent with NUREG-1801, except for the Class 2 and 3 components. For these, consistent for material, environment, and aging effect, but a different aging management program was used. Class 2 and 3 components are evaluated under ASME Section XI, Subsection IWF (B2.1.28). For other components, Structures Monitoring program (B2.1.31) is credited, which is consistent with NUREG-1801.

Table 3.5-1 Summary of Aging Management Programs in Chapters II and III of NUREG-1801 for Containments, Structures, and Component Supports (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.5.1.094	Vibration isolation elements	Reduction or loss of isolation function due to radiation hardening, temperature, humidity, sustained vibratory loading	ASME Section XI, Subsection IWF (B2.1.28)	No	Not applicable. Callaway has no in-scope vibration isolation elements, so the applicable NUREG-1801 lines were not used.
3.5.1.095	Aluminum, galvanized steel and stainless steel Support members; welds; bolted connections; support anchorage to building structure exposed to Air – indoor, uncontrolled	None	None	NA - No AEM or AMP	Consistent with NUREG-1801.

Table 3.5.2-1 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation - Reactor Building

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Barrier	MB, SH	Concrete	Atmosphere/ Weather (Structural) (Ext)	Loss of material (spalling, scaling) and cracking	Structures Monitoring (B2.1.31)	III.A7.TP-23	3.5.1.064	A
Barrier	MB, SH	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking	Structures Monitoring (B2.1.31)	III.A7.TP-25	3.5.1.054	A
Barrier	MB, SH	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking; loss of bond; and loss of material (spalling, scaling)	Structures Monitoring (B2.1.31)	III.A7.TP-26	3.5.1.066	A
Barrier	MB, SH	Concrete	Atmosphere/ Weather (Structural) (Ext)	Increase in porosity and permeability; cracking; loss of material (spalling, scaling)	Structures Monitoring (B2.1.31)	III.A7.TP-28	3.5.1.067	A
Bolting (Pressure-retaining)	SPB, SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	ASME Section XI, Subsection IWE (B2.1.26)	II.A3.CP-148	3.5.1.031	A
Bolting (Pressure-retaining)	SPB, SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of preload	ASME Section XI, Subsection IWE (B2.1.26) and 10 CFR Part 50, Appendix J (B2.1.29)	II.A3.CP-150	3.5.1.030	A
Bolting (Structural)	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A1.TP-248	3.5.1.080	A

Table 3.5.2-1 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation - Reactor Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Bolting (Structural)	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of preload	Structures Monitoring (B2.1.31)	III.A1.TP-261	3.5.1.088	A
Caulking and Sealant	FLB, SH	Elastomer	Plant Indoor Air (Structural) (Ext)	Loss of sealing	ASME Section XI, Subsection IWE (B2.1.26)	II.A3.CP-40	3.5.1.026	A
Coatings	MCI	Coatings	Plant Indoor Air (Structural) (Ext)	Loss of coating integrity	Protective Coating Monitoring and Maintenance (B2.1.33)	II.A3.CP-152	3.5.1.034	B
Coatings	MCI	Coatings	Plant Indoor Air (Structural) (Ext)	Loss of coating integrity	Protective Coating Monitoring and Maintenance (B2.1.33)	III.A4.TP-301	3.5.1.073	B
Compressible Joints and Seals	ES, SH, SPB	Elastomer	Plant Indoor Air (Structural) (Ext)	Loss of sealing	10 CFR Part 50, Appendix J (B2.1.29)	II.A3.CP-41	3.5.1.033	A
Concrete Elements	FB, MB, SH, SLD, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Loss of material (spalling, scaling) and cracking	ASME Section XI, Subsection IWL (B2.1.27)	II.A1.CP-31	3.5.1.018	A
Concrete Elements	FB, MB, SH, SLD, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Increase in porosity and permeability; loss of strength	ASME Section XI, Subsection IWL (B2.1.27)	II.A1.CP-32	3.5.1.020	A

Table 3.5.2-1 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation - Reactor Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Concrete Elements	FB, MB, SH, SLD, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking	ASME Section XI, Subsection IWL (B2.1.27)	II.A1.CP-33	3.5.1.019	A
Concrete Elements	FB, MB, SH, SLD, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking; loss of bond; and loss of material (spalling, scaling)	ASME Section XI, Subsection IWL (B2.1.27)	II.A1.CP-68	3.5.1.021	A
Concrete Elements	FB, MB, SH, SLD, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Increase in porosity and permeability; cracking; loss of material (spalling, scaling)	ASME Section XI, Subsection IWL (B2.1.27)	II.A1.CP-87	3.5.1.017	A
Concrete Elements	FB, MB, SH, SLD, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking, loss of material	Fire Protection (B2.1.13) and Structures Monitoring (B2.1.31)	VII.G.A-92	3.3.1.061	A
Concrete Elements	FB, MB, SH, SLD, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Fire Protection (B2.1.13) and Structures Monitoring (B2.1.31)	VII.G.A-93	3.3.1.062	A

Table 3.5.2-1 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation - Reactor Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Concrete Elements	FLB, SH, SLD, SPB, SS	Concrete	Buried (Structural) (Ext)	Increase in porosity and permeability; cracking; loss of material (spalling, scaling)	Structures Monitoring (B2.1.31)	II.A1.CP-100	3.5.1.024	A
Concrete Elements	FLB, SH, SLD, SPB, SS	Concrete	Buried (Structural) (Ext)	Cracking and distortion	Structures Monitoring (B2.1.31)	II.A1.CP-101	3.5.1.001	A
Concrete Elements	SH, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking	ASME Section XI, Subsection IWL (B2.1.27)	II.A1.CP-33	3.5.1.019	A
Concrete Elements	SH, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking; loss of bond; and loss of material (spalling, scaling)	ASME Section XI, Subsection IWL (B2.1.27)	II.A1.CP-68	3.5.1.021	A
Concrete Elements	SH, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Increase in porosity and permeability; cracking; loss of material (spalling, scaling)	ASME Section XI, Subsection IWL (B2.1.27)	II.A1.CP-87	3.5.1.017	A
Concrete Elements	FB, MB, SH, SLD, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking	Structures Monitoring (B2.1.31)	III.A4.TP-25	3.5.1.054	A

Table 3.5.2-1 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation - Reactor Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Concrete Elements	FB, MB, SH, SLD, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking; loss of bond; and loss of material (spalling, scaling)	Structures Monitoring (B2.1.31)	III.A4.TP-26	3.5.1.066	A
Concrete Elements	FB, MB, SH, SLD, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Increase in porosity and permeability; cracking; loss of material (spalling, scaling)	Structures Monitoring (B2.1.31)	III.A4.TP-28	3.5.1.067	A
Concrete Elements	FB, MB, SH, SLD, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Concrete cracking and spalling	Fire Protection (B2.1.13) and Structures Monitoring (B2.1.31)	VII.G.A-90	3.3.1.060	A
Concrete Elements	FB, MB, SH, SLD, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Loss of material	Fire Protection (B2.1.13) and Structures Monitoring (B2.1.31)	VII.G.A-91	3.3.1.062	A
Debris Barrier	FIL, SH	Stainless Steel	Plant Indoor Air (Structural) (Ext)	None	None	VII.J.AP-17	3.3.1.120	C
Fire Barrier Coatings/ Wraps	FB	Fire Barrier (Cementitious Coating)	Plant Indoor Air (Structural) (Ext)	Cracking, loss of material	Fire Protection (B2.1.13)	None	None	J, 1

Table 3.5.2-1 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation - Reactor Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Fire Barrier Doors	FB, MB, SH	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A1.TP-302	3.5.1.077	A
Fire Barrier Doors	FB, MB, SH	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Fire Protection (B2.1.13)	VII.G.A-21	3.3.1.059	A
Gate	SH, SPB	Stainless Steel	Plant Indoor Air (Structural) (Ext)	None	None	VII.J.AP-17	3.3.1.120	C
Gate	SH, SPB	Stainless Steel	Submerged (Structural) (Ext)	Cracking, loss of material	Water Chemistry (B2.1.2) and Monitoring of the Spent Fuel Pool Water Level	III.A5.T-14	3.5.1.078	C
Hatch Emergency Airlock	FB, SH, SLD, SPB, SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	ASME Section XI, Subsection IWE (B2.1.26) and 10 CFR Part 50, Appendix J (B2.1.29)	II.A3.C-16	3.5.1.028	A
Hatch Emergency Airlock	FB, SH, SLD, SPB, SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of leak tightness	ASME Section XI, Subsection IWE (B2.1.26) and 10 CFR Part 50, Appendix J (B2.1.29)	II.A3.CP-39	3.5.1.029	A

Table 3.5.2-1 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation - Reactor Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Hatch Equipment	SH, SLD, SPB, SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	ASME Section XI, Subsection IWE (B2.1.26) and 10 CFR Part 50, Appendix J (B2.1.29)	II.A3.C-16	3.5.1.028	A
Hatch Equipment	SH, SLD, SPB, SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of leak tightness	ASME Section XI, Subsection IWE (B2.1.26) and 10 CFR Part 50, Appendix J (B2.1.29)	II.A3.CP-39	3.5.1.029	A
Hatch Personnel Airlock	FB, SH, SLD, SPB, SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	ASME Section XI, Subsection IWE (B2.1.26) and 10 CFR Part 50, Appendix J (B2.1.29)	II.A3.C-16	3.5.1.028	A
Hatch Personnel Airlock	FB, SH, SLD, SPB, SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of leak tightness	ASME Section XI, Subsection IWE (B2.1.26) and 10 CFR Part 50, Appendix J (B2.1.29)	II.A3.CP-39	3.5.1.029	A
Hatches and Plugs	MB, SH	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking	Structures Monitoring (B2.1.31)	III.A7.TP-25	3.5.1.054	A
Hatches and Plugs	MB, SH	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking; loss of bond; and loss of material (spalling, scaling)	Structures Monitoring (B2.1.31)	III.A7.TP-26	3.5.1.066	A

Table 3.5.2-1 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation - Reactor Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Hatches and Plugs	MB, SH	Concrete	Plant Indoor Air (Structural) (Ext)	Increase in porosity and permeability; cracking; loss of material (spalling, scaling)	Structures Monitoring (B2.1.31)	III.A7.TP-28	3.5.1.067	A
High Strength Bolting	SS	High Strength Low Alloy Steel (Bolting)	Plant Indoor Air (Structural) (Ext)	Loss of preload	Structures Monitoring (B2.1.31)	III.A1.TP-261	3.5.1.088	A
High Strength Bolting	SS	High Strength Low Alloy Steel (Bolting)	Plant Indoor Air (Structural) (Ext)	Cracking	Structures Monitoring (B2.1.31)	III.A1.TP-300	3.5.1.069	A
Liner Containment	SH, SPB	Carbon Steel	Concrete (Structural) (Ext)	None	None	VII.J.AP-282	3.3.1.112	C
Liner Containment	SH, SPB	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	ASME Section XI, Subsection IWE (B2.1.26) and 10 CFR Part 50, Appendix J (B2.1.29)	II.A1.CP-35	3.5.1.035	A
Liner Containment	SH, SPB	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	ASME Section XI, Subsection IWE (B2.1.26) and 10 CFR Part 50, Appendix J (B2.1.29)	II.A1.CP-98	3.5.1.005	A

Table 3.5.2-1 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation - Reactor Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Liner Refueling	SH	Stainless Steel	Concrete (Structural) (Ext)	None	None	VII.J.AP-19	3.3.1.120	C
Liner Refueling	SH	Stainless Steel	Plant Indoor Air (Structural) (Ext)	None	None	VII.J.AP-17	3.3.1.120	C
Liner Refueling	SH	Stainless Steel	Submerged (Structural) (Ext)	Cracking, loss of material	Water Chemistry (B2.1.2) and Monitoring of the Spent Fuel Pool Water Level	III.A5.T-14	3.5.1.078	A
Liner Sumps	SH, SPB	Stainless Steel	Plant Indoor Air (Structural) (Ext)	None	None	VII.J.AP-17	3.3.1.120	C
Penetration	SH, SLD, SPB, SS	Carbon Steel	Plant Indoor Air (Ext)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	II.A3.C-13	3.5.1.009	A
Penetration	SH, SLD, SPB, SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	ASME Section XI, Subsection IWE (B2.1.26) and 10 CFR Part 50, Appendix J (B2.1.29)	II.A3.CP-36	3.5.1.035	A
Penetration	SH, SLD, SPB, SS	Stainless Steel	Plant Indoor Air (Ext)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	II.A3.C-13	3.5.1.009	A

Table 3.5.2-1 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation - Reactor Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Penetration	SH, SLD, SPB, SS	Stainless Steel	Plant Indoor Air (Structural) (Ext)	None	None	VII.J.AP-17	3.3.1.120	C
Penetration - Electrical	SH, SPB, SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	ASME Section XI, Subsection IWE (B2.1.26) and 10 CFR Part 50, Appendix J (B2.1.29)	II.A3.CP-36	3.5.1.035	A
Penetrations Mechanical	SH, SLD, SPB, SS	Stainless Steel; Dissimilar Metal Welds	Plant Indoor Air (Structural) (Ext)	Cracking	ASME Section XI, Subsection IWE (B2.1.26) and 10 CFR Part 50, Appendix J (B2.1.29)	II.A3.CP-38	3.5.1.010	A
Pipe Whip Restraints and Jet Shields	HLBS, MB, PWR, SS	Stainless Steel	Plant Indoor Air (Structural) (Ext)	None	None	VII.J.AP-17	3.3.1.120	C
Stairs, Platforms and Grates	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A4.TP-302	3.5.1.077	A
Structural Steel	SS	Carbon Steel	Concrete (Ext)	None	None	VII.J.AP-282	3.3.1.112	C
Structural Steel	SS	Carbon Steel	Concrete (Structural) (Ext)	None	None	VII.J.AP-282	3.3.1.112	C

Table 3.5.2-1 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation - Reactor Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Structural Steel	SH, SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A4.TP-302	3.5.1.077	A
Tendons	SS	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	ASME Section XI, Subsection IWL (B2.1.27)	II.A1.C-10	3.5.1.032	A
Tendons	SS	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of prestress	Time-Limited Aging Analysis evaluated for the period of extended operation	II.A1.C-11	3.5.1.008	A
Tendons	SS	Carbon Steel	Concrete (Structural) (Ext)	None	None	VII.J.AP-282	3.3.1.112	C
Tendons	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	ASME Section XI, Subsection IWL (B2.1.27)	II.A1.C-10	3.5.1.032	A

Notes for Table 3.5.2-1:

Standard Notes:

A	Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.
B	Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.
C	Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.
J	Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant Specific Notes:

1	NUREG-1801 does not provide a line in which fire barriers (ceramic fiber or cementitious coating) are inspected per the Fire Protection program (B2.1.13).

Table 3.5.2-2 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation - Control Building

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Bolting (Structural)	SS	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of preload	Structures Monitoring (B2.1.31)	III.A1.TP-261	3.5.1.088	A
Bolting (Structural)	SS	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A1.TP-274	3.5.1.082	A
Bolting (Structural)	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A1.TP-248	3.5.1.080	A
Bolting (Structural)	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of preload	Structures Monitoring (B2.1.31)	III.A1.TP-261	3.5.1.088	A
Caulking and Sealant	FLB, SH	Elastomer	Atmosphere/ Weather (Structural) (Ext)	Loss of sealing	Structures Monitoring (B2.1.31)	III.A6.TP-7	3.5.1.072	A
Caulking and Sealant	FLB, SH	Elastomer	Buried (Structural) (Ext)	Loss of sealing	Structures Monitoring (B2.1.31)	III.A6.TP-7	3.5.1.072	A
Caulking and Sealant	FLB, SH	Elastomer	Plant Indoor Air (Structural) (Ext)	Loss of sealing	Structures Monitoring (B2.1.31)	III.A6.TP-7	3.5.1.072	A
Compressible Joints and Seals	ES, FLB, SH	Elastomer	Atmosphere/ Weather (Structural) (Ext)	Loss of sealing	Structures Monitoring (B2.1.31)	III.A6.TP-7	3.5.1.072	A
Compressible Joints and Seals	ES, FLB, SH	Elastomer	Buried (Structural) (Ext)	Loss of sealing	Structures Monitoring (B2.1.31)	III.A6.TP-7	3.5.1.072	A
Compressible Joints and Seals	ES, FLB, SH	Elastomer	Plant Indoor Air (Structural) (Ext)	Loss of sealing	Structures Monitoring (B2.1.31)	III.A6.TP-7	3.5.1.072	A

Table 3.5.2-2 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation - Control Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Concrete Block (Masonry Walls)	FB, SH, SS	Concrete Block (Masonry Walls)	Plant Indoor Air (Structural) (Ext)	Cracking	Fire Protection (B2.1.13) and Masonry Walls (B2.1.30)	III.A1.T-12	3.5.1.070	E, 1
Concrete Elements	FB, MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Loss of material (spalling, scaling) and cracking	Structures Monitoring (B2.1.31)	III.A1.TP-23	3.5.1.064	A
Concrete Elements	FB, MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Increase in porosity and permeability; loss of strength	Structures Monitoring (B2.1.31)	III.A1.TP-24	3.5.1.063	A
Concrete Elements	FB, MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking	Structures Monitoring (B2.1.31)	III.A1.TP-25	3.5.1.054	A
Concrete Elements	FB, MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking; loss of bond; and loss of material (spalling, scaling)	Structures Monitoring (B2.1.31)	III.A1.TP-26	3.5.1.066	A
Concrete Elements	FB, MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Increase in porosity and permeability; cracking; loss of material (spalling, scaling)	Structures Monitoring (B2.1.31)	III.A1.TP-28	3.5.1.067	A

Table 3.5.2-2 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation - Control Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Concrete Elements	FB, MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking, loss of material	Fire Protection (B2.1.13) and Structures Monitoring (B2.1.31)	VII.G.A-92	3.3.1.061	A
Concrete Elements	FB, MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Fire Protection (B2.1.13) and Structures Monitoring (B2.1.31)	VII.G.A-93	3.3.1.062	A
Concrete Elements	SH, SS	Concrete	Buried (Structural) (Ext)	Increase in porosity and permeability; cracking; loss of material (spalling, scaling)	Structures Monitoring (B2.1.31)	III.A1.TP-29	3.5.1.067	A
Concrete Elements	SH, SS	Concrete	Buried (Structural) (Ext)	Cracking and distortion	Structures Monitoring (B2.1.31)	III.A1.TP-30	3.5.1.044	A
Concrete Elements	SH, SS	Concrete	Buried (Structural) (Ext)	Cracking; loss of bond; and loss of material (spalling, scaling)	Structures Monitoring (B2.1.31)	III.A1.TP-212	3.5.1.065	A
Concrete Elements	FB, FLB, MB, SH, SPB, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Increase in porosity and permeability; loss of strength	Structures Monitoring (B2.1.31)	III.A1.TP-24	3.5.1.063	A

Table 3.5.2-2 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation - Control Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Concrete Elements	FB, FLB, MB, SH, SPB, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking	Structures Monitoring (B2.1.31)	III.A1.TP-25	3.5.1.054	A
Concrete Elements	FB, FLB, MB, SH, SPB, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking; loss of bond; and loss of material (spalling, scaling)	Structures Monitoring (B2.1.31)	III.A1.TP-26	3.5.1.066	A
Concrete Elements	FB, FLB, MB, SH, SPB, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Increase in porosity and permeability; cracking; loss of material (spalling, scaling)	Structures Monitoring (B2.1.31)	III.A1.TP-28	3.5.1.067	A
Concrete Elements	FB, FLB, MB, SH, SPB, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking and distortion	Structures Monitoring (B2.1.31)	III.A1.TP-30	3.5.1.044	A
Concrete Elements	FB, FLB, MB, SH, SPB, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Concrete cracking and spalling	Fire Protection (B2.1.13) and Structures Monitoring (B2.1.31)	VII.G.A-90	3.3.1.060	A
Concrete Elements	FB, FLB, MB, SH, SPB, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Loss of material	Fire Protection (B2.1.13) and Structures Monitoring (B2.1.31)	VII.G.A-91	3.3.1.062	A

Table 3.5.2-2 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation - Control Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Door	MB, SH, SPB	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A1.TP-302	3.5.1.077	A
Door	MB, SH, SLD, SPB	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A1.TP-302	3.5.1.077	A
Fire Barrier Coatings/ Wraps	FB	Fire Barrier (Cementitious Coating)	Plant Indoor Air (Structural) (Ext)	Cracking, loss of material	Fire Protection (B2.1.13)	None	None	J, 2
Fire Barrier Coatings/ Wraps	FB	Fire Barrier (Ceramic Fiber)	Plant Indoor Air (Structural) (Ext)	Cracking, loss of material	Fire Protection (B2.1.13)	None	None	J, 2
Fire Barrier Doors	FB, MB, SH, SLD, SPB	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A1.TP-302	3.5.1.077	A
Fire Barrier Doors	FB, MB, SH, SLD, SPB	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Fire Protection (B2.1.13)	VII.G.A-21	3.3.1.059	A
Fire Barrier Seals	FB	Elastomer	Atmosphere/ Weather (Structural) (Ext)	Loss of sealing	Structures Monitoring (B2.1.31)	III.A6.TP-7	3.5.1.072	A
Fire Barrier Seals	FB	Elastomer	Atmosphere/ Weather (Structural) (Ext)	Increased hardness; shrinkage; loss of strength	Fire Protection (B2.1.13)	VII.G.A-20	3.3.1.057	A
Fire Barrier Seals	FB	Elastomer	Plant Indoor Air (Structural) (Ext)	Loss of sealing	Structures Monitoring (B2.1.31)	III.A6.TP-7	3.5.1.072	A

Table 3.5.2-2 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation - Control Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Fire Barrier Seals	FB	Elastomer	Plant Indoor Air (Structural) (Ext)	Increased hardness; shrinkage; loss of strength	Fire Protection (B2.1.13)	VII.G.A-19	3.3.1.057	A
High Strength Bolting	SS	High Strength Low Alloy Steel (Bolting)	Plant Indoor Air (Structural) (Ext)	Loss of preload	Structures Monitoring (B2.1.31)	III.A1.TP-261	3.5.1.088	A
High Strength Bolting	SS	High Strength Low Alloy Steel (Bolting)	Plant Indoor Air (Structural) (Ext)	Cracking	Structures Monitoring (B2.1.31)	III.A1.TP-300	3.5.1.069	A
Penetrations Electrical	SS	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A1.TP-302	3.5.1.077	A
Penetrations Electrical	SS	Carbon Steel	Concrete (Structural) (Ext)	None	None	VII.J.AP-282	3.3.1.112	C
Penetrations Electrical	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A1.TP-302	3.5.1.077	A
Penetrations Mechanical	SS	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A1.TP-302	3.5.1.077	A
Penetrations Mechanical	SS	Carbon Steel	Concrete (Structural) (Ext)	None	None	VII.J.AP-282	3.3.1.112	C
Penetrations Mechanical	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A1.TP-302	3.5.1.077	A

Table 3.5.2-2 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation - Control Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Roofing Membrane	FLB, SH	Elastomer	Atmosphere/ Weather (Structural) (Ext)	Loss of sealing	Structures Monitoring (B2.1.31)	III.A6.TP-7	3.5.1.072	A
Stairs, Platforms and Grates	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A1.TP-302	3.5.1.077	A
Structural Steel	MB, SH, SS	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A1.TP-302	3.5.1.077	A
Structural Steel	SS	Carbon Steel	Concrete (Structural) (Ext)	None	None	VII.J.AP-282	3.3.1.112	C
Structural Steel	SH, SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A1.TP-302	3.5.1.077	A

Notes for Table 3.5.2-2:

Standard Notes:

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

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

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

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

Plant Specific Notes:

1 NUREG-1801 does not provide a line in which concrete masonry is inspected per the Fire Protection program (B2.1.13).

2 NUREG-1801 does not provide a line in which fire barriers (ceramic fiber or cementitious coating) are inspected per the Fire Protection program (B2.1.13).

Table 3.5.2-3 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Auxiliary Building

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Bolting (Structural)	SS	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of preload	Structures Monitoring (B2.1.31)	III.A3.TP-261	3.5.1.088	A
Bolting (Structural)	SS	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-274	3.5.1.082	A
Bolting (Structural)	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-248	3.5.1.080	A
Bolting (Structural)	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of preload	Structures Monitoring (B2.1.31)	III.A3.TP-261	3.5.1.088	A
Caulking and Sealant	SH	Elastomer	Atmosphere/ Weather (Structural) (Ext)	Loss of sealing	Structures Monitoring (B2.1.31)	III.A6.TP-7	3.5.1.072	A
Caulking and Sealant	FLB, SH	Elastomer	Buried (Structural) (Ext)	Loss of sealing	Structures Monitoring (B2.1.31)	III.A6.TP-7	3.5.1.072	A
Caulking and Sealant	FLB, SH	Elastomer	Plant Indoor Air (Structural) (Ext)	Loss of sealing	Structures Monitoring (B2.1.31)	III.A6.TP-7	3.5.1.072	A
Compressible Joints and Seals	ES, SH	Elastomer	Atmosphere/ Weather (Structural) (Ext)	Loss of sealing	Structures Monitoring (B2.1.31)	III.A6.TP-7	3.5.1.072	A
Compressible Joints and Seals	ES, SH	Elastomer	Plant Indoor Air (Structural) (Ext)	Loss of sealing	Structures Monitoring (B2.1.31)	III.A6.TP-7	3.5.1.072	A

Table 3.5.2-3 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Auxiliary Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Concrete Block (Masonry Walls)	FB, SH, SS	Concrete Block (Masonry Walls)	Plant Indoor Air (Structural) (Ext)	Cracking	Fire Protection (B2.1.13) and Masonry Walls (B2.1.30)	III.A3.T-12	3.5.1.070	E, 1
Concrete Elements	FB, FLB, MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Loss of material (spalling, scaling) and cracking	Structures Monitoring (B2.1.31)	III.A3.TP-23	3.5.1.064	A
Concrete Elements	FB, FLB, MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Increase in porosity and permeability; loss of strength	Structures Monitoring (B2.1.31)	III.A3.TP-24	3.5.1.063	A
Concrete Elements	FB, FLB, MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking	Structures Monitoring (B2.1.31)	III.A3.TP-25	3.5.1.054	A
Concrete Elements	FB, FLB, MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking; loss of bond; and loss of material (spalling, scaling)	Structures Monitoring (B2.1.31)	III.A3.TP-26	3.5.1.066	A
Concrete Elements	FB, FLB, MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Increase in porosity and permeability; cracking; loss of material (spalling, scaling)	Structures Monitoring (B2.1.31)	III.A3.TP-28	3.5.1.067	A

Table 3.5.2-3 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Auxiliary Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Concrete Elements	FB, FLB, MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking, loss of material	Fire Protection (B2.1.13) and Structures Monitoring (B2.1.31)	VII.G.A-92	3.3.1.061	A
Concrete Elements	FB, FLB, MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Fire Protection (B2.1.13) and Structures Monitoring (B2.1.31)	VII.G.A-93	3.3.1.062	A
Concrete Elements	FLB, SH, SS	Concrete	Buried (Structural) (Ext)	Increase in porosity and permeability; cracking; loss of material (spalling, scaling)	Structures Monitoring (B2.1.31)	III.A3.TP-29	3.5.1.067	A
Concrete Elements	FLB, SH, SS	Concrete	Buried (Structural) (Ext)	Cracking and distortion	Structures Monitoring (B2.1.31)	III.A3.TP-30	3.5.1.044	A
Concrete Elements	FLB, SH, SS	Concrete	Buried (Structural) (Ext)	Cracking; loss of bond; and loss of material (spalling, scaling)	Structures Monitoring (B2.1.31)	III.A3.TP-212	3.5.1.065	A
Concrete Elements	FB, FLB, HLBS, SH, SPB, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Increase in porosity and permeability; loss of strength	Structures Monitoring (B2.1.31)	III.A3.TP-24	3.5.1.063	A

Table 3.5.2-3 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Auxiliary Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Concrete Elements	FB, FLB, HLBS, SH, SPB, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking	Structures Monitoring (B2.1.31)	III.A3.TP-25	3.5.1.054	A
Concrete Elements	FB, FLB, HLBS, SH, SPB, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking; loss of bond; and loss of material (spalling, scaling)	Structures Monitoring (B2.1.31)	III.A3.TP-26	3.5.1.066	A
Concrete Elements	FB, FLB, HLBS, SH, SPB, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Increase in porosity and permeability; cracking; loss of material (spalling, scaling)	Structures Monitoring (B2.1.31)	III.A3.TP-28	3.5.1.067	A
Concrete Elements	FB, FLB, HLBS, SH, SPB, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking and distortion	Structures Monitoring (B2.1.31)	III.A3.TP-30	3.5.1.044	A
Concrete Elements	FB, FLB, HLBS, SH, SPB, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Concrete cracking and spalling	Fire Protection (B2.1.13) and Structures Monitoring (B2.1.31)	VII.G.A-90	3.3.1.060	A
Concrete Elements	FB, FLB, HLBS, SH, SPB, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Loss of material	Fire Protection (B2.1.13) and Structures Monitoring (B2.1.31)	VII.G.A-91	3.3.1.062	A

Table 3.5.2-3 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Auxiliary Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Door	HLBS, MB, SH, SPB	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-302	3.5.1.077	A
Door	FLB, HLBS, MB, SH, SPB	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-302	3.5.1.077	A
Fire Barrier Coatings/ Wraps	FB	Fire Barrier (Cementitious Coating)	Plant Indoor Air (Structural) (Ext)	Cracking, loss of material	Fire Protection (B2.1.13)	None	None	J, 2
Fire Barrier Doors	FB, FLB, HLBS, MB, SH, SPB	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-302	3.5.1.077	A
Fire Barrier Doors	FB, FLB, HLBS, MB, SH, SPB	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Fire Protection (B2.1.13)	VII.G.A-22	3.3.1.059	A
Fire Barrier Doors	FB, FLB, HLBS, MB, SH, SPB	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-302	3.5.1.077	A
Fire Barrier Doors	FB, FLB, HLBS, MB, SH, SPB	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Fire Protection (B2.1.13)	VII.G.A-21	3.3.1.059	A

Table 3.5.2-3 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Auxiliary Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Fire Barrier Seals	FB	Elastomer	Atmosphere/ Weather (Structural) (Ext)	Loss of sealing	Structures Monitoring (B2.1.31)	III.A6.TP-7	3.5.1.072	A
Fire Barrier Seals	FB	Elastomer	Atmosphere/ Weather (Structural) (Ext)	Increased hardness; shrinkage; loss of strength	Fire Protection (B2.1.13)	VII.G.A-20	3.3.1.057	A
Fire Barrier Seals	FB	Elastomer	Plant Indoor Air (Structural) (Ext)	Loss of sealing	Structures Monitoring (B2.1.31)	III.A6.TP-7	3.5.1.072	A
Fire Barrier Seals	FB	Elastomer	Plant Indoor Air (Structural) (Ext)	Increased hardness; shrinkage; loss of strength	Fire Protection (B2.1.13)	VII.G.A-19	3.3.1.057	A
Hatch	FB, HLBS, MB, SH	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-302	3.5.1.077	A
Hatch	FB, HLBS, MB, SH	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Fire Protection (B2.1.13)	VII.G.A-22	3.3.1.059	C
Hatch	FB, HLBS, MB, SH	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-302	3.5.1.077	A
Hatch	FB, HLBS, MB, SH	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Fire Protection (B2.1.13)	VII.G.A-21	3.3.1.059	C

Table 3.5.2-3 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Auxiliary Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Hatches and Plugs	FB, HLBS, MB, SH	Concrete	Atmosphere/ Weather (Structural) (Ext)	Loss of material (spalling, scaling) and cracking	Structures Monitoring (B2.1.31)	III.A3.TP-23	3.5.1.064	A
Hatches and Plugs	FB, HLBS, MB, SH	Concrete	Atmosphere/ Weather (Structural) (Ext)	Increase in porosity and permeability; loss of strength	Structures Monitoring (B2.1.31)	III.A3.TP-24	3.5.1.063	A
Hatches and Plugs	FB, HLBS, MB, SH	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking	Structures Monitoring (B2.1.31)	III.A3.TP-25	3.5.1.054	A
Hatches and Plugs	FB, HLBS, MB, SH	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking; loss of bond; and loss of material (spalling, scaling)	Structures Monitoring (B2.1.31)	III.A3.TP-26	3.5.1.066	A
Hatches and Plugs	FB, HLBS, MB, SH	Concrete	Atmosphere/ Weather (Structural) (Ext)	Increase in porosity and permeability; cracking; loss of material (spalling, scaling)	Structures Monitoring (B2.1.31)	III.A3.TP-28	3.5.1.067	A
Hatches and Plugs	FB, HLBS, MB, SH	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking, loss of material	Fire Protection (B2.1.13) and Structures Monitoring (B2.1.31)	VII.G.A-92	3.3.1.061	A

Table 3.5.2-3 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Auxiliary Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Hatches and Plugs	FB, HLBS, MB, SH	Concrete	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Fire Protection (B2.1.13) and Structures Monitoring (B2.1.31)	VII.G.A-93	3.3.1.062	A
Hatches and Plugs	FB, HLBS, MB, SH, SLD	Concrete	Plant Indoor Air (Structural) (Ext)	Increase in porosity and permeability; loss of strength	Structures Monitoring (B2.1.31)	III.A3.TP-24	3.5.1.063	A
Hatches and Plugs	FB, HLBS, MB, SH, SLD	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking	Structures Monitoring (B2.1.31)	III.A3.TP-25	3.5.1.054	A
Hatches and Plugs	FB, HLBS, MB, SH, SLD	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking; loss of bond; and loss of material (spalling, scaling)	Structures Monitoring (B2.1.31)	III.A3.TP-26	3.5.1.066	A
Hatches and Plugs	FB, HLBS, MB, SH, SLD	Concrete	Plant Indoor Air (Structural) (Ext)	Increase in porosity and permeability; cracking; loss of material (spalling, scaling)	Structures Monitoring (B2.1.31)	III.A3.TP-28	3.5.1.067	A
Hatches and Plugs	FB, HLBS, MB, SH, SLD	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking and distortion	Structures Monitoring (B2.1.31)	III.A3.TP-30	3.5.1.044	A

Table 3.5.2-3 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Auxiliary Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Hatches and Plugs	FB, HLBS, MB, SH, SLD	Concrete	Plant Indoor Air (Structural) (Ext)	Concrete cracking and spalling	Fire Protection (B2.1.13) and Structures Monitoring (B2.1.31)	VII.G.A-90	3.3.1.060	A
Hatches and Plugs	FB, HLBS, MB, SH, SLD	Concrete	Plant Indoor Air (Structural) (Ext)	Loss of material	Fire Protection (B2.1.13) and Structures Monitoring (B2.1.31)	VII.G.A-91	3.3.1.062	A
High Strength Bolting	SS	High Strength Low Alloy Steel (Bolting)	Plant Indoor Air (Structural) (Ext)	Loss of preload	Structures Monitoring (B2.1.31)	III.A3.TP-261	3.5.1.088	A
High Strength Bolting	SS	High Strength Low Alloy Steel (Bolting)	Plant Indoor Air (Structural) (Ext)	Cracking	Structures Monitoring (B2.1.31)	III.A3.TP-300	3.5.1.069	A
Metal Siding	SH	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-302	3.5.1.077	A
Penetrations Electrical	SS	Carbon Steel	Concrete (Structural) (Ext)	None	None	VII.J.AP-282	3.3.1.112	C
Penetrations Electrical	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-302	3.5.1.077	A
Penetrations Mechanical	SS	Carbon Steel	Concrete (Structural) (Ext)	None	None	VII.J.AP-282	3.3.1.112	C
Penetrations Mechanical	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-302	3.5.1.077	A

Table 3.5.2-3 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Auxiliary Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Roofing Membrane	FLB, SH	Elastomer	Atmosphere/ Weather (Structural) (Ext)	Loss of sealing	Structures Monitoring (B2.1.31)	III.A6.TP-7	3.5.1.072	A
Stairs, Platforms and Grates	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-302	3.5.1.077	A
Structural Steel	SH, SS	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-302	3.5.1.077	A
Structural Steel	SS	Carbon Steel	Concrete (Structural) (Ext)	None	None	VII.J.AP-282	3.3.1.112	C
Structural Steel	SH, SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-302	3.5.1.077	A

Notes for Table 3.5.2-3:

Standard Notes:

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

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

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

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

Plant Specific Notes:

1 NUREG-1801 does not provide a line in which concrete masonry is inspected per the Fire Protection program (B2.1.13).

2 NUREG-1801 does not provide a line in which fire barriers (ceramic fiber or cementitious coating) are inspected per the Fire Protection program (B2.1.13).

Table 3.5.2-4 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Turbine Building

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Bolting (Structural)	SS	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of preload	Structures Monitoring (B2.1.31)	III.A3.TP-261	3.5.1.088	A
Bolting (Structural)	SS	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-274	3.5.1.082	A
Bolting (Structural)	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-248	3.5.1.080	A
Bolting (Structural)	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of preload	Structures Monitoring (B2.1.31)	III.A3.TP-261	3.5.1.088	A
Caulking and Sealant	FLB, SH	Elastomer	Atmosphere/ Weather (Structural) (Ext)	Loss of sealing	Structures Monitoring (B2.1.31)	III.A6.TP-7	3.5.1.072	A
Caulking and Sealant	FLB, SH	Elastomer	Plant Indoor Air (Structural) (Ext)	Loss of sealing	Structures Monitoring (B2.1.31)	III.A6.TP-7	3.5.1.072	A
Compressible Joints and Seals	ES, SH	Elastomer	Buried (Structural) (Ext)	Loss of sealing	Structures Monitoring (B2.1.31)	III.A6.TP-7	3.5.1.072	A

Table 3.5.2-4 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Turbine Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Compressible Joints and Seals	ES, SH	Elastomer	Plant Indoor Air (Structural) (Ext)	Loss of sealing	Structures Monitoring (B2.1.31)	III.A6.TP-7	3.5.1.072	A
Concrete Block (Masonry Walls)	FB, SH, SS	Concrete Block (Masonry Walls)	Atmosphere/ Weather (Structural) (Ext)	Cracking	Fire Protection (B2.1.13) and Masonry Walls (B2.1.30)	III.A3.T-12	3.5.1.070	E, 1
Concrete Block (Masonry Walls)	FB, FLB, SH, SS	Concrete Block (Masonry Walls)	Plant Indoor Air (Structural) (Ext)	Cracking	Fire Protection (B2.1.13) and Masonry Walls (B2.1.30)	III.A3.T-12	3.5.1.070	E, 1
Concrete Elements	FB, MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Loss of material (spalling, scaling) and cracking	Structures Monitoring (B2.1.31)	III.A3.TP-23	3.5.1.064	A
Concrete Elements	FB, MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Increase in porosity and permeability; loss of strength	Structures Monitoring (B2.1.31)	III.A3.TP-24	3.5.1.063	A
Concrete Elements	FB, MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking	Structures Monitoring (B2.1.31)	III.A3.TP-25	3.5.1.054	A

Table 3.5.2-4 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Turbine Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Concrete Elements	FB, MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking; loss of bond; and loss of material (spalling, scaling)	Structures Monitoring (B2.1.31)	III.A3.TP-26	3.5.1.066	A
Concrete Elements	FB, MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Increase in porosity and permeability; cracking; loss of material (spalling, scaling)	Structures Monitoring (B2.1.31)	III.A3.TP-28	3.5.1.067	A
Concrete Elements	FB, MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking, loss of material	Fire Protection (B2.1.13) and Structures Monitoring (B2.1.31)	VII.G.A-92	3.3.1.061	A
Concrete Elements	FB, MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Fire Protection (B2.1.13) and Structures Monitoring (B2.1.31)	VII.G.A-93	3.3.1.062	A
Concrete Elements	FLB, SH, SS	Concrete	Buried (Structural) (Ext)	Increase in porosity and permeability; cracking; loss of material (spalling, scaling)	Structures Monitoring (B2.1.31)	III.A3.TP-29	3.5.1.067	A
Concrete Elements	FLB, SH, SS	Concrete	Buried (Structural) (Ext)	Cracking and distortion	Structures Monitoring (B2.1.31)	III.A3.TP-30	3.5.1.044	A

Table 3.5.2-4 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Turbine Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Concrete Elements	FLB, SH, SS	Concrete	Buried (Structural) (Ext)	Cracking; loss of bond; and loss of material (spalling, scaling)	Structures Monitoring (B2.1.31)	III.A3.TP-212	3.5.1.065	A
Concrete Elements	FB, FLB, SH, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Increase in porosity and permeability; loss of strength	Structures Monitoring (B2.1.31)	III.A3.TP-24	3.5.1.063	A
Concrete Elements	FB, FLB, SH, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking	Structures Monitoring (B2.1.31)	III.A3.TP-25	3.5.1.054	A
Concrete Elements	FB, FLB, SH, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking; loss of bond; and loss of material (spalling, scaling)	Structures Monitoring (B2.1.31)	III.A3.TP-26	3.5.1.066	A
Concrete Elements	FB, FLB, SH, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Increase in porosity and permeability; cracking; loss of material (spalling, scaling)	Structures Monitoring (B2.1.31)	III.A3.TP-28	3.5.1.067	A
Concrete Elements	FB, FLB, SH, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking and distortion	Structures Monitoring (B2.1.31)	III.A3.TP-30	3.5.1.044	A

Table 3.5.2-4 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Turbine Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Concrete Elements	FB, FLB, SH, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Concrete cracking and spalling	Fire Protection (B2.1.13) and Structures Monitoring (B2.1.31)	VII.G.A-90	3.3.1.060	A
Concrete Elements	FB, FLB, SH, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Loss of material	Fire Protection (B2.1.13) and Structures Monitoring (B2.1.31)	VII.G.A-91	3.3.1.062	A
Door	SH	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-302	3.5.1.077	A
Door	SH	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-302	3.5.1.077	A
Fire Barrier Coatings/ Wraps	FB	Fire Barrier (Cementitious Coating)	Plant Indoor Air (Structural) (Ext)	Cracking, loss of material	Fire Protection (B2.1.13)	None	None	J, 2
Fire Barrier Doors	FB, SH	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-302	3.5.1.077	A
Fire Barrier Doors	FB, SH	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Fire Protection (B2.1.13)	VII.G.A-22	3.3.1.059	A

Table 3.5.2-4 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Turbine Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Fire Barrier Doors	FB, SH	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-302	3.5.1.077	A
Fire Barrier Doors	FB, SH	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Fire Protection (B2.1.13)	VII.G.A-21	3.3.1.059	A
Fire Barrier Seals	FB	Elastomer	Atmosphere/ Weather (Structural) (Ext)	Loss of sealing	Structures Monitoring (B2.1.31)	III.A6.TP-7	3.5.1.072	A
Fire Barrier Seals	FB	Elastomer	Atmosphere/ Weather (Structural) (Ext)	Increased hardness; shrinkage; loss of strength	Fire Protection (B2.1.13)	VII.G.A-20	3.3.1.057	A
Fire Barrier Seals	FB	Elastomer	Plant Indoor Air (Structural) (Ext)	Loss of sealing	Structures Monitoring (B2.1.31)	III.A6.TP-7	3.5.1.072	A
Fire Barrier Seals	FB	Elastomer	Plant Indoor Air (Structural) (Ext)	Increased hardness; shrinkage; loss of strength	Fire Protection (B2.1.13)	VII.G.A-19	3.3.1.057	A
Hatch	MB, SH	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-302	3.5.1.077	A

Table 3.5.2-4 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Turbine Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Hatch	MB, SH	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-302	3.5.1.077	A
Hatches and Plugs	FB, MB, SH, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Increase in porosity and permeability; loss of strength	Structures Monitoring (B2.1.31)	III.A3.TP-24	3.5.1.063	A
Hatches and Plugs	FB, MB, SH, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking	Structures Monitoring (B2.1.31)	III.A3.TP-25	3.5.1.054	A
Hatches and Plugs	FB, MB, SH, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking; loss of bond; and loss of material (spalling, scaling)	Structures Monitoring (B2.1.31)	III.A3.TP-26	3.5.1.066	A
Hatches and Plugs	FB, MB, SH, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Increase in porosity and permeability; cracking; loss of material (spalling, scaling)	Structures Monitoring (B2.1.31)	III.A3.TP-28	3.5.1.067	A
Hatches and Plugs	FB, MB, SH, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking and distortion	Structures Monitoring (B2.1.31)	III.A3.TP-30	3.5.1.044	A

Table 3.5.2-4 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Turbine Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Hatches and Plugs	FB, MB, SH, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Concrete cracking and spalling	Fire Protection (B2.1.13) and Structures Monitoring (B2.1.31)	VII.G.A-90	3.3.1.060	A
Hatches and Plugs	FB, MB, SH, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Loss of material	Fire Protection (B2.1.13) and Structures Monitoring (B2.1.31)	VII.G.A-91	3.3.1.062	A
High Strength Bolting	SS	High Strength Low Alloy Steel (Bolting)	Plant Indoor Air (Structural) (Ext)	Loss of preload	Structures Monitoring (B2.1.31)	III.A3.TP-261	3.5.1.088	A
High Strength Bolting	SS	High Strength Low Alloy Steel (Bolting)	Plant Indoor Air (Structural) (Ext)	Cracking	Structures Monitoring (B2.1.31)	III.A3.TP-300	3.5.1.069	A
Metal Siding	FB, SH	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-302	3.5.1.077	A
Metal Siding	FB, SH	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Fire Protection (B2.1.13)	VII.G.A-22	3.3.1.059	C
Metal Siding	FB, SH	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-302	3.5.1.077	A

Table 3.5.2-4 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Turbine Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Metal Siding	FB, SH	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Fire Protection (B2.1.13)	VII.G.A-21	3.3.1.059	C
Penetrations Electrical	SS	Carbon Steel	Concrete (Structural) (Ext)	None	None	VII.J.AP-282	3.3.1.112	C
Penetrations Electrical	SH, SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-302	3.5.1.077	A
Penetrations Mechanical	SS	Carbon Steel	Concrete (Structural) (Ext)	None	None	VII.J.AP-282	3.3.1.112	A
Penetrations Mechanical	SH, SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-302	3.5.1.077	A
Roofing Membrane	FLB, SH	Elastomer	Atmosphere/ Weather (Structural) (Ext)	Loss of sealing	Structures Monitoring (B2.1.31)	III.A6.TP-7	3.5.1.072	A
Stairs, Platforms and Grates	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-302	3.5.1.077	A
Structural Steel	SS	Carbon Steel	Concrete (Structural) (Ext)	None	None	VII.J.AP-282	3.3.1.112	A

Table 3.5.2-4 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Turbine Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Structural Steel	SH, SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-302	3.5.1.077	A

Notes for Table 3.5.2-4:

Standard Notes:

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

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

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

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

Plant Specific Notes:

1 NUREG-1801 does not provide a line in which concrete masonry is inspected per the Fire Protection program (B2.1.13).

2 NUREG-1801 does not provide a line in which fire barriers (ceramic fiber or cementitious coating) are inspected per the Fire Protection program (B2.1.13).

Table 3.5.2-5 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Diesel Generator Building

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Bolting (Structural)	SS	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of preload	Structures Monitoring (B2.1.31)	III.A3.TP-261	3.5.1.088	A
Bolting (Structural)	SS	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-274	3.5.1.082	A
Bolting (Structural)	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-248	3.5.1.080	A
Bolting (Structural)	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of preload	Structures Monitoring (B2.1.31)	III.A3.TP-261	3.5.1.088	A
Caulking and Sealant	FLB, SH	Elastomer	Atmosphere/ Weather (Structural) (Ext)	Loss of sealing	Structures Monitoring (B2.1.31)	III.A6.TP-7	3.5.1.072	A
Caulking and Sealant	FLB, SH	Elastomer	Buried (Structural) (Ext)	Loss of sealing	Structures Monitoring (B2.1.31)	III.A6.TP-7	3.5.1.072	A
Caulking and Sealant	FLB, SH	Elastomer	Plant Indoor Air (Structural) (Ext)	Loss of sealing	Structures Monitoring (B2.1.31)	III.A6.TP-7	3.5.1.072	A
Compressible Joints and Seals	ES, SH	Elastomer	Atmosphere/ Weather (Structural) (Ext)	Loss of sealing	Structures Monitoring (B2.1.31)	III.A6.TP-7	3.5.1.072	A
Compressible Joints and Seals	ES, SH	Elastomer	Plant Indoor Air (Structural) (Ext)	Loss of sealing	Structures Monitoring (B2.1.31)	III.A6.TP-7	3.5.1.072	A
Concrete Elements	FB, MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Loss of material (spalling, scaling) and cracking	Structures Monitoring (B2.1.31)	III.A3.TP-23	3.5.1.064	A

Table 3.5.2-5 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Diesel Generator Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Concrete Elements	FB, MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Increase in porosity and permeability; loss of strength	Structures Monitoring (B2.1.31)	III.A3.TP-24	3.5.1.063	A
Concrete Elements	FB, MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking	Structures Monitoring (B2.1.31)	III.A3.TP-25	3.5.1.054	A
Concrete Elements	FB, MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking; loss of bond; and loss of material (spalling, scaling)	Structures Monitoring (B2.1.31)	III.A3.TP-26	3.5.1.066	A
Concrete Elements	FB, MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Increase in porosity and permeability; cracking; loss of material (spalling, scaling)	Structures Monitoring (B2.1.31)	III.A3.TP-28	3.5.1.067	A
Concrete Elements	FB, MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking, loss of material	Fire Protection (B2.1.13) and Structures Monitoring (B2.1.31)	VII.G.A-92	3.3.1.061	A
Concrete Elements	FB, MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Fire Protection (B2.1.13) and Structures Monitoring (B2.1.31)	VII.G.A-93	3.3.1.062	A

Table 3.5.2-5 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Diesel Generator Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Concrete Elements	FLB, SH, SS	Concrete	Buried (Structural) (Ext)	Increase in porosity and permeability; cracking; loss of material (spalling, scaling)	Structures Monitoring (B2.1.31)	III.A3.TP-29	3.5.1.067	A
Concrete Elements	FLB, SH, SS	Concrete	Buried (Structural) (Ext)	Cracking and distortion	Structures Monitoring (B2.1.31)	III.A3.TP-30	3.5.1.044	A
Concrete Elements	FLB, SH, SS	Concrete	Buried (Structural) (Ext)	Cracking; loss of bond; and loss of material (spalling, scaling)	Structures Monitoring (B2.1.31)	III.A3.TP-212	3.5.1.065	A
Concrete Elements	DF, FB, MB, SH, SPB, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Increase in porosity and permeability; loss of strength	Structures Monitoring (B2.1.31)	III.A3.TP-24	3.5.1.063	A
Concrete Elements	DF, FB, MB, SH, SPB, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking	Structures Monitoring (B2.1.31)	III.A3.TP-25	3.5.1.054	A
Concrete Elements	DF, FB, MB, SH, SPB, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking; loss of bond; and loss of material (spalling, scaling)	Structures Monitoring (B2.1.31)	III.A3.TP-26	3.5.1.066	A

Table 3.5.2-5 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Diesel Generator Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Concrete Elements	DF, FB, MB, SH, SPB, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Increase in porosity and permeability; cracking; loss of material (spalling, scaling)	Structures Monitoring (B2.1.31)	III.A3.TP-28	3.5.1.067	A
Concrete Elements	DF, FB, MB, SH, SPB, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking and distortion	Structures Monitoring (B2.1.31)	III.A3.TP-30	3.5.1.044	A
Concrete Elements	DF, FB, MB, SH, SPB, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Concrete cracking and spalling	Fire Protection (B2.1.13) and Structures Monitoring (B2.1.31)	VII.G.A-90	3.3.1.060	A
Concrete Elements	DF, FB, MB, SH, SPB, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Loss of material	Fire Protection (B2.1.13) and Structures Monitoring (B2.1.31)	VII.G.A-91	3.3.1.062	A
Door	MB, SH	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-302	3.5.1.077	A
Door	MB, SH	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-302	3.5.1.077	A
Fire Barrier Coatings/ Wraps	FB	Fire Barrier (Cementitious Coating)	Plant Indoor Air (Structural) (Ext)	Cracking, loss of material	Fire Protection (B2.1.13)	None	None	J, 1

Table 3.5.2-5 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Diesel Generator Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Fire Barrier Seals	FB	Elastomer	Atmosphere/ Weather (Structural) (Ext)	Loss of sealing	Structures Monitoring (B2.1.31)	III.A6.TP-7	3.5.1.072	A
Fire Barrier Seals	FB	Elastomer	Atmosphere/ Weather (Structural) (Ext)	Increased hardness; shrinkage; loss of strength	Fire Protection (B2.1.13)	VII.G.A-20	3.3.1.057	A
Fire Barrier Seals	FB	Elastomer	Plant Indoor Air (Structural) (Ext)	Loss of sealing	Structures Monitoring (B2.1.31)	III.A6.TP-7	3.5.1.072	A
Fire Barrier Seals	FB	Elastomer	Plant Indoor Air (Structural) (Ext)	Increased hardness; shrinkage; loss of strength	Fire Protection (B2.1.13)	VII.G.A-19	3.3.1.057	A
High Strength Bolting	SS	High Strength Low Alloy Steel (Bolting)	Plant Indoor Air (Structural) (Ext)	Loss of preload	Structures Monitoring (B2.1.31)	III.A3.TP-261	3.5.1.088	A
High Strength Bolting	SS	High Strength Low Alloy Steel (Bolting)	Plant Indoor Air (Structural) (Ext)	Cracking	Structures Monitoring (B2.1.31)	III.A3.TP-300	3.5.1.069	A
Penetrations Electrical	SS	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-302	3.5.1.077	A
Penetrations Electrical	SS	Carbon Steel	Concrete (Structural) (Ext)	None	None	VII.J.AP-282	3.3.1.112	C
Penetrations Electrical	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-302	3.5.1.077	A

Table 3.5.2-5 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Diesel Generator Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Penetrations Mechanical	SS	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-302	3.5.1.077	A
Penetrations Mechanical	SS	Carbon Steel	Concrete (Structural) (Ext)	None	None	VII.J.AP-282	3.3.1.112	C
Penetrations Mechanical	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-302	3.5.1.077	A
Roofing Membrane	FLB, SH	Elastomer	Atmosphere/ Weather (Structural) (Ext)	Loss of sealing	Structures Monitoring (B2.1.31)	III.A6.TP-7	3.5.1.072	A
Stairs, Platforms and Grates	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-302	3.5.1.077	A
Structural Steel	MB, SH, SS	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-302	3.5.1.077	A
Structural Steel	SS	Carbon Steel	Concrete (Structural) (Ext)	None	None	VII.J.AP-282	3.3.1.112	C
Structural Steel	SH, SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-302	3.5.1.077	A

Notes for Table 3.5.2-5:

Standard Notes:

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

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

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

Plant Specific Notes:

1 NUREG-1801 does not provide a line in which fire barriers (ceramic fiber or cementitious coating) are inspected per the Fire Protection program (B2.1.13).

Table 3.5.2-6 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Miscellaneous In-Scope Structures

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Barrier	SH	Glass	Atmosphere/ Weather (Structural) (Ext)	None	None	VII.J.AP-167	3.3.1.117	C
Barrier	SH	Glass	Plant Indoor Air (Structural) (Ext)	None	None	VII.J.AP-14	3.3.1.117	C
Bolting (Structural)	SS	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of preload	Structures Monitoring (B2.1.31)	III.A3.TP-261	3.5.1.088	A
Bolting (Structural)	SS	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-274	3.5.1.082	A
Bolting (Structural)	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-248	3.5.1.080	A
Bolting (Structural)	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of preload	Structures Monitoring (B2.1.31)	III.A3.TP-261	3.5.1.088	A
Caulking and Sealant	FLB, SH	Elastomer	Atmosphere/ Weather (Structural) (Ext)	Loss of sealing	Structures Monitoring (B2.1.31)	III.A6.TP-7	3.5.1.072	A

Table 3.5.2-6 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Miscellaneous In-Scope Structures (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Caulking and Sealant	FLB, SH	Elastomer	Buried (Ext)	Loss of sealing	Structures Monitoring (B2.1.31)	III.A6.TP-7	3.5.1.072	A
Caulking and Sealant	FLB, SH	Elastomer	Plant Indoor Air (Structural) (Ext)	Loss of sealing	Structures Monitoring (B2.1.31)	III.A6.TP-7	3.5.1.072	A
Concrete Block (Masonry Walls)	SH, SS	Concrete Block (Masonry Walls)	Atmosphere/ Weather (Structural) (Ext)	Cracking	Masonry Walls (B2.1.30)	III.A3.T-12	3.5.1.070	A
Concrete Block (Masonry Walls)	FB, SH, SS	Concrete Block (Masonry Walls)	Plant Indoor Air (Structural) (Ext)	Cracking	Fire Protection (B2.1.13) and Masonry Walls (B2.1.30)	III.A3.T-12	3.5.1.070	E, 1
Concrete Elements	SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Loss of material (spalling, scaling) and cracking	Structures Monitoring (B2.1.31)	III.A3.TP-23	3.5.1.064	A
Concrete Elements	SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Increase in porosity and permeability; loss of strength	Structures Monitoring (B2.1.31)	III.A3.TP-24	3.5.1.063	A
Concrete Elements	SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking	Structures Monitoring (B2.1.31)	III.A3.TP-25	3.5.1.054	A

Table 3.5.2-6 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Miscellaneous In-Scope Structures (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Concrete Elements	SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking; loss of bond; and loss of material (spalling, scaling)	Structures Monitoring (B2.1.31)	III.A3.TP-26	3.5.1.066	A
Concrete Elements	SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Increase in porosity and permeability; cracking; loss of material (spalling, scaling)	Structures Monitoring (B2.1.31)	III.A3.TP-28	3.5.1.067	A
Concrete Elements	SH, SS	Concrete	Buried (Structural) (Ext)	Increase in porosity and permeability; cracking; loss of material (spalling, scaling)	Structures Monitoring (B2.1.31)	III.A3.TP-29	3.5.1.067	A
Concrete Elements	SH, SS	Concrete	Buried (Structural) (Ext)	Cracking and distortion	Structures Monitoring (B2.1.31)	III.A3.TP-30	3.5.1.044	A
Concrete Elements	SH, SS	Concrete	Buried (Structural) (Ext)	Cracking; loss of bond; and loss of material (spalling, scaling)	Structures Monitoring (B2.1.31)	III.A3.TP-212	3.5.1.065	A
Concrete Elements	SH, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Increase in porosity and permeability; loss of strength	Structures Monitoring (B2.1.31)	III.A3.TP-24	3.5.1.063	A

Table 3.5.2-6 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Miscellaneous In-Scope Structures (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Concrete Elements	SH, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking	Structures Monitoring (B2.1.31)	III.A3.TP-25	3.5.1.054	A
Concrete Elements	SH, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking; loss of bond; and loss of material (spalling, scaling)	Structures Monitoring (B2.1.31)	III.A3.TP-26	3.5.1.066	A
Concrete Elements	SH, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Increase in porosity and permeability; cracking; loss of material (spalling, scaling)	Structures Monitoring (B2.1.31)	III.A3.TP-28	3.5.1.067	A
Concrete Elements	SH, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking and distortion	Structures Monitoring (B2.1.31)	III.A3.TP-30	3.5.1.044	A
Concrete Elements	SH, SS	Concrete	Submerged (Structural) (Ext)	Increase in porosity and permeability; loss of strength	Structures Monitoring (B2.1.31)	III.A3.TP-24	3.5.1.063	A
Concrete Elements	SH, SS	Concrete	Submerged (Structural) (Ext)	Cracking	Structures Monitoring (B2.1.31)	III.A3.TP-25	3.5.1.054	A

Table 3.5.2-6 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Miscellaneous In-Scope Structures (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Door	SH	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-302	3.5.1.077	A
Door	SH	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-302	3.5.1.077	A
Metal Siding	SH	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-302	3.5.1.077	A
Metal Siding	SH	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-302	3.5.1.077	A
Penetrations Electrical	SS	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-302	3.5.1.077	A
Penetrations Electrical	SS	Carbon Steel	Concrete (Structural) (Ext)	None	None	VII.J.AP-282	3.3.1.112	C
Penetrations Electrical	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-302	3.5.1.077	A

Table 3.5.2-6 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Miscellaneous In-Scope Structures (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Penetrations Mechanical	SS	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-302	3.5.1.077	A
Penetrations Mechanical	SS	Carbon Steel	Concrete (Structural) (Ext)	None	None	VII.J.AP-282	3.3.1.112	C
Penetrations Mechanical	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-302	3.5.1.077	A
Roofing Membrane	FLB, SH	Elastomer	Atmosphere/ Weather (Structural) (Ext)	Loss of sealing	Structures Monitoring (B2.1.31)	III.A6.TP-7	3.5.1.072	A
Structural Steel	SH, SS	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-302	3.5.1.077	A
Structural Steel	SS	Carbon Steel	Concrete (Structural) (Ext)	None	None	VII.J.AP-282	3.3.1.112	C
Structural Steel	SH, SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-302	3.5.1.077	A

Table 3.5.2-6 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Miscellaneous In-Scope Structures (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Structural Steel	SH, SS	Carbon Steel	Submerged (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A6.TP-221	3.5.1.083	E, 2

Notes for Table 3.5.2-6:

Standard Notes:

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

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

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

Plant Specific Notes:

1 NUREG-1801 does not provide a line in which concrete masonry is inspected per the Fire Protection program (B2.1.13).

2 NUREG-1801, Chapter III.A3 does not provide a line to evaluate carbon structural steel in a submerged environment.

Table 3.5.2-7 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – In-Scope Tank Foundations and Structures

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Bolting (Structural)	SS	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of preload	Structures Monitoring (B2.1.31)	III.A3.TP-261	3.5.1.088	A
Bolting (Structural)	SS	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-274	3.5.1.082	A
Bolting (Structural)	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-248	3.5.1.080	A
Bolting (Structural)	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of preload	Structures Monitoring (B2.1.31)	III.A3.TP-261	3.5.1.088	A
Caulking and Sealant	FLB, SH	Elastomer	Atmosphere/ Weather (Structural) (Ext)	Loss of sealing	Structures Monitoring (B2.1.31)	III.A6.TP-7	3.5.1.072	A
Caulking and Sealant	FLB, SH	Elastomer	Buried (Structural) (Ext)	Loss of sealing	Structures Monitoring (B2.1.31)	III.A6.TP-7	3.5.1.072	A
Caulking and Sealant	FLB, SH	Elastomer	Plant Indoor Air (Structural) (Ext)	Loss of sealing	Structures Monitoring (B2.1.31)	III.A6.TP-7	3.5.1.072	A

Table 3.5.2-7 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – In-Scope Tank Foundations and Structures (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Concrete Block (Masonry Walls)	SH, SS	Concrete Block (Masonry Walls)	Atmosphere/ Weather (Structural) (Ext)	Cracking	Masonry Walls (B2.1.30)	III.A3.T-12	3.5.1.070	A
Concrete Block (Masonry Walls)	SH, SS	Concrete Block (Masonry Walls)	Plant Indoor Air (Structural) (Ext)	Cracking	Masonry Walls (B2.1.30)	III.A3.T-12	3.5.1.070	A
Concrete Elements	SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Loss of material (spalling, scaling) and cracking	Structures Monitoring (B2.1.31)	III.A3.TP-23	3.5.1.064	A
Concrete Elements	SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Increase in porosity and permeability; loss of strength	Structures Monitoring (B2.1.31)	III.A3.TP-24	3.5.1.063	A
Concrete Elements	SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking	Structures Monitoring (B2.1.31)	III.A3.TP-25	3.5.1.054	A
Concrete Elements	SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking; loss of bond; and loss of material (spalling, scaling)	Structures Monitoring (B2.1.31)	III.A3.TP-26	3.5.1.066	A

Table 3.5.2-7 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – In-Scope Tank Foundations and Structures (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Concrete Elements	SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Increase in porosity and permeability; cracking; loss of material (spalling, scaling)	Structures Monitoring (B2.1.31)	III.A3.TP-28	3.5.1.067	A
Concrete Elements	FLB, SH, SS	Concrete	Buried (Structural) (Ext)	Increase in porosity and permeability; cracking; loss of material (spalling, scaling)	Structures Monitoring (B2.1.31)	III.A3.TP-29	3.5.1.067	A
Concrete Elements	FLB, SH, SS	Concrete	Buried (Structural) (Ext)	Cracking and distortion	Structures Monitoring (B2.1.31)	III.A3.TP-30	3.5.1.044	A
Concrete Elements	FLB, SH, SS	Concrete	Buried (Structural) (Ext)	Cracking; loss of bond; and loss of material (spalling, scaling)	Structures Monitoring (B2.1.31)	III.A3.TP-212	3.5.1.065	A
Concrete Elements	FLB, SH, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Increase in porosity and permeability; loss of strength	Structures Monitoring (B2.1.31)	III.A3.TP-24	3.5.1.063	A
Concrete Elements	FLB, SH, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking	Structures Monitoring (B2.1.31)	III.A3.TP-25	3.5.1.054	A

Table 3.5.2-7 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – In-Scope Tank Foundations and Structures (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Concrete Elements	FLB, SH, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking; loss of bond; and loss of material (spalling, scaling)	Structures Monitoring (B2.1.31)	III.A3.TP-26	3.5.1.066	A
Concrete Elements	FLB, SH, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Increase in porosity and permeability; cracking; loss of material (spalling, scaling)	Structures Monitoring (B2.1.31)	III.A3.TP-28	3.5.1.067	A
Concrete Elements	FLB, SH, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking and distortion	Structures Monitoring (B2.1.31)	III.A3.TP-30	3.5.1.044	A
Door	SH	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-302	3.5.1.077	A
Door	SH	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-302	3.5.1.077	A
Expansion Joint	ES	Elastomer	Atmosphere/ Weather (Structural) (Ext)	Loss of sealing	Structures Monitoring (B2.1.31)	III.A6.TP-7	3.5.1.072	A

Table 3.5.2-7 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – In-Scope Tank Foundations and Structures (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Hatch	SH	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-302	3.5.1.077	A
Hatch	SH	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-302	3.5.1.077	A
High Strength Bolting	SS	High Strength Low Alloy Steel (Bolting)	Plant Indoor Air (Structural) (Ext)	Loss of preload	Structures Monitoring (B2.1.31)	III.A3.TP-261	3.5.1.088	A
High Strength Bolting	SS	High Strength Low Alloy Steel (Bolting)	Plant Indoor Air (Structural) (Ext)	Cracking	Structures Monitoring (B2.1.31)	III.A3.TP-300	3.5.1.069	A
Penetrations Electrical	SS	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-302	3.5.1.077	A
Penetrations Electrical	SS	Carbon Steel	Concrete (Structural) (Ext)	None	None	VII.J.AP-282	3.3.1.112	C
Penetrations Electrical	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-302	3.5.1.077	A

Table 3.5.2-7 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – In-Scope Tank Foundations and Structures (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Penetrations Mechanical	SS	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-302	3.5.1.077	A
Penetrations Mechanical	SS	Carbon Steel	Concrete (Structural) (Ext)	None	None	VII.J.AP-282	3.3.1.112	C
Penetrations Mechanical	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-302	3.5.1.077	A
Roofing Membrane	FLB, SH	Elastomer	Atmosphere/ Weather (Structural) (Ext)	Loss of sealing	Structures Monitoring (B2.1.31)	III.A6.TP-7	3.5.1.072	A
Stairs, Platforms and Grates	SS	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-302	3.5.1.077	A
Stairs, Platforms and Grates	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-302	3.5.1.077	A
Structural Metals	SH	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-302	3.5.1.077	A

Table 3.5.2-7 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – In-Scope Tank Foundations and Structures (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Structural Metals	SH	Stainless Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.B4.TP-6	3.5.1.093	C
Structural Steel	SH, SS	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-302	3.5.1.077	A
Structural Steel	SS	Carbon Steel	Concrete (Structural) (Ext)	None	None	VII.J.AP-282	3.3.1.112	C
Structural Steel	SH, SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-302	3.5.1.077	A

<u>Notes for Table 3.5.2-7:</u>

<u>Standard Notes:</u>

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

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

<u>Plant Specific Notes:</u>

None

Table 3.5.2-8 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Electrical Foundations and Structures

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Bolting (Structural)	SS	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of preload	Structures Monitoring (B2.1.31)	III.A3.TP-261	3.5.1.088	A
Bolting (Structural)	SS	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-274	3.5.1.082	A
Bolting (Structural)	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-248	3.5.1.080	A
Bolting (Structural)	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of preload	Structures Monitoring (B2.1.31)	III.A3.TP-261	3.5.1.088	A
Caulking and Sealant	FLB, SH	Elastomer	Atmosphere/ Weather (Structural) (Ext)	Loss of sealing	Structures Monitoring (B2.1.31)	III.A6.TP-7	3.5.1.072	A
Caulking and Sealant	FLB, SH	Elastomer	Buried (Structural) (Ext)	Loss of sealing	Structures Monitoring (B2.1.31)	III.A6.TP-7	3.5.1.072	A
Compressible Joints and Seals	ES, SH	Elastomer	Atmosphere/ Weather (Structural) (Ext)	Loss of sealing	Structures Monitoring (B2.1.31)	III.A6.TP-7	3.5.1.072	A

Table 3.5.2-8 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Electrical Foundations and Structures (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Compressible Joints and Seals	ES, SH	Elastomer	Buried (Structural) (Ext)	Loss of sealing	Structures Monitoring (B2.1.31)	III.A6.TP-7	3.5.1.072	A
Concrete Elements	FB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Loss of material (spalling, scaling) and cracking	Structures Monitoring (B2.1.31)	III.A3.TP-23	3.5.1.064	A
Concrete Elements	FB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Increase in porosity and permeability; loss of strength	Structures Monitoring (B2.1.31)	III.A3.TP-24	3.5.1.063	A
Concrete Elements	FB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking	Structures Monitoring (B2.1.31)	III.A3.TP-25	3.5.1.054	A
Concrete Elements	FB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking; loss of bond; and loss of material (spalling, scaling)	Structures Monitoring (B2.1.31)	III.A3.TP-26	3.5.1.066	A
Concrete Elements	FB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Increase in porosity and permeability; cracking; loss of material (spalling, scaling)	Structures Monitoring (B2.1.31)	III.A3.TP-28	3.5.1.067	A

Table 3.5.2-8 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Electrical Foundations and Structures (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Concrete Elements	FB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking, loss of material	Fire Protection (B2.1.13) and Structures Monitoring (B2.1.31)	VII.G.A-92	3.3.1.061	A
Concrete Elements	FB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Fire Protection (B2.1.13) and Structures Monitoring (B2.1.31)	VII.G.A-93	3.3.1.062	A
Concrete Elements	FLB, SH, SS	Concrete	Buried (Structural) (Ext)	Increase in porosity and permeability; cracking; loss of material (spalling, scaling)	Structures Monitoring (B2.1.31)	III.A3.TP-29	3.5.1.067	A
Concrete Elements	FLB, SH, SS	Concrete	Buried (Structural) (Ext)	Cracking and distortion	Structures Monitoring (B2.1.31)	III.A3.TP-30	3.5.1.044	A
Concrete Elements	FLB, SH, SS	Concrete	Buried (Structural) (Ext)	Cracking; loss of bond; and loss of material (spalling, scaling)	Structures Monitoring (B2.1.31)	III.A3.TP-212	3.5.1.065	A
Duct Banks and Manholes	SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Loss of material (spalling, scaling) and cracking	Structures Monitoring (B2.1.31)	III.A3.TP-23	3.5.1.064	A

Table 3.5.2-8 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Electrical Foundations and Structures (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Duct Banks and Manholes	SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Increase in porosity and permeability; loss of strength	Structures Monitoring (B2.1.31)	III.A3.TP-24	3.5.1.063	A
Duct Banks and Manholes	SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking	Structures Monitoring (B2.1.31)	III.A3.TP-25	3.5.1.054	A
Duct Banks and Manholes	SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking; loss of bond; and loss of material (spalling, scaling)	Structures Monitoring (B2.1.31)	III.A3.TP-26	3.5.1.066	A
Duct Banks and Manholes	SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Increase in porosity and permeability; cracking; loss of material (spalling, scaling)	Structures Monitoring (B2.1.31)	III.A3.TP-28	3.5.1.067	A
Duct Banks and Manholes	SH, SS	Concrete	Buried (Structural) (Ext)	Increase in porosity and permeability; cracking; loss of material (spalling, scaling)	Structures Monitoring (B2.1.31)	III.A3.TP-29	3.5.1.067	A
Duct Banks and Manholes	SH, SS	Concrete	Buried (Structural) (Ext)	Cracking and distortion	Structures Monitoring (B2.1.31)	III.A3.TP-30	3.5.1.044	A

Table 3.5.2-8 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Electrical Foundations and Structures (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Duct Banks and Manholes	SH, SS	Concrete	Buried (Structural) (Ext)	Cracking; loss of bond; and loss of material (spalling, scaling)	Structures Monitoring (B2.1.31)	III.A3.TP-212	3.5.1.065	A
Duct Banks and Manholes	SH, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Increase in porosity and permeability; loss of strength	Structures Monitoring (B2.1.31)	III.A3.TP-24	3.5.1.063	A
Duct Banks and Manholes	SH, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking	Structures Monitoring (B2.1.31)	III.A3.TP-25	3.5.1.054	A
Duct Banks and Manholes	SH, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking; loss of bond; and loss of material (spalling, scaling)	Structures Monitoring (B2.1.31)	III.A3.TP-26	3.5.1.066	A
Duct Banks and Manholes	SH, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Increase in porosity and permeability; cracking; loss of material (spalling, scaling)	Structures Monitoring (B2.1.31)	III.A3.TP-28	3.5.1.067	A
Duct Banks and Manholes	SH, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking and distortion	Structures Monitoring (B2.1.31)	III.A3.TP-30	3.5.1.044	A

Table 3.5.2-8 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Electrical Foundations and Structures (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Hatches and Plugs	MB, SH	Concrete	Atmosphere/ Weather (Structural) (Ext)	Loss of material (spalling, scaling) and cracking	Structures Monitoring (B2.1.31)	III.A3.TP-23	3.5.1.064	A
Hatches and Plugs	MB, SH	Concrete	Atmosphere/ Weather (Structural) (Ext)	Increase in porosity and permeability; loss of strength	Structures Monitoring (B2.1.31)	III.A3.TP-24	3.5.1.063	A
Hatches and Plugs	MB, SH	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking	Structures Monitoring (B2.1.31)	III.A3.TP-25	3.5.1.054	A
Hatches and Plugs	MB, SH	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking; loss of bond; and loss of material (spalling, scaling)	Structures Monitoring (B2.1.31)	III.A3.TP-26	3.5.1.066	A
Hatches and Plugs	MB, SH	Concrete	Atmosphere/ Weather (Structural) (Ext)	Increase in porosity and permeability; cracking; loss of material (spalling, scaling)	Structures Monitoring (B2.1.31)	III.A3.TP-28	3.5.1.067	A
Hatches and Plugs	MB, SH	Concrete	Plant Indoor Air (Structural) (Ext)	Increase in porosity and permeability; loss of strength	Structures Monitoring (B2.1.31)	III.A3.TP-24	3.5.1.063	A

Table 3.5.2-8 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Electrical Foundations and Structures (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Hatches and Plugs	MB, SH	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking	Structures Monitoring (B2.1.31)	III.A3.TP-25	3.5.1.054	A
Hatches and Plugs	MB, SH	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking; loss of bond; and loss of material (spalling, scaling)	Structures Monitoring (B2.1.31)	III.A3.TP-26	3.5.1.066	A
Hatches and Plugs	MB, SH	Concrete	Plant Indoor Air (Structural) (Ext)	Increase in porosity and permeability; cracking; loss of material (spalling, scaling)	Structures Monitoring (B2.1.31)	III.A3.TP-28	3.5.1.067	A
Hatches and Plugs	MB, SH	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking and distortion	Structures Monitoring (B2.1.31)	III.A3.TP-30	3.5.1.044	A
Penetrations Electrical	SS	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-302	3.5.1.077	A
Penetrations Electrical	SS	Carbon Steel	Concrete (Structural) (Ext)	None	None	VII.J.AP-282	3.3.1.112	C

Table 3.5.2-8 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Electrical Foundations and Structures (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Structural Steel	SS	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-302	3.5.1.077	A
Structural Steel	SS	Carbon Steel	Concrete (Structural) (Ext)	None	None	VII.J.AP-282	3.3.1.112	C
Structural Steel	SH, SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-302	3.5.1.077	A
Transmission Tower	SS	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-302	3.5.1.077	A

Notes for Table 3.5.2-8:

Standard Notes:

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

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

Plant Specific Notes:

None

Table 3.5.2-9 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Radwaste Building

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Bolting (Structural)	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-248	3.5.1.080	A
Bolting (Structural)	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of preload	Structures Monitoring (B2.1.31)	III.A3.TP-261	3.5.1.088	A
Caulking and Sealant	FLB, SH	Elastomer	Atmosphere/ Weather (Structural) (Ext)	Loss of sealing	Structures Monitoring (B2.1.31)	III.A6.TP-7	3.5.1.072	A
Caulking and Sealant	FLB, SH	Elastomer	Buried (Structural) (Ext)	Loss of sealing	Structures Monitoring (B2.1.31)	III.A6.TP-7	3.5.1.072	A
Caulking and Sealant	FLB, SH	Elastomer	Plant Indoor Air (Structural) (Ext)	Loss of sealing	Structures Monitoring (B2.1.31)	III.A6.TP-7	3.5.1.072	A
Compressible Joints and Seals	ES, SH	Elastomer	Atmosphere/ Weather (Structural) (Ext)	Loss of sealing	Structures Monitoring (B2.1.31)	III.A6.TP-7	3.5.1.072	A
Compressible Joints and Seals	ES, SH	Elastomer	Buried (Structural) (Ext)	Loss of sealing	Structures Monitoring (B2.1.31)	III.A6.TP-7	3.5.1.072	A
Compressible Joints and Seals	ES, SH	Elastomer	Plant Indoor Air (Structural) (Ext)	Loss of sealing	Structures Monitoring (B2.1.31)	III.A6.TP-7	3.5.1.072	A

Table 3.5.2-9 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Radwaste Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Concrete Block (Masonry Walls)	FLB, SH, SS	Concrete Block (Masonry Walls)	Plant Indoor Air (Structural) (Ext)	Cracking	Masonry Walls (B2.1.30)	III.A3.T-12	3.5.1.070	A
Concrete Elements	FB, MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Loss of material (spalling, scaling) and cracking	Structures Monitoring (B2.1.31)	III.A3.TP-23	3.5.1.064	A
Concrete Elements	FB, MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Increase in porosity and permeability; loss of strength	Structures Monitoring (B2.1.31)	III.A3.TP-24	3.5.1.063	A
Concrete Elements	FB, MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking	Structures Monitoring (B2.1.31)	III.A3.TP-25	3.5.1.054	A
Concrete Elements	FB, MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking; loss of bond; and loss of material (spalling, scaling)	Structures Monitoring (B2.1.31)	III.A3.TP-26	3.5.1.066	A
Concrete Elements	FB, MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Increase in porosity and permeability; cracking; loss of material (spalling, scaling)	Structures Monitoring (B2.1.31)	III.A3.TP-28	3.5.1.067	A

Table 3.5.2-9 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Radwaste Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Concrete Elements	FB, MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking, loss of material	Fire Protection (B2.1.13) and Structures Monitoring (B2.1.31)	VII.G.A-92	3.3.1.061	A
Concrete Elements	FB, MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Fire Protection (B2.1.13) and Structures Monitoring (B2.1.31)	VII.G.A-93	3.3.1.062	A
Concrete Elements	FLB, SH, SS	Concrete	Buried (Structural) (Ext)	Increase in porosity and permeability; cracking; loss of material (spalling, scaling)	Structures Monitoring (B2.1.31)	III.A3.TP-29	3.5.1.067	A
Concrete Elements	FLB, SH, SS	Concrete	Buried (Structural) (Ext)	Cracking and distortion	Structures Monitoring (B2.1.31)	III.A3.TP-30	3.5.1.044	A
Concrete Elements	FLB, SH, SS	Concrete	Buried (Structural) (Ext)	Cracking; loss of bond; and loss of material (spalling, scaling)	Structures Monitoring (B2.1.31)	III.A3.TP-212	3.5.1.065	A
Concrete Elements	FB, FLB, SH, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Increase in porosity and permeability; loss of strength	Structures Monitoring (B2.1.31)	III.A3.TP-24	3.5.1.063	A

Table 3.5.2-9 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Radwaste Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Concrete Elements	FB, FLB, SH, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking	Structures Monitoring (B2.1.31)	III.A3.TP-25	3.5.1.054	A
Concrete Elements	FB, FLB, SH, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking; loss of bond; and loss of material (spalling, scaling)	Structures Monitoring (B2.1.31)	III.A3.TP-26	3.5.1.066	A
Concrete Elements	FB, FLB, SH, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Increase in porosity and permeability; cracking; loss of material (spalling, scaling)	Structures Monitoring (B2.1.31)	III.A3.TP-28	3.5.1.067	A
Concrete Elements	FB, FLB, SH, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking and distortion	Structures Monitoring (B2.1.31)	III.A3.TP-30	3.5.1.044	A
Concrete Elements	FB, FLB, SH, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Concrete cracking and spalling	Fire Protection (B2.1.13) and Structures Monitoring (B2.1.31)	VII.G.A-90	3.3.1.060	A
Concrete Elements	FB, FLB, SH, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Loss of material	Fire Protection (B2.1.13) and Structures Monitoring (B2.1.31)	VII.G.A-91	3.3.1.062	A

Table 3.5.2-9 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Radwaste Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Door	SH	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-302	3.5.1.077	A
Door	FLB, SH	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-302	3.5.1.077	A
Fire Barrier Coatings/ Wraps	FB	Fire Barrier (Cementitious Coating)	Plant Indoor Air (Structural) (Ext)	Cracking, loss of material	Fire Protection (B2.1.13)	None	None	J, 1
Fire Barrier Doors	FB, SH	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-302	3.5.1.077	A
Fire Barrier Doors	FB, SH	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Fire Protection (B2.1.13)	VII.G.A-21	3.3.1.059	A
Fire Barrier Seals	FB	Elastomer	Atmosphere/ Weather (Structural) (Ext)	Loss of sealing	Structures Monitoring (B2.1.31)	III.A6.TP-7	3.5.1.072	A
Fire Barrier Seals	FB	Elastomer	Atmosphere/ Weather (Structural) (Ext)	Increased hardness; shrinkage; loss of strength	Fire Protection (B2.1.13)	VII.G.A-20	3.3.1.057	A

Table 3.5.2-9 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Radwaste Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Fire Barrier Seals	FB	Elastomer	Plant Indoor Air (Structural) (Ext)	Loss of sealing	Structures Monitoring (B2.1.31)	III.A6.TP-7	3.5.1.072	A
Fire Barrier Seals	FB	Elastomer	Plant Indoor Air (Structural) (Ext)	Increased hardness; shrinkage; loss of strength	Fire Protection (B2.1.13)	VII.G.A-19	3.3.1.057	A
High Strength Bolting	SS	High Strength Low Alloy Steel (Bolting)	Plant Indoor Air (Structural) (Ext)	Loss of preload	Structures Monitoring (B2.1.31)	III.A3.TP-261	3.5.1.088	A
High Strength Bolting	SS	High Strength Low Alloy Steel (Bolting)	Plant Indoor Air (Structural) (Ext)	Cracking	Structures Monitoring (B2.1.31)	III.A3.TP-300	3.5.1.069	A
Penetrations Electrical	SS	Carbon Steel	Concrete (Structural) (Ext)	None	None	VII.J.AP-282	3.3.1.112	C
Penetrations Electrical	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-302	3.5.1.077	A
Penetrations Mechanical	SS	Carbon Steel	Concrete (Structural) (Ext)	None	None	VII.J.AP-282	3.3.1.112	C
Penetrations Mechanical	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-302	3.5.1.077	A

Table 3.5.2-9 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Radwaste Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Roofing Membrane	FLB, SH	Elastomer	Atmosphere/ Weather (Structural) (Ext)	Loss of sealing	Structures Monitoring (B2.1.31)	III.A6.TP-7	3.5.1.072	A
Stairs, Platforms and Grates	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-302	3.5.1.077	A
Structural Steel	SS	Carbon Steel	Concrete (Structural) (Ext)	None	None	VII.J.AP-282	3.3.1.112	C
Structural Steel	SH, SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A3.TP-302	3.5.1.077	A

<u>Notes for Table 3.5.2-9:</u>

<u>Standard Notes:</u>

A Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.
C Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.
J Neither the component nor the material and environment combination is evaluated in NUREG-1801.

<u>Plant Specific Notes:</u>

1 NUREG-1801 does not provide a line in which fire barriers (ceramic fiber or cementitious coating) are inspected per the Fire Protection program (B2.1.13).

Table 3.5.2-10 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Fuel Building

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Bolting (Structural)	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A5.TP-248	3.5.1.080	A
Bolting (Structural)	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of preload	Structures Monitoring (B2.1.31)	III.A5.TP-261	3.5.1.088	A
Caulking and Sealant	FLB, SH	Elastomer	Atmosphere/ Weather (Structural) (Ext)	Loss of sealing	Structures Monitoring (B2.1.31)	III.A6.TP-7	3.5.1.072	A
Caulking and Sealant	FLB, SH	Elastomer	Buried (Structural) (Ext)	Loss of sealing	Structures Monitoring (B2.1.31)	III.A6.TP-7	3.5.1.072	A
Caulking and Sealant	FLB, SH	Elastomer	Plant Indoor Air (Structural) (Ext)	Loss of sealing	Structures Monitoring (B2.1.31)	III.A6.TP-7	3.5.1.072	A
Compressible Joints and Seals	ES, SH	Elastomer	Atmosphere/ Weather (Structural) (Ext)	Loss of sealing	Structures Monitoring (B2.1.31)	III.A6.TP-7	3.5.1.072	A
Compressible Joints and Seals	ES, SH	Elastomer	Buried (Structural) (Ext)	Loss of sealing	Structures Monitoring (B2.1.31)	III.A6.TP-7	3.5.1.072	A
Compressible Joints and Seals	ES, SH	Elastomer	Plant Indoor Air (Structural) (Ext)	Loss of sealing	Structures Monitoring (B2.1.31)	III.A6.TP-7	3.5.1.072	A
Concrete Elements	FB, MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Loss of material (spalling, scaling) and cracking	Structures Monitoring (B2.1.31)	III.A5.TP-23	3.5.1.064	A
Concrete Elements	FB, MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Increase in porosity and permeability; loss of strength	Structures Monitoring (B2.1.31)	III.A5.TP-24	3.5.1.063	A

Table 3.5.2-10 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Fuel Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Concrete Elements	FB, MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking	Structures Monitoring (B2.1.31)	III.A5.TP-25	3.5.1.054	A
Concrete Elements	FB, MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking; loss of bond; and loss of material (spalling, scaling)	Structures Monitoring (B2.1.31)	III.A5.TP-26	3.5.1.066	A
Concrete Elements	FB, MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Increase in porosity and permeability; cracking; loss of material (spalling, scaling)	Structures Monitoring (B2.1.31)	III.A5.TP-28	3.5.1.067	A
Concrete Elements	FB, MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking, loss of material	Fire Protection (B2.1.13) and Structures Monitoring (B2.1.31)	VII.G.A-92	3.3.1.061	A
Concrete Elements	FB, MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Fire Protection (B2.1.13) and Structures Monitoring (B2.1.31)	VII.G.A-93	3.3.1.062	A

Table 3.5.2-10 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Fuel Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Concrete Elements	FLB, SH, SS	Concrete	Buried (Structural) (Ext)	Increase in porosity and permeability; cracking; loss of material (spalling, scaling)	Structures Monitoring (B2.1.31)	III.A5.TP-29	3.5.1.067	A
Concrete Elements	FLB, SH, SS	Concrete	Buried (Structural) (Ext)	Cracking and distortion	Structures Monitoring (B2.1.31)	III.A5.TP-30	3.5.1.044	A
Concrete Elements	FLB, SH, SS	Concrete	Buried (Structural) (Ext)	Cracking; loss of bond; and loss of material (spalling, scaling)	Structures Monitoring (B2.1.31)	III.A5.TP-212	3.5.1.065	A
Concrete Elements	FB, FLB, SH, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Increase in porosity and permeability; loss of strength	Structures Monitoring (B2.1.31)	III.A5.TP-24	3.5.1.063	A
Concrete Elements	FB, FLB, SH, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking	Structures Monitoring (B2.1.31)	III.A5.TP-25	3.5.1.054	A
Concrete Elements	FB, FLB, SH, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking; loss of bond; and loss of material (spalling, scaling)	Structures Monitoring (B2.1.31)	III.A5.TP-26	3.5.1.066	A

Table 3.5.2-10 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Fuel Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Concrete Elements	FB, FLB, SH, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Increase in porosity and permeability; cracking; loss of material (spalling, scaling)	Structures Monitoring (B2.1.31)	III.A5.TP-28	3.5.1.067	A
Concrete Elements	FB, FLB, SH, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking and distortion	Structures Monitoring (B2.1.31)	III.A5.TP-30	3.5.1.044	A
Concrete Elements	FB, FLB, SH, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Concrete cracking and spalling	Fire Protection (B2.1.13) and Structures Monitoring (B2.1.31)	VII.G.A-90	3.3.1.060	A
Concrete Elements	FB, FLB, SH, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Loss of material	Fire Protection (B2.1.13) and Structures Monitoring (B2.1.31)	VII.G.A-91	3.3.1.062	A
Door	SH	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A5.TP-302	3.5.1.077	A
Door	SH	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A5.TP-302	3.5.1.077	A
Fire Barrier Coatings/ Wraps	FB	Fire Barrier (Cementitious Coating)	Plant Indoor Air (Structural) (Ext)	Cracking, loss of material	Fire Protection (B2.1.13)	None	None	J, 1

Table 3.5.2-10 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Fuel Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Fire Barrier Doors	FB, SH	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A5.TP-302	3.5.1.077	A
Fire Barrier Doors	FB, SH	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Fire Protection (B2.1.13)	VII.G.A-22	3.3.1.059	A
Fire Barrier Doors	FB, SH	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A5.TP-302	3.5.1.077	A
Fire Barrier Doors	FB, SH	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Fire Protection (B2.1.13)	VII.G.A-21	3.3.1.059	A
Fire Barrier Seals	FB	Elastomer	Plant Indoor Air (Structural) (Ext)	Loss of sealing	Structures Monitoring (B2.1.31)	III.A6.TP-7	3.5.1.072	A
Fire Barrier Seals	FB	Elastomer	Plant Indoor Air (Structural) (Ext)	Increased hardness; shrinkage; loss of strength	Fire Protection (B2.1.13)	VII.G.A-19	3.3.1.057	A
Hatch	SH	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A5.TP-302	3.5.1.077	A
High Strength Bolting	SS	High Strength Low Alloy Steel (Bolting)	Plant Indoor Air (Structural) (Ext)	Loss of preload	Structures Monitoring (B2.1.31)	III.A5.TP-261	3.5.1.088	A
High Strength Bolting	SS	High Strength Low Alloy Steel (Bolting)	Plant Indoor Air (Structural) (Ext)	Cracking	Structures Monitoring (B2.1.31)	III.A5.TP-300	3.5.1.069	A

Table 3.5.2-10 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Fuel Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Liner Spent Fuel Pool	SH, SPB	Stainless Steel	Concrete (Structural) (Ext)	None	None	VII.J.AP-19	3.3.1.120	C
Liner Spent Fuel Pool	SH, SPB	Stainless Steel	Plant Indoor Air (Structural) (Ext)	None	None	VII.J.AP-17	3.3.1.120	C
Liner Spent Fuel Pool	SH, SPB	Stainless Steel	Submerged (Structural) (Ext)	Cracking, loss of material	Water Chemistry (B2.1.2) and Monitoring of the Spent Fuel Pool Water Level and leakage from the leak chase channels	III.A5.T-14	3.5.1.078	A
Liner Spent Fuel Pool	SH, SPB	Stainless Steel	Submerged (Structural) (Ext)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	VII.E1.A-57	3.3.1.002	C, 2
Penetrations Electrical	SS	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A5.TP-302	3.5.1.077	A
Penetrations Electrical	SS	Carbon Steel	Concrete (Structural) (Ext)	None	None	VII.J.AP-282	3.3.1.112	C
Penetrations Electrical	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A5.TP-302	3.5.1.077	A
Penetrations Mechanical	SS	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A5.TP-302	3.5.1.077	A

Table 3.5.2-10 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Fuel Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Penetrations Mechanical	SS	Carbon Steel	Concrete (Structural) (Ext)	None	None	VII.J.AP-282	3.3.1.112	C
Penetrations Mechanical	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A5.TP-302	3.5.1.077	A
Roofing Membrane	FLB, SH	Elastomer	Atmosphere/ Weather (Structural) (Ext)	Loss of sealing	Structures Monitoring (B2.1.31)	III.A6.TP-7	3.5.1.072	A
Stairs, Platforms and Grates	SS	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A5.TP-302	3.5.1.077	A
Stairs, Platforms and Grates	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A5.TP-302	3.5.1.077	A
Structural Metals	SH	Aluminum	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.B4.TP-6	3.5.1.093	C
Structural Steel	MB, SH, SS	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A5.TP-302	3.5.1.077	A
Structural Steel	SS	Carbon Steel	Concrete (Structural) (Ext)	None	None	VII.J.AP-282	3.3.1.112	C
Structural Steel	MB, SH, SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.A5.TP-302	3.5.1.077	A

Notes for Table 3.5.2-10:

Standard Note Text

A Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.
C Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.
J Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant Specific Notes:

1 NUREG-1801 does not provide a line in which fire barriers (ceramic fiber or cementitious coating) are inspected per the Fire Protection program (B2.1.13).
2 Fatigue design of the spent fuel pool liner and racks for seismic events is a TLAA as defined by 10 CFR 54.3. TLAAs are evaluated in accordance with 10 CFR 54.21(c)(1). Section 4.3.6 describes the evaluation of these TLAAs for the fatigue design of the spent fuel pool liner and racks.

Table 3.5.2-11 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Essential Service Water Structures

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Bolting (Structural)	SS	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.32)	III.A6.TP-221	3.5.1.083	A
Bolting (Structural)	SS	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of preload	Structures Monitoring (B2.1.31)	III.A6.TP-261	3.5.1.088	A
Bolting (Structural)	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.32)	III.A6.TP-221	3.5.1.083	A
Bolting (Structural)	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of preload	Structures Monitoring (B2.1.31)	III.A6.TP-261	3.5.1.088	A
Bolting (Structural)	SS	Stainless Steel	Plant Indoor Air (Structural) (Ext)	Loss of preload	Structures Monitoring (B2.1.31)	III.A6.TP-261	3.5.1.088	A
Bolting (Structural)	SS	Stainless Steel	Plant Indoor Air (Structural) (Ext)	None	None	VII.J.AP-17	3.3.1.120	C
Caulking and Sealant	FLB, SH	Elastomer	Atmosphere/ Weather (Structural) (Ext)	Loss of sealing	Structures Monitoring (B2.1.31)	III.A6.TP-7	3.5.1.072	A
Caulking and Sealant	FLB, SH	Elastomer	Buried (Structural) (Ext)	Loss of sealing	Structures Monitoring (B2.1.31)	III.A6.TP-7	3.5.1.072	A

Table 3.5.2-11 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Essential Service Water Structures (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Caulking and Sealant	FLB, SH	Elastomer	Plant Indoor Air (Structural) (Ext)	Loss of sealing	Structures Monitoring (B2.1.31)	III.A6.TP-7	3.5.1.072	A
Compressible Joints and Seals	SH	Elastomer	Atmosphere/ Weather (Structural) (Ext)	Loss of sealing	Structures Monitoring (B2.1.31)	III.A6.TP-7	3.5.1.072	A
Compressible Joints and Seals	SH	Elastomer	Buried (Structural) (Ext)	Loss of sealing	Structures Monitoring (B2.1.31)	III.A6.TP-7	3.5.1.072	A
Compressible Joints and Seals	SH	Elastomer	Plant Indoor Air (Structural) (Ext)	Loss of sealing	Structures Monitoring (B2.1.31)	III.A6.TP-7	3.5.1.072	A
Concrete Block (Masonry Walls)	SH, SS	Concrete Block (Masonry Walls)	Plant Indoor Air (Structural) (Ext)	Cracking	Masonry Walls (B2.1.30)	III.A6.T-12	3.5.1.070	A
Concrete Elements	FB, MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Loss of material	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.32)	III.A6.T-20	3.5.1.056	A

Table 3.5.2-11 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Essential Service Water Structures (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Concrete Elements	FB, MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Loss of material (spalling, scaling) and cracking	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.32)	III.A6.TP-36	3.5.1.060	A
Concrete Elements	FB, MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Increase in porosity and permeability; loss of strength	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.32)	III.A6.TP-37	3.5.1.061	A
Concrete Elements	FB, MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking; loss of bond; and loss of material (spalling, scaling)	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.32)	III.A6.TP-38	3.5.1.059	A
Concrete Elements	FB, MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking, loss of material	Fire Protection (B2.1.13) and Structures Monitoring (B2.1.31)	VII.G.A-92	3.3.1.061	A
Concrete Elements	FB, MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Fire Protection (B2.1.13) and Structures Monitoring (B2.1.31)	VII.G.A-93	3.3.1.062	A

Table 3.5.2-11 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Essential Service Water Structures (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Concrete Elements	FLB, SH, SS	Concrete	Buried (Structural) (Ext)	Cracking and distortion	Structures Monitoring (B2.1.31)	III.A6.TP-30	3.5.1.044	A
Concrete Elements	FLB, SH, SS	Concrete	Buried (Structural) (Ext)	Cracking; loss of bond; and loss of material (spalling, scaling)	Structures Monitoring (B2.1.31)	III.A6.TP-104	3.5.1.065	A
Concrete Elements	FLB, SH, SS	Concrete	Buried (Structural) (Ext)	Increase in porosity and permeability; cracking; loss of material (spalling, scaling)	Structures Monitoring (B2.1.31)	III.A6.TP-107	3.5.1.067	A
Concrete Elements	FB, FLB, SH, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Loss of material	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.32)	III.A6.T-20	3.5.1.056	A
Concrete Elements	FB, FLB, SH, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking and distortion	Structures Monitoring (B2.1.31)	III.A6.TP-30	3.5.1.044	A
Concrete Elements	FB, FLB, SH, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Increase in porosity and permeability; loss of strength	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.32)	III.A6.TP-37	3.5.1.061	A

Table 3.5.2-11 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Essential Service Water Structures (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Concrete Elements	FB, FLB, SH, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking; loss of bond; and loss of material (spalling, scaling)	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.32)	III.A6.TP-38	3.5.1.059	A
Concrete Elements	FB, FLB, SH, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Concrete cracking and spalling	Fire Protection (B2.1.13) and Structures Monitoring (B2.1.31)	VII.G.A-90	3.3.1.060	A
Concrete Elements	FB, FLB, SH, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Loss of material	Fire Protection (B2.1.13) and Structures Monitoring (B2.1.31)	VII.G.A-91	3.3.1.062	A
Concrete Elements	SH, SS	Concrete	Submerged (Structural) (Ext)	Loss of material	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.32)	III.A6.T-20	3.5.1.056	A
Concrete Elements	SH, SS	Concrete	Submerged (Structural) (Ext)	Increase in porosity and permeability; loss of strength	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.32)	III.A6.TP-37	3.5.1.061	A

Table 3.5.2-11 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Essential Service Water Structures (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Dams and Dikes	HS, SH	Earthfill (rip-rap, stone, soil)	Atmosphere/ Weather (Structural) (Ext)	Loss of material; loss of form	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.32)	III.A6.T-22	3.5.1.058	A
Dams and Dikes	HS, SH	Earthfill (rip-rap, stone, soil)	Submerged (Structural) (Ext)	Loss of material; loss of form	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.32)	III.A6.T-22	3.5.1.058	A
Door	MB, SH	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.32)	III.A6.TP-221	3.5.1.083	C
Door	MB, SH	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.32)	III.A6.TP-221	3.5.1.083	C
Fan Stack	SH	Fiberglass Reinforced Plastic	Atmosphere/ Weather (Structural) (Ext)	Cracking, blistering, change in color	Structures Monitoring (B2.1.31)	None	None	F

Table 3.5.2-11 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Essential Service Water Structures (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Fire Barrier Doors	FB, SH	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.32)	III.A6.TP-221	3.5.1.083	C
Fire Barrier Doors	FB, SH	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Fire Protection (B2.1.13)	VII.G.A-22	3.3.1.059	A
Fire Barrier Doors	FB, SH	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.32)	III.A6.TP-221	3.5.1.083	C
Fire Barrier Doors	FB, SH	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Fire Protection (B2.1.13)	VII.G.A-21	3.3.1.059	A
Fire Barrier Seals	FB	Elastomer	Atmosphere/ Weather (Structural) (Ext)	Loss of sealing	Structures Monitoring (B2.1.31)	III.A6.TP-7	3.5.1.072	A
Fire Barrier Seals	FB	Elastomer	Atmosphere/ Weather (Structural) (Ext)	Increased hardness; shrinkage; loss of strength	Fire Protection (B2.1.13)	VII.G.A-20	3.3.1.057	A
Fire Barrier Seals	FB	Elastomer	Plant Indoor Air (Structural) (Ext)	Loss of sealing	Structures Monitoring (B2.1.31)	III.A6.TP-7	3.5.1.072	A

Table 3.5.2-11 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Essential Service Water Structures (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Fire Barrier Seals	FB	Elastomer	Plant Indoor Air (Structural) (Ext)	Increased hardness; shrinkage; loss of strength	Fire Protection (B2.1.13)	VII.G.A-19	3.3.1.057	A
Hatch	MB, SH, SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.32)	III.A6.TP-221	3.5.1.083	C
Hatch	MB, SH, SS	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.32)	III.A6.TP-221	3.5.1.083	C
Hatches and Plugs	MB, SH	Concrete	Atmosphere/ Weather (Structural) (Ext)	Loss of material (spalling, scaling) and cracking	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.32)	III.A6.TP-36	3.5.1.060	A

Table 3.5.2-11 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Essential Service Water Structures (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Hatches and Plugs	MB, SH	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking; loss of bond; and loss of material (spalling, scaling)	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.32)	III.A6.TP-38	3.5.1.059	A
Hatches and Plugs	MB, SH	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking; loss of bond; and loss of material (spalling, scaling)	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.32)	III.A6.TP-38	3.5.1.059	A
Penetrations Electrical	SS	Carbon Steel	Concrete (Structural) (Ext)	None	None	VII.J.AP-282	3.3.1.112	C
Penetrations Electrical	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.32)	III.A6.TP-221	3.5.1.083	C
Penetrations Mechanical	SS	Carbon Steel	Concrete (Structural) (Ext)	None	None	VII.J.AP-282	3.3.1.112	C

Table 3.5.2-11 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Essential Service Water Structures (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Penetrations Mechanical	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.32)	III.A6.TP-221	3.5.1.083	C
Roofing Membrane	FLB, SH	Elastomer	Atmosphere/ Weather (Structural) (Ext)	Loss of sealing	Structures Monitoring (B2.1.31)	III.A6.TP-7	3.5.1.072	A
Stairs, Platforms and Grates	SS	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.32)	III.A6.TP-221	3.5.1.083	C
Stairs, Platforms and Grates	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.32)	III.A6.TP-221	3.5.1.083	C
Structural Steel	MB, SH, SS	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.32)	III.A6.TP-221	3.5.1.083	C

Table 3.5.2-11 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Essential Service Water Structures (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Structural Steel	SS	Carbon Steel	Concrete (Structural) (Ext)	None	None	VII.J.AP-282	3.3.1.112	C
Structural Steel	SH, SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.32)	III.A6.TP-221	3.5.1.083	C
Structural Steel	SS	Carbon Steel	Submerged (Structural) (Ext)	Loss of material	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.32)	III.A6.TP-221	3.5.1.083	C
Structural Steel	SS	Stainless Steel	Concrete (Structural) (Ext)	None	None	VII.J.AP-19	3.3.1.120	C
Structural Steel	SS	Stainless Steel	Plant Indoor Air (Structural) (Ext)	None	None	VII.J.AP-17	3.3.1.120	C
Structural Steel	SS	Stainless Steel	Submerged (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	None	None	G

Notes for Table 3.5.2-11:

Standard Notes:

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

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

F Material not in NUREG-1801 for this component.

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

Plant Specific Notes:

None

Table 3.5.2-12 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Supports

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Bolting (Structural)	SS	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of preload	ASME Section XI, Subsection IWF (B2.1.28)	III.B1.2.TP-229	3.5.1.087	A
Bolting (Structural)	SS	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	ASME Section XI, Subsection IWF (B2.1.28)	III.B1.2.TP-235	3.5.1.086	A
Bolting (Structural)	SS	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of preload	Structures Monitoring (B2.1.31)	III.B2.TP-261	3.5.1.088	A
Bolting (Structural)	SS	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.B2.TP-274	3.5.1.082	A
Bolting (Structural)	SS	Carbon Steel	Borated Water Leakage (Ext)	Loss of material	Boric Acid Corrosion (B2.1.4)	III.B1.1.T-25	3.5.1.089	A
Bolting (Structural)	SS	Carbon Steel	Borated Water Leakage (Ext)	Loss of preload	ASME Section XI, Subsection IWF (B2.1.28)	III.B1.1.TP-229	3.5.1.087	A
Bolting (Structural)	SS	Carbon Steel	Borated Water Leakage (Ext)	Loss of material	Boric Acid Corrosion (B2.1.4)	III.B1.2.T-25	3.5.1.089	A
Bolting (Structural)	SS	Carbon Steel	Borated Water Leakage (Ext)	Loss of preload	ASME Section XI, Subsection IWF (B2.1.28)	III.B1.2.TP-229	3.5.1.087	A

Table 3.5.2-12 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Supports (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Bolting (Structural)	SS	Carbon Steel	Borated Water Leakage (Ext)	Loss of material	Boric Acid Corrosion (B2.1.4)	III.B2.T-25	3.5.1.089	A
Bolting (Structural)	SS	Carbon Steel	Borated Water Leakage (Ext)	Loss of preload	Structures Monitoring (B2.1.31)	III.B2.TP-261	3.5.1.088	A
Bolting (Structural)	SS	Carbon Steel	Borated Water Leakage (Ext)	Loss of material	Boric Acid Corrosion (B2.1.4)	III.B4.T-25	3.5.1.089	A
Bolting (Structural)	SS	Carbon Steel	Borated Water Leakage (Ext)	Loss of preload	Structures Monitoring (B2.1.31)	III.B4.TP-261	3.5.1.088	A
Bolting (Structural)	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	ASME Section XI, Subsection IWF (B2.1.28)	III.B1.1.TP-226	3.5.1.081	A
Bolting (Structural)	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of preload	ASME Section XI, Subsection IWF (B2.1.28)	III.B1.1.TP-229	3.5.1.087	A
Bolting (Structural)	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	ASME Section XI, Subsection IWF (B2.1.28)	III.B1.2.TP-226	3.5.1.081	A
Bolting (Structural)	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of preload	ASME Section XI, Subsection IWF (B2.1.28)	III.B1.2.TP-229	3.5.1.087	A
Bolting (Structural)	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.B2.TP-248	3.5.1.080	A

Table 3.5.2-12 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Supports (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Bolting (Structural)	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of preload	Structures Monitoring (B2.1.31)	III.B2.TP-261	3.5.1.088	A
Bolting (Structural)	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.B3.TP-248	3.5.1.080	A
Bolting (Structural)	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of preload	Structures Monitoring (B2.1.31)	III.B3.TP-261	3.5.1.088	A
Bolting (Structural)	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.B4.TP-248	3.5.1.080	A
Bolting (Structural)	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of preload	Structures Monitoring (B2.1.31)	III.B4.TP-261	3.5.1.088	A
Bolting (Structural)	SS	Stainless Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of preload	ASME Section XI, Subsection IWF (B2.1.28)	III.B1.2.TP-229	3.5.1.087	A
Bolting (Structural)	SS	Stainless Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.B2.TP-6	3.5.1.093	A

Table 3.5.2-12 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Supports (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Bolting (Structural)	SS	Stainless Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of preload	Structures Monitoring (B2.1.31)	III.B2.TP-261	3.5.1.088	A
Bolting (Structural)	SS	Stainless Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	ASME Section XI, Subsection IWF (B2.1.28)	III.B4.TP-6	3.5.1.093	E, 2
Bolting (Structural)	SS	Stainless Steel	Borated Water Leakage (Ext)	None	None	III.B1.1.TP-4	3.5.1.095	A
Bolting (Structural)	SS	Stainless Steel	Borated Water Leakage (Ext)	Loss of preload	ASME Section XI, Subsection IWF (B2.1.28)	III.B1.1.TP-229	3.5.1.087	A
Bolting (Structural)	SS	Stainless Steel	Borated Water Leakage (Ext)	None	None	III.B1.2.TP-4	3.5.1.095	A
Bolting (Structural)	SS	Stainless Steel	Borated Water Leakage (Ext)	Loss of preload	ASME Section XI, Subsection IWF (B2.1.28)	III.B1.2.TP-229	3.5.1.087	A
Bolting (Structural)	SS	Stainless Steel	Borated Water Leakage (Ext)	None	None	III.B2.TP-4	3.5.1.095	A
Bolting (Structural)	SS	Stainless Steel	Borated Water Leakage (Ext)	Loss of preload	Structures Monitoring (B2.1.31)	III.B2.TP-261	3.5.1.088	A
Bolting (Structural)	SS	Stainless Steel	Borated Water Leakage (Ext)	None	None	III.B4.TP-4	3.5.1.095	A
Bolting (Structural)	SS	Stainless Steel	Borated Water Leakage (Ext)	Loss of preload	Structures Monitoring (B2.1.31)	III.B4.TP-261	3.5.1.088	A

Table 3.5.2-12 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Supports (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Bolting (Structural)	SS	Stainless Steel	Plant Indoor Air (Structural) (Ext)	None	None	III.B1.1.TP-8	3.5.1.095	A
Bolting (Structural)	SS	Stainless Steel	Plant Indoor Air (Structural) (Ext)	Loss of preload	ASME Section XI, Subsection IWF (B2.1.28)	III.B1.1.TP-229	3.5.1.087	A
Bolting (Structural)	SS	Stainless Steel	Plant Indoor Air (Structural) (Ext)	None	None	III.B1.2.TP-8	3.5.1.095	A
Bolting (Structural)	SS	Stainless Steel	Plant Indoor Air (Structural) (Ext)	Loss of preload	ASME Section XI, Subsection IWF (B2.1.28)	III.B1.2.TP-229	3.5.1.087	A
Bolting (Structural)	SS	Stainless Steel	Plant Indoor Air (Structural) (Ext)	None	None	III.B2.TP-8	3.5.1.095	A
Bolting (Structural)	SS	Stainless Steel	Plant Indoor Air (Structural) (Ext)	Loss of preload	Structures Monitoring (B2.1.31)	III.B2.TP-261	3.5.1.088	A
Bolting (Structural)	SS	Stainless Steel	Plant Indoor Air (Structural) (Ext)	None	None	III.B4.TP-8	3.5.1.095	A
Bolting (Structural)	SS	Stainless Steel	Plant Indoor Air (Structural) (Ext)	Loss of preload	Structures Monitoring (B2.1.31)	III.B4.TP-261	3.5.1.088	A

Table 3.5.2-12 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Supports (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Cable Trays and Supports	SS	Carbon Steel	Plant Indoor Air (Ext)	Cumulative fatigue damage	Time-Limited Aging Analysis evaluated for the period of extended operation	III.B1.1.T-26	3.5.1.053	A
Cable Trays and Supports	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.B2.TP-43	3.5.1.092	A
Cable Trays and Supports	SS	Concrete	Plant Indoor Air (Structural) (Ext)	Reduction in concrete anchor capacity	Structures Monitoring (B2.1.31)	III.B2.TP-42	3.5.1.055	A
Conduit And Supports	SH, SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.B2.TP-43	3.5.1.092	A
Conduit And Supports	SS	Concrete	Plant Indoor Air (Structural) (Ext)	Reduction in concrete anchor capacity	Structures Monitoring (B2.1.31)	III.B2.TP-42	3.5.1.055	A
Electrical Panels and Enclosures	SH, SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.B3.TP-43	3.5.1.092	A
Electrical Panels and Enclosures	SS	Concrete	Plant Indoor Air (Structural) (Ext)	Reduction in concrete anchor capacity	Structures Monitoring (B2.1.31)	III.B3.TP-42	3.5.1.055	A
High Strength Bolting	SS	High Strength Low Alloy Steel (Bolting)	Plant Indoor Air (Structural) (Ext)	Cracking	ASME Section XI, Subsection IWF (B2.1.28)	III.B1.1.TP-41	3.5.1.068	A

Table 3.5.2-12 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Supports (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
High Strength Bolting	SS	High Strength Low Alloy Steel (Bolting)	Plant Indoor Air (Structural) (Ext)	Loss of preload	ASME Section XI, Subsection IWF (B2.1.28)	III.B1.1.TP-229	3.5.1.087	A
High Strength Bolting	SS	High Strength Low Alloy Steel (Bolting)	Plant Indoor Air (Structural) (Ext)	Loss of preload	Structures Monitoring (B2.1.31)	III.B2.TP-261	3.5.1.088	A
High Strength Bolting	SS	High Strength Low Alloy Steel (Bolting)	Plant Indoor Air (Structural) (Ext)	Cracking	Structures Monitoring (B2.1.31)	III.B2.TP-300	3.5.1.069	A
High Strength Bolting	SS	High Strength Low Alloy Steel (Bolting)	Plant Indoor Air (Structural) (Ext)	Loss of preload	Structures Monitoring (B2.1.31)	III.B3.TP-261	3.5.1.088	A
High Strength Bolting	SS	High Strength Low Alloy Steel (Bolting)	Plant Indoor Air (Structural) (Ext)	Cracking	Structures Monitoring (B2.1.31)	III.B3.TP-300	3.5.1.069	A
High Strength Bolting	SS	High Strength Low Alloy Steel (Bolting)	Plant Indoor Air (Structural) (Ext)	Loss of preload	Structures Monitoring (B2.1.31)	III.B4.TP-261	3.5.1.088	A
High Strength Bolting	SS	High Strength Low Alloy Steel (Bolting)	Plant Indoor Air (Structural) (Ext)	Cracking	Structures Monitoring (B2.1.31)	III.B4.TP-300	3.5.1.069	A
Instrument Panels and Racks	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.B3.TP-43	3.5.1.092	A

Table 3.5.2-12 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Supports (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Instrument Panels and Racks	SS	Concrete	Plant Indoor Air (Structural) (Ext)	Reduction in concrete anchor capacity	Structures Monitoring (B2.1.31)	III.B3.TP-42	3.5.1.055	A
Spring Hangers/ Sliding Surfaces	ES, SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of mechanical function and Fatigue	ASME Section XI, Subsection IWF (B2.1.28)	III.B1.1.T-28	3.5.1.057	A
Spring Hangers/ Sliding Surfaces	ES, SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of mechanical function and Fatigue	ASME Section XI, Subsection IWF (B2.1.28)	III.B1.2.T-28	3.5.1.057	A
Spring Hangers/ Sliding Surfaces	ES, SS	Lubrite	Plant Indoor Air (Structural) (Ext)	Loss of mechanical function	ASME Section XI, Subsection IWF (B2.1.28)	III.B1.1.TP-45	3.5.1.075	A
Spring Hangers/ Sliding Surfaces	ES, SS	Lubrite	Plant Indoor Air (Structural) (Ext)	Loss of mechanical function	ASME Section XI, Subsection IWF (B2.1.28)	III.B1.2.TP-45	3.5.1.075	A
Spring Hangers/ Sliding Surfaces	ES, SS	Lubrite	Plant Indoor Air (Structural) (Ext)	Loss of mechanical function	Structures Monitoring (B2.1.31)	III.B2.TP-46	3.5.1.074	A
Supports ASME 1	SS	Carbon Steel	Borated Water Leakage (Ext)	Loss of material	Boric Acid Corrosion (B2.1.4)	III.B1.1.T-25	3.5.1.089	A

Table 3.5.2-12 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Supports (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Supports ASME 1	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	ASME Section XI, Subsection IWF (B2.1.28)	III.B1.1.T-24	3.5.1.091	A
Supports ASME 1	SS	Concrete	Plant Indoor Air (Structural) (Ext)	Reduction in concrete anchor capacity	Structures Monitoring (B2.1.31)	III.B1.1.TP-42	3.5.1.055	A
Supports ASME 1	SS	Stainless Steel	Borated Water Leakage (Ext)	None	None	III.B1.1.TP-4	3.5.1.095	A
Supports ASME 1	SS	Stainless Steel	Plant Indoor Air (Structural) (Ext)	None	None	III.B1.1.TP-8	3.5.1.095	A
Supports ASME 2 and 3	SS	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	ASME Section XI, Subsection IWF (B2.1.28)	III.B1.2.T-24	3.5.1.091	A
Supports ASME 2 and 3	SS	Carbon Steel	Borated Water Leakage (Ext)	Loss of material	Boric Acid Corrosion (B2.1.4)	III.B1.2.T-25	3.5.1.089	A
Supports ASME 2 and 3	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	ASME Section XI, Subsection IWF (B2.1.28)	III.B1.2.T-24	3.5.1.091	A
Supports ASME 2 and 3	SS	Carbon Steel	Submerged (Structural) (Ext)	Loss of material	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.32)	III.A6.TP-221	3.5.1.083	C

Table 3.5.2-12 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Supports (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Supports ASME 2 and 3	SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Reduction in concrete anchor capacity	Structures Monitoring (B2.1.31)	III.B1.2.TP-42	3.5.1.055	A
Supports ASME 2 and 3	SS	Concrete	Plant Indoor Air (Structural) (Ext)	Reduction in concrete anchor capacity	Structures Monitoring (B2.1.31)	III.B1.2.TP-42	3.5.1.055	A
Supports ASME 2 and 3	SS	Stainless Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	ASME Section XI, Subsection IWF (B2.1.28)	III.B4.TP-6	3.5.1.093	E, 1
Supports ASME 2 and 3	SS	Stainless Steel	Borated Water Leakage (Ext)	None	None	III.B1.2.TP-4	3.5.1.095	A
Supports ASME 2 and 3	SS	Stainless Steel	Plant Indoor Air (Structural) (Ext)	None	None	III.B1.2.TP-8	3.5.1.095	A
Supports HVAC Duct	SS	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.B2.TP-43	3.5.1.092	A
Supports HVAC Duct	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.B2.TP-43	3.5.1.092	A

Table 3.5.2-12 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Supports (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Supports HVAC Duct	SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Reduction in concrete anchor capacity	Structures Monitoring (B2.1.31)	III.B2.TP-42	3.5.1.055	A
Supports HVAC Duct	SS	Concrete	Plant Indoor Air (Structural) (Ext)	Reduction in concrete anchor capacity	Structures Monitoring (B2.1.31)	III.B2.TP-42	3.5.1.055	A
Supports HVAC Duct	SS	Stainless Steel	Plant Indoor Air (Structural) (Ext)	None	None	III.B2.TP-8	3.5.1.095	A
Supports Instrument	SS	Carbon Steel	Borated Water Leakage (Ext)	Loss of material	Boric Acid Corrosion (B2.1.4)	III.B2.T-25	3.5.1.089	A
Supports Instrument	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.B2.TP-43	3.5.1.092	A
Supports Instrument	SS	Concrete	Plant Indoor Air (Structural) (Ext)	Reduction in concrete anchor capacity	Structures Monitoring (B2.1.31)	III.B2.TP-42	3.5.1.055	A
Supports Instrument	SS	Stainless Steel	Borated Water Leakage (Ext)	None	None	III.B2.TP-4	3.5.1.095	A
Supports Instrument	SS	Stainless Steel	Plant Indoor Air (Structural) (Ext)	None	None	III.B2.TP-8	3.5.1.095	A
Supports Insulation	SS	Stainless Steel	Plant Indoor Air (Structural) (Ext)	None	None	III.B2.TP-8	3.5.1.095	A

Table 3.5.2-12 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Supports (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Supports Mech Equip Class 1	SS	Carbon Steel	Borated Water Leakage (Ext)	Loss of material	Boric Acid Corrosion (B2.1.4)	III.B1.1.T-25	3.5.1.089	A
Supports Mech Equip Class 1	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	ASME Section XI, Subsection IWF (B2.1.28)	III.B1.1.T-24	3.5.1.091	A
Supports Mech Equip Class 1	SS	Concrete	Plant Indoor Air (Structural) (Ext)	Reduction in concrete anchor capacity	Structures Monitoring (B2.1.31)	III.B1.1.TP-42	3.5.1.055	A
Supports Mech Equip Class 1	SS	Stainless Steel	Borated Water Leakage (Ext)	None	None	III.B1.1.TP-4	3.5.1.095	A
Supports Mech Equip Class 1	SS	Stainless Steel	Plant Indoor Air (Structural) (Ext)	None	None	III.B1.1.TP-8	3.5.1.095	A
Supports Mech Equip Class 2 and 3	SS	Carbon Steel	Borated Water Leakage (Ext)	Loss of material	Boric Acid Corrosion (B2.1.4)	III.B1.2.T-25	3.5.1.089	A
Supports Mech Equip Class 2 and 3	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	ASME Section XI, Subsection IWF (B2.1.28)	III.B1.2.T-24	3.5.1.091	A
Supports Mech Equip Class 2 and 3	SS	Concrete	Plant Indoor Air (Structural) (Ext)	Reduction in concrete anchor capacity	Structures Monitoring (B2.1.31)	III.B1.2.TP-42	3.5.1.055	A
Supports Mech Equip Class 2 and 3	SS	Stainless Steel	Borated Water Leakage (Ext)	None	None	III.B1.2.TP-4	3.5.1.095	A

Table 3.5.2-12 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Supports (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Supports Mech Equip Class 2 and 3	SS	Stainless Steel	Plant Indoor Air (Structural) (Ext)	None	None	III.B1.2.TP-8	3.5.1.095	A
Supports Mech Equip Non ASME	SS	Carbon Steel	Borated Water Leakage (Ext)	Loss of material	Boric Acid Corrosion (B2.1.4)	III.B4.T-25	3.5.1.089	A
Supports Mech Equip Non ASME	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.B4.TP-43	3.5.1.092	A
Supports Mech Equip Non ASME	SS	Concrete	Plant Indoor Air (Structural) (Ext)	Reduction in concrete anchor capacity	Structures Monitoring (B2.1.31)	III.B4.TP-42	3.5.1.055	A
Supports Mech Equip Non ASME	SS	Stainless Steel	Borated Water Leakage (Ext)	None	None	III.B4.TP-4	3.5.1.095	A
Supports Mech Equip Non ASME	SS	Stainless Steel	Plant Indoor Air (Structural) (Ext)	None	None	III.B4.TP-8	3.5.1.095	A
Supports Non ASME	SS	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.B2.TP-43	3.5.1.092	A
Supports Non ASME	SS	Carbon Steel	Borated Water Leakage (Ext)	Loss of material	Boric Acid Corrosion (B2.1.4)	III.B2.T-25	3.5.1.089	A

Table 3.5.2-12 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation – Supports (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Supports Non ASME	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.B2.TP-43	3.5.1.092	A
Supports Non ASME	SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Reduction in concrete anchor capacity	Structures Monitoring (B2.1.31)	III.B2.TP-42	3.5.1.055	A
Supports Non ASME	SS	Concrete	Plant Indoor Air (Structural) (Ext)	Reduction in concrete anchor capacity	Structures Monitoring (B2.1.31)	III.B2.TP-42	3.5.1.055	A
Supports Non ASME	SS	Stainless Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring (B2.1.31)	III.B2.TP-6	3.5.1.093	A
Supports Non ASME	SS	Stainless Steel	Borated Water Leakage (Ext)	None	None	III.B2.TP-4	3.5.1.095	A
Supports Non ASME	SS	Stainless Steel	Plant Indoor Air (Structural) (Ext)	None	None	III.B2.TP-8	3.5.1.095	A

Notes for Table 3.5.2-12:

Standard Notes:

A	Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.
C	Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.
E	Consistent with NUREG-1801 for material, environment, and aging effect, but a different aging management program is credited or NUREG-1801 identifies a plant-specific aging management program.

Plant Specific Notes:

1	NUREG-1801 does not provide a line to evaluate stainless steel components outdoors under the ASME Section XI, Subsection IWF program (B2.1.29).
2	NUREG-1801 does not provide a line in Chapter III.B1.2 to evaluate a stainless steel component in an air-outdoor environment.

3.6 AGING MANAGEMENT OF ELECTRICAL AND INSTRUMENTATION AND CONTROLS

3.6.1 Introduction

Section 3.6 provides the results of the aging management reviews (AMRs) for those component types identified in Section 2.5, *Scoping and Screening Results – Electrical and Instrumentation and Control Systems*, subject to AMR. The electrical component types subject to AMR are discussed in the following sections:

- Cable connections (metallic parts)
- Connectors
- High voltage insulators
- Insulated cable and connections (includes the following):
  - Electrical cables and connections not subject to 10 CFR 50.49 EQ requirements
  - Electrical cables and connections not subject to 10 CFR 50.49 EQ requirements used in instrumentation circuits that are sensitive to reduction in conductor insulation resistance
  - Inaccessible power cables not subject to 10 CFR 50.49 EQ requirements
- Switchyard bus and connections
- Terminal Blocks
- Transmission conductors
- Transmission connections
- Electrical equipment subject to 10 CFR 50.49 environmental qualification (EQ) requirements
- Metal enclosed bus (including the following):
  - Bus and connections
  - Enclosure
  - Insulation and insulators

Table 3.6-1, *Summary of Aging Management Programs in Chapter VI of NUREG-1801 for Electrical Components*, provides the summary of the programs evaluated in NUREG-1801 that are applicable to component types in this section. Table 3.6-1 uses the format of Table 1 described in Section 3.0, *Aging Management Review*.

3.6.2 Results

The following table summarizes the results of the AMR for the component types in the Electrical and Instrumentation and Controls area.

- Table 3.6.2-1, *Electrical and Instrumentation and Controls – Summary of Aging Management Evaluation – Electrical Components*

This table uses the format of Table 2 discussed in Section 3.0, *Aging Management Review*.

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

The materials from which the component types are fabricated, the environments to which they are exposed, the potential aging effects requiring management, and the aging management programs used to manage these aging effects are provided for each of the above electrical component commodities in the following sections.

3.6.2.1.1 Cable Connections (metallic parts)

Materials

The material of construction for the cable connections (metallic parts) is:

- Various Metals Used For Electrical Contacts

Environment

The cable connections (metallic parts) are exposed to the following environments:

- Atmosphere/ Weather
- Plant Indoor Air

Aging Effects Requiring Management

The following cable connections (metallic parts) aging effect requires management:

- Increased resistance of connection

Aging Management Programs

The following aging management program manages the aging effects for the cable connections (metallic parts):

- Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (B2.1.37)

3.6.2.1.2 Connectors

Materials

The material of construction for the connectors is:

- Various Metals Used For Electrical Contacts

Environment

The connectors are exposed to the following environment:

- Borated Water Leakage

Aging Effects Requiring Management

The following connectors aging effect requires management:

- Increased resistance of connection

Aging Management Programs

The following aging management program manages the aging effects for the connectors:

- Boric Acid Corrosion (B2.1.4)

3.6.2.1.3 High Voltage Insulators

Materials

The materials of construction for the high voltage insulators are:

- Carbon Steel (Galvanized)
- Cement (Electrical Insulators)
- Porcelain

Environment

The high voltage insulators are exposed to the following environment:

- Atmosphere/ Weather

Aging Effects Requiring Management

The following high voltage insulator aging effect requires management:

- None

Aging Management Programs

The following aging management program manages the aging effects for the high voltage insulators:

- None

3.6.2.1.4 Insulated Cable and Connections

3.6.2.1.4.1 Electrical cables and connections not subject to 10 CFR 50.49 environmental qualification requirements

Materials

The materials of construction for the electrical cable and connections not subject to 10 CFR 50.49 environmental qualification requirements are:

- Various Organic Polymers

Environment

The electrical cable and connections not subject to 10 CFR 50.49 environmental qualification requirements are exposed to the following environment:

- Adverse Localized Environment

Aging Effects Requiring Management

The following electrical cable and connections not subject to 10 CFR 50.49 environmental qualification requirements aging effects require management:

- Reduced insulation resistance

Aging Management Programs

The following aging management program manages the aging effects for the cable and connections not subject to 10 CFR 50.49 environmental qualification requirements:

- Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (B2.1.34)

3.6.2.1.4.2 Inaccessible Power Cables not subject to 10 CFR 50.49 environmental qualification requirements

Materials

The materials of construction for the inaccessible power cables not subject to 10 CFR 50.49 environmental qualification requirements are:

- Various Organic Polymers

Environment

The inaccessible power cables not subject to 10 CFR 50.49 environmental qualification requirements are exposed to the following environment:

- Adverse Localized Environment

Aging Effects Requiring Management

The following inaccessible power cables not subject to 10 CFR 50.49 environmental qualification requirements aging effects require management:

- Reduced insulation resistance

Aging Management Programs

The following aging management program manages the inaccessible power cables not subject to 10 CFR 50.49 EQ requirements:

- Inaccessible Power Cables Not Subject to 10 CFR 50.49 EQ Requirements (B2.1.36)

3.6.2.1.5 Switchyard Bus and Connections

Materials

The materials of construction for the switchyard bus and connections are:

- Aluminum
- Carbon Steel (Galvanized)
- Stainless Steel

Environment

The switchyard bus and connections are exposed to the following environment:

- Atmosphere/ Weather

Aging Effects Requiring Management

The following switchyard bus and connections aging effect requires management:

- None

Aging Management Programs

The following aging management program manages the switchyard bus and connections:

- None

3.6.2.1.6 Terminal Block

Materials

The material of construction for the terminal block is:

- Various Organic Polymers

Environment

The terminal blocks are exposed to the following environment:

- Adverse Localized Environment

Aging Effects Requiring Management

The following terminal blocks aging effect requires management:

- Reduced insulation resistance

Aging Management Programs

The following aging management program manages the aging effects for the terminal blocks:

- Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (B2.1.34)

3.6.2.1.7 Transmission Conductors

Materials

The materials of construction for the transmission conductors are:

- Aluminum

- Aluminum Conductor Steel Reinforced

Environment

The transmission conductors are exposed to the following environment:

- Atmosphere/ Weather

Aging Effects Requiring Management

The following transmission conductors aging effects require management:

- None

Aging Management Programs

The following aging management program manages the aging effects for the transmission conductors:

- None

3.6.2.1.8 Transmission Connections

Materials

The material of construction for the transmission connections is:

- Stainless Steel

Environment

The transmission connections are exposed to the following environment:

- Atmosphere/ Weather

Aging Effects Requiring Management

The following transmission connections aging effects require management:

- None

Aging Management Programs

The following aging management program manages the aging effects for the transmission connections:

- None

3.6.2.1.9 Metal Enclosed Bus

Materials

The materials of construction for the metal enclosed bus are:

- Aluminum
- Carbon Steel
- Carbon Steel (Galvanized)
- Elastomer
- Porcelain
- Various Insulation Material (Electrical)
- Various Metals Used for Electrical Contacts

Environment

The metal enclosed bus is exposed to the following environment:

- Atmosphere/ Weather
- Plant Indoor Air

Aging Effects Requiring Management

The following metal enclosed bus aging effects require management:

- Surface cracking, crazing, scuffing, dimensional change (e.g., “ballooning” and “necking”), shrinkage, discoloration, hardening and loss of strength
- Increased resistance of connection
- Reduced insulation resistance
- Loss of material

Aging Management Programs

The following aging management program manages the aging effects for the metal enclosed bus:

- Metal Enclosed Bus (B2.1.39)

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

NUREG-1801 provides the basis for identifying those programs that warrant further evaluation. For the electrical and control systems, those evaluations are addressed in the following sections.

3.6.2.2.1 Electrical Equipment Subject to Environmental Qualification

The Callaway Environmental Qualification (EQ) of Electric Components program (B3.2) meets requirements of 10 CFR 50.49. Aging evaluations that qualify components to at least the end of the current licensed operating period are TLAAs. Section 4.4 describes the evaluation of these TLAAs.

3.6.2.2.2 Reduced Insulation Resistance due to Presence of Any Salt Deposits and Surface Contamination, and Loss of Material due to Mechanical Wear Caused by Wind Blowing on Transmission Conductors

Callaway Plant is located in an area with moderate rainfall and where the outdoor environment is not subject to industry air pollution or salt spray. Contamination buildup on the high-voltage insulators is not a problem due to sufficient rainfall periodically washing the insulators. Additionally, there is no salt spray at the plant since the plant is not located near the ocean. Degradation of insulator quality in the absence of salt deposits and surface contamination is not an aging effect requiring management.

Industry experience has shown that transmission conductors are designed and installed not to swing significantly and cause wear due to wind induced abrasion and fatigue. The Callaway transmission conductors are designed and installed not to swing significantly and cause wear due to wind induced abrasion and fatigue. Therefore, loss of material due to wind induced abrasion and fatigue is not an applicable aging effect requiring management.

The Callaway outdoor environment is not subject to industry air pollution or saline environment. Callaway has experienced no instance of flashover due to pollution or salt contamination and no instances of loss of material on high voltage insulators due to mechanical wear. Therefore, mechanical wear is not an aging effect requiring aging management.

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

Industry experience has shown that transmission conductors are designed and installed not to swing significantly and cause wear due to wind induced abrasion and fatigue. Therefore, loss of material due to wind induced abrasion and fatigue is not an applicable aging effect requiring management for the period of extended operation.

The most prevalent mechanism contributing to loss of conductor strength is corrosion. Corrosion rates depend largely on air quality, which involves suspended particles in the air, SO_2 concentration, rain, fog chemistry, and other weather conditions. The Callaway Plant environment is not subject to industrial or salt pollution. FSAR Section 2.3.1.2.10 SA shows that there is a low frequency and duration (22 days in five years) of high air pollution potential due to low mixing depth and low wind speed at the Callaway site.

Transmission conductors within the switchyard are 91-strand 2500 kcmil stranded aluminum conductors (SAC) to the first tower leaving the switchyard. The transmission conductors from the switchyard tower to startup transformer XMR01 are 795 kcmil aluminum conductor, steel reinforced (ACSR).

The IEEE Transactions on Power Delivery contain a two part paper on ACSR conductors, commonly referred to as the Ontario Hydro Study. In testing (Part I), the study found that even with heavy contamination, the aluminum wires were in good condition.

Part II of the Ontario Hydro Study concentrates on prediction of remaining life of ACSR cable. Laboratory testing consistently showed that, for ACSR cable, aluminum was found to have retained its original properties, for the most part, while the steel components showed reductions in tensile strength. The data also indicates that the reduction in strength was almost solely in the steel wires.

The SAC at Callaway are not subject to either severe corrosion or reduction in tensile strength due to aging. Therefore, corrosion of the SAC is not a credible aging effect that requires management for the period of extended operation.

The National Electrical Safety Code (NESC) requires that tension on installed conductors be a maximum of 60% of the rated breaking strength. The NESC also sets the maximum tension a conductor must be designed to withstand under heavy load requirements, which includes consideration of ice, wind, and temperature.

At Callaway, the ACSR transmission conductors with a core of seven steel strands have a rated breaking strength of 22,100 lbs. The Callaway ACSR transmission conductors within the scope of license renewal are installed so that conductor final tension of 4,337 lb at 60°F does not exceed the NESC heavy loading condition (25 percent of the rated breaking strength) of 5,525 lbs.

Tests performed by Ontario Hydroelectric on ACSR transmission conductors with a core of seven steel strands averaging 70 to 80 years old showed a 30 percent loss of rated breaking strength due to corrosion. Assuming a 30 percent loss of rated breaking strength (6,630 lbs) due to corrosion over 60 years the Callaway ACSR transmission conductors have adequate design margin to offset the loss of strength due to corrosion and still meet the NESC requirement of not exceeding 60 percent of the rated breaking strength ((22,100 – 6,630) x 60 percent = 9,282 lbs). The Ontario Hydroelectric test envelopes the conductors at Callaway and based on the conservatism in strength margin, demonstrates that the material loss on the Callaway transmission conductors is acceptable for the period of extended operation. Therefore, corrosion is not a credible aging effect that requires management for the period of extended operation.

The Callaway outdoor environment is not subject to industry air pollution or saline environment. Aluminum bus material, galvanized steel support hardware and aluminum connection material do not experience any appreciable aging effects in this environment. Connection configuration includes stainless steel Belleville washers that are torqued to preclude loss of preload. These connections are periodically evaluated via thermography as part of the preventive maintenance activities. Therefore, increased resistance of connections due to oxidation or loss of pre-load are not aging effects requiring management for the period of extended operation.

3.6.2.2.4 Quality Assurance for Aging Management of Nonsafety-Related Components

Quality Assurance Program and Administrative Controls are discussed in Section B1.3, *Quality Assurance Program and Administrative Controls*.

3.6.2.3 Time-Limited Aging Analyses

The time-limited aging analyses identified below are associated with the electrical and instrumentation and controls component types. The section within Chapter 4, *Time-Limited Aging Analyses*, is indicated in parenthesis.

- Environmental Qualification of Electrical and Instrumentation and Control Equipment (Section 4.4, *Environmental Qualification of Electric Equipment*)

3.6.3 Conclusions

The Electrical and Instrumentation and Controls component types that are subject to AMR have been evaluated. The aging management programs selected to manage the aging effects for the Electrical and Instrumentation and Controls component types are identified in the summary Tables and in Section 3.6.2.1.

A description of these aging management programs is provided in Appendix B, *Aging Management Programs*, along with a demonstration that the identified aging effects will be managed for the period of extended operation.

Therefore, based on the demonstration provided in Appendix B, *Aging Management Programs*, the effects of aging associated with the Electrical and Instrumentation and Controls component types will be adequately managed so that there is reasonable assurance that the intended functions will be maintained consistent with the current licensing basis during the period of extended operation.

Table 3.6-1 Summary of Aging Management Programs in Chapter VI of NUREG-1801 for Electrical Components

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.6.1.001	Electrical equipment subject to 10 CFR 50.49 EQ requirements composed of Various polymeric and metallic materials exposed to Adverse localized environment caused by heat, radiation, oxygen, moisture, or voltage	Various aging effects due to various mechanisms in accordance with 10 CFR 50.49	EQ is a time-limited aging analysis (TLAA) to be evaluated for the period of extended operation. See the Standard Review Plan, Section 4.4, Environmental Qualification (EQ) of Electrical Equipment, for acceptable methods for meeting the requirements of 10 CFR 54.21(c)(1)(i) and (ii). See Environmental Qualification (EQ) of Electric Components, of this report for meeting the requirements of 10 CFR 54.21(c)(1)(iii).	Yes, TLAA	EQ is a time-limited aging analysis TLAA. See further evaluation in Section 3.6.2.2.1.
3.6.1.002	High-voltage insulators composed of Porcelain; malleable iron; aluminum; galvanized steel; cement exposed to Air – outdoor	Loss of material due to mechanical wear caused by wind blowing on transmission conductors	A plant-specific aging management program is to be evaluated	Yes, plant-specific	Exception to NUREG-1801. Aging effect in NUREG-1801 for this material and environment combination is not applicable. See further evaluation in Section 3.6.2.2.2.

Table 3.6-1 Summary of Aging Management Programs in Chapter VI of NUREG-1801 for Electrical Components (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.6.1.003	High-voltage insulators composed of Porcelain; malleable iron; aluminum; galvanized steel; cement exposed to Air – outdoor	Reduced insulation resistance due to presence of salt deposits or surface contamination	A plant-specific aging management program is to be evaluated for plants located such that the potential exists for salt deposits or surface contamination (e.g., in the vicinity of salt water bodies or industrial pollution)	Yes, plant-specific	Exception to NUREG-1801. Aging effect in NUREG-1801 for this material and environment combination is not applicable. See further evaluation in Section 3.6.2.2.2.
3.6.1.004	Transmission conductors composed of Aluminum; steel exposed to Air – outdoor	Loss of conductor strength due to corrosion	A plant-specific aging management program is to be evaluated for ACSR	Yes, plant-specific	Exception to NUREG-1801. Aging effect in NUREG-1801 for this material and environment combination is not applicable. See further evaluation in Section 3.6.2.2.3.
3.6.1.005	Transmission connectors composed of Aluminum; steel exposed to Air – outdoor	Increased resistance of connection due to oxidation or loss of pre-load	A plant-specific aging management program is to be evaluated	Yes, plant-specific	Exception to NUREG-1801. Aging effect in NUREG-1801 for this material and environment combination is not applicable. See further evaluation in Section 3.6.2.2.3.

Table 3.6-1 Summary of Aging Management Programs in Chapter VI of NUREG-1801 for Electrical Components (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.6.1.006	Switchyard bus and connections composed of Aluminum; copper; bronze; stainless steel; galvanized steel exposed to Air – outdoor	Loss of material due to wind-induced abrasion; Increased resistance of connection due to oxidation or loss of pre-load	A plant-specific aging management program is to be evaluated	Yes, plant-specific	Exception to NUREG-1801. Aging effect in NUREG-1801 for this material and environment combination is not applicable. See further evaluation in Section 3.6.2.2.3.
3.6.1.007	Transmission conductors composed of Aluminum; Steel exposed to Air – outdoor	Loss of material due to wind-induced abrasion	A plant-specific aging management program is to be evaluated for ACAR and ACSR	Yes, plant-specific	Exception to NUREG-1801. Aging effect in NUREG-1801 for this material and environment combination is not applicable. See further evaluation in Section 3.6.2.2.3.
3.6.1.008	Insulation material for electrical cables and connections (including terminal blocks, fuse holders, etc.) composed of Various organic polymers (e.g., EPR, SR, EPDM, XLPE) exposed to Adverse localized environment caused by heat, radiation, or moisture	Reduced insulation resistance due to thermal/ thermoxidative degradation of organics, radiolysis, and photolysis (UV sensitive materials only) of organics; radiation-induced oxidation; moisture intrusion	Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (B2.1.34)	No	Consistent with NUREG-1801.

Table 3.6-1 Summary of Aging Management Programs in Chapter VI of NUREG-1801 for Electrical Components (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.6.1.009	Insulation material for electrical cables and connections used in instrumentation circuits that are sensitive to reduction in conductor insulation resistance (IR) composed of Various organic polymers (e.g., EPR, SR, EPDM, XLPE) exposed to Adverse localized environment caused by heat, radiation, or moisture	Reduced insulation resistance due to thermal/ thermoxidative degradation of organics, radiolysis, and photolysis (UV sensitive materials only) of organics; radiation-induced oxidation; moisture intrusion	Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits (B2.1.35)	No	Consistent with NUREG-1801.
3.6.1.010	Conductor insulation for inaccessible power cables greater than or equal to 400 volts (e.g., installed in conduit or direct buried) composed of Various organic polymers (e.g., EPR, SR, EPDM, XLPE) exposed to Adverse localized environment caused by significant moisture	Reduced insulation resistance due to moisture	Inaccessible Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (B2.1.36)	No	Consistent with NUREG-1801.

Table 3.6-1 Summary of Aging Management Programs in Chapter VI of NUREG-1801 for Electrical Components (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.6.1.011	Metal enclosed bus: enclosure assemblies composed of Elastomers exposed to Air – indoor, controlled or uncontrolled or Air – outdoor	Surface cracking, crazing, scuffing, dimensional change (e.g. "ballooning" and "necking"), shrinkage, discoloration, hardening and loss of strength due to elastomer degradation	Metal Enclosed Bus (B2.1.39), or Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23)	No	Consistent with NUREG-1801.
3.6.1.012	Metal enclosed bus: bus/connections composed of Various metals used for electrical bus and connections exposed to Air – indoor, controlled or uncontrolled or Air – outdoor	Increased resistance of connection due to the loosening of bolts caused by thermal cycling and ohmic heating	Metal Enclosed Bus (B2.1.39)	No	Consistent with NUREG-1801.

Table 3.6-1 Summary of Aging Management Programs in Chapter VI of NUREG-1801 for Electrical Components (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.6.1.013	Metal enclosed bus: insulation; insulators composed of Porcelain; xenoy; thermo-plastic organic polymers exposed to Air – indoor, controlled or uncontrolled or Air – outdoor	Reduced insulation resistance due to thermal/ thermoxidative degradation of organics/thermoplastics, radiation-induced oxidation, moisture/debris intrusion, and ohmic heating	Metal Enclosed Bus (B2.1.39)	No	Consistent with NUREG-1801.
3.6.1.014	Metal enclosed bus: external surface of enclosure assemblies composed of Steel exposed to Air – indoor, uncontrolled or Air – outdoor	Loss of material due to general, pitting, and crevice corrosion	Metal Enclosed Bus (B2.1.39), or Structures Monitoring (B2.1.31)	No	Consistent with NUREG-1801.
3.6.1.015	Metal enclosed bus: external surface of enclosure assemblies composed of Galvanized steel; aluminum exposed to Air – outdoor	Loss of material due to pitting and crevice corrosion	Metal Enclosed Bus (B2.1.39), or Structures Monitoring (B2.1.31)	No	Consistent with NUREG-1801.

Table 3.6-1 Summary of Aging Management Programs in Chapter VI of NUREG-1801 for Electrical Components (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.6.1.016	Fuse holders (not part of active equipment): metallic clamps composed of Various metals used for electrical connections exposed to Air – indoor, uncontrolled	Increased resistance of connection due to chemical contamination, corrosion, and oxidation (in an air, indoor controlled environment, increased resistance of connection due to chemical contamination, corrosion and oxidation do not apply); fatigue due to ohmic heating, thermal cycling, electrical transients	Fuse Holders	No	Not applicable. All fuse holders including the fuses installed for electrical penetration protection are part of larger assemblies.
3.6.1.017	Fuse holders (not part of active equipment): metallic clamps composed of Various metals used for electrical connections exposed to Air – indoor, controlled or uncontrolled	Increased resistance of connection due to fatigue caused by frequent manipulation or vibration	Fuse Holders - No aging management program is required for those applicants who can demonstrate these fuse holders are located in an environment that does not subject them to environmental aging mechanisms or fatigue caused by frequent manipulation or vibration	No	Not applicable. All fuse holders including the fuses installed for electrical penetration protection are part of larger assemblies.

Table 3.6-1 Summary of Aging Management Programs in Chapter VI of NUREG-1801 for Electrical Components (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.6.1.018	Cable connections (metallic parts) composed of Various metals used for electrical contacts exposed to Air – indoor, controlled or uncontrolled or Air – outdoor	Increased resistance of connection due to thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion, and oxidation	Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (B2.1.37)	No	Consistent with NUREG-1801.
3.6.1.019	Connector contacts for electrical connectors exposed to borated water leakage composed of Various metals used for electrical contacts exposed to Air with borated water leakage	Increased resistance of connection due to corrosion of connector contact surfaces caused by intrusion of borated water	Boric Acid Corrosion (B2.1.4)	No	Consistent with NUREG-1801.
3.6.1.020	Transmission conductors composed of Aluminum exposed to Air – outdoor	Loss of conductor strength due to corrosion	None - for Aluminum Conductor Aluminum Alloy Reinforced (ACAR)	None	Exception to NUREG-1801. Aging effect in NUREG-1801 for this material and environment combination is not applicable.

Table 3.6-1 Summary of Aging Management Programs in Chapter VI of NUREG-1801 for Electrical Components (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.6.1.021	Fuse holders (not part of active equipment): insulation material, Metal enclosed bus: external surface of enclosure assemblies composed of Insulation material: bakelite; phenolic melamine or ceramic; molded polycarbonate; other, Galvanized steel; aluminum, Steel exposed to Air – indoor, controlled or uncontrolled	None	None	NA - No AEM or AMP	Not applicable. All fuse holders including the fuses installed for electrical penetration protection are part of larger assemblies.

Table 3.6.2-1 Electrical and Instrumentation and Controls – Summary of Aging Management Evaluation – Electrical Components

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
10 CFR 50.49 Electrical Equipment	IN	Various Organic Polymers	Adverse Localized Environment (Ext)	Various aging effects	Time-Limited Aging Analysis evaluated for the period of extended operation	VI.B.L-05	3.6.1.001	A
Cable Connections (Metallic Parts)	EC	Various Metals Used for Electrical Contacts	Atmosphere/ Weather (Ext)	Increased resistance of connection	Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (B2.1.37)	VI.A.LP-30	3.6.1.018	A
Cable Connections (Metallic Parts)	EC	Various Metals Used for Electrical Contacts	Plant Indoor Air (Ext)	Increased resistance of connection	Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (B2.1.37)	VI.A.LP-30	3.6.1.018	A
Connector	EC	Various Metals Used for Electrical Contacts	Borated Water Leakage (Ext)	Increased resistance of connection	Boric Acid Corrosion (B2.1.4)	VI.A.LP-36	3.6.1.019	A
High Voltage Insulator	SS	Carbon Steel (Galvanized)	Atmosphere/ Weather (Ext)	None	None	VI.A.LP-28	3.6.1.003	I, 1

Table 3.6.2-1 Electrical and Instrumentation and Controls – Summary of Aging Management Evaluation – Electrical Components (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
High Voltage Insulator	SS	Carbon Steel (Galvanized)	Atmosphere/ Weather (Ext)	None	None	VI.A.LP-32	3.6.1.002	I, 1
High Voltage Insulator	IN	Cement (Electrical Insulators)	Atmosphere/ Weather (Ext)	None	None	VI.A.LP-28	3.6.1.003	I, 1
High Voltage Insulator	IN	Cement (Electrical Insulators)	Atmosphere/ Weather (Ext)	None	None	VI.A.LP-32	3.6.1.002	I, 1
High Voltage Insulator	IN	Porcelain	Atmosphere/ Weather (Ext)	None	None	VI.A.LP-28	3.6.1.003	I, 1
High Voltage Insulator	IN	Porcelain	Atmosphere/ Weather (Ext)	None	None	VI.A.LP-32	3.6.1.002	I, 1
Insulated Cable and Connections	IN	Various Organic Polymers	Adverse Localized Environment (Ext)	Reduced insulation resistance	Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (B2.1.34)	VI.A.LP-33	3.6.1.008	A

Table 3.6.2-1 Electrical and Instrumentation and Controls – Summary of Aging Management Evaluation – Electrical Components (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Insulated Cable and Connections	IN	Various Organic Polymers	Adverse Localized Environment (Ext)	Reduced insulation resistance	Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits (B2.1.35)	VI.A.LP-34	3.6.1.009	A
Insulated Cable and Connections	IN	Various Organic Polymers	Adverse Localized Environment (Ext)	Reduced insulation resistance	Inaccessible Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (B2.1.36)	VI.A.LP-35	3.6.1.010	A
Metal Enclosed Bus (Bus/ Connections)	EC	Various Metals Used for Electrical Contacts	Atmosphere/ Weather (Ext)	Increased resistance of connection	Metal Enclosed Bus (B2.1.39)	VI.A.LP-25	3.6.1.012	A
Metal Enclosed Bus (Bus/ Connections)	EC	Various Metals Used for Electrical Contacts	Plant Indoor Air (Ext)	Increased resistance of connection	Metal Enclosed Bus (B2.1.39)	VI.A.LP-25	3.6.1.012	A

Table 3.6.2-1 Electrical and Instrumentation and Controls – Summary of Aging Management Evaluation – Electrical Components (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Metal Enclosed Bus (Enclosure)	SS	Aluminum	Atmosphere/ Weather (Ext)	Loss of material	Metal Enclosed Bus (B2.1.39)	VI.A.LP-42	3.6.1.015	A
Metal Enclosed Bus (Enclosure)	SS	Carbon Steel	Atmosphere/ Weather (Ext)	Loss of material	Metal Enclosed Bus (B2.1.39)	VI.A.LP-43	3.6.1.014	A
Metal Enclosed Bus (Enclosure)	SS	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Metal Enclosed Bus (B2.1.39)	VI.A.LP-43	3.6.1.014	A
Metal Enclosed Bus (Enclosure)	SS	Carbon Steel (Galvanized)	Atmosphere/ Weather (Ext)	Loss of material	Metal Enclosed Bus (B2.1.39)	VI.A.LP-42	3.6.1.015	A
Metal Enclosed Bus (Enclosure)	ES	Elastomer	Atmosphere/ Weather (Ext)	Surface cracking, crazing, scuffing, dimensional change (e.g. "ballooning" and "necking"), shrinkage, discoloration, hardening and loss of strength	Metal Enclosed Bus (B2.1.39)	VI.A.LP-29	3.6.1.011	A

Table 3.6.2-1 Electrical and Instrumentation and Controls – Summary of Aging Management Evaluation – Electrical Components (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Metal Enclosed Bus (Enclosure)	ES	Elastomer	Plant Indoor Air (Ext)	Surface cracking, crazing, scuffing, dimensional change (e.g. "ballooning" and "necking"), shrinkage, discoloration, hardening and loss of strength	Metal Enclosed Bus (B2.1.39)	VI.A.LP-29	3.6.1.011	A
Metal Enclosed Bus (Insulation/ Insulator)	IN	Porcelain	Atmosphere/ Weather (Ext)	Reduced insulation resistance	Metal Enclosed Bus (B2.1.39)	VI.A.LP-26	3.6.1.013	A
Metal Enclosed Bus (Insulation/ Insulator)	IN	Porcelain	Plant Indoor Air (Ext)	Reduced insulation resistance	Metal Enclosed Bus (B2.1.39)	VI.A.LP-26	3.6.1.013	A
Switchyard Bus and Connections	EC	Aluminum	Atmosphere/ Weather (Ext)	None	None	VI.A.LP-39	3.6.1.006	I, 2
Switchyard Bus and Connections	EC	Carbon Steel (Galvanized)	Atmosphere/ Weather (Ext)	None	None	VI.A.LP-39	3.6.1.006	I, 2

Table 3.6.2-1 Electrical and Instrumentation and Controls – Summary of Aging Management Evaluation – Electrical Components (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Switchyard Bus and Connections	EC	Stainless Steel	Atmosphere/ Weather (Ext)	None	None	VI.A.LP-39	3.6.1.006	I, 2
Terminal Block	IN	Various Organic Polymers	Adverse Localized Environment (Ext)	Reduced insulation resistance	Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (B2.1.34)	VI.A.LP-33	3.6.1.008	A
Transmission Conductors	EC	Aluminum	Atmosphere/ Weather (Ext)	None	None	VI.A.LP-46	3.6.1.020	I, 2
Transmission Conductors	EC	Aluminum	Atmosphere/ Weather (Ext)	None	None	VI.A.LP-47	3.6.1.007	I, 2
Transmission Conductors	EC	Aluminum	Atmosphere/ Weather (Ext)	None	None	VI.A.LP-48	3.6.1.005	I, 2
Transmission Conductors	EC	Aluminum Conductor Steel Reinforced	Atmosphere/ Weather (Ext)	None	None	VI.A.LP-38	3.6.1.004	I, 2
Transmission Connections	EC	Stainless Steel	Atmosphere/ Weather (Ext)	None	None	VI.A.LP-48	3.6.1.005	I, 2

Notes for Table 3.6.2-1:

Standard Notes:

A	Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.
I	Aging effect in NUREG-1801 for this component, material and environment combination is not applicable.

Plant Specific Notes:

1	See further evaluation in Section 3.6.2.2.2.
2	See further evaluation in Section 3.6.2.2.3.

CHAPTER 4

TIME-LIMITED AGING ANALYSES

4.0 TIME-LIMITED AGING ANALYSES

4.1 INTRODUCTION

This chapter describes the Time-Limited Aging Analyses (TLAAs) for the Callaway Plant in accordance with 10 CFR 54.3(a) and 54.21(c). Subsequent sections of this chapter describe TLAAs within these common general categories:

1. Neutron Embrittlement of the Reactor Vessel (Section 4.2)
2. Metal Fatigue of Vessels, Piping, and Components (Section 4.3)
3. Environmental Qualification (EQ) of Electric Equipment (Section 4.4)
4. Loss of Prestress in Concrete Containment Tendons (Section 4.5)
5. Fatigue of the Containment Liner and Penetrations (Section 4.6)
6. Other Plant-Specific TLAAs (Section 4.7)

The information on each specific TLAA within these general categories includes a brief description of the TLAA , a description of the current licensing basis analysis, and the disposition of the TLAA for the period of extended operation, in accordance with 10 CFR 54.21(c)(1).

4.1.1 Identification of TLAAs

Survey of Design and Licensing Bases

An analysis, calculation, or evaluation is a “Time-Limited Aging Analysis” (TLAA) under the 10 CFR 54 License Renewal Rule, only if it meets all six of the 10 CFR 54.3(a) criteria:

(1) Involve systems, structures, and components within the scope of license renewal, as delineated in §54.4(a);

(2) Consider the effects of aging;

(3) Involve time-limited assumptions defined by the current operating term, for example, 40 years;

(4) Were determined to be relevant by the licensee in making a safety determination;

(5) Involve conclusions or provide the basis for conclusions related to the capability of the system, structure, and component to perform its intended functions, as delineated in §54.4(b); and

(6) Are contained or incorporated by reference in the current licensing basis (CLB).

10 CFR 54.21(c) requires that:

A list of time-limited aging analyses, as defined in §54.3, must be provided. The applicant shall demonstrate that –

(i) The analyses remain valid for the period of extended operation;

(ii) The analyses have been projected to the end of the period of extended operation; or

(iii) The effects of aging on the intended function(s) will be adequately managed for the period of extended operation.

This chapter provides dispositions and their bases.

A list of potential TLAAs was assembled from regulatory guidance and industry experience, including:

- NUREG-1800, *Standard Review Plan for the Review of License Renewal Applications for Nuclear Power Plants*, Chapter 4
- NUREG-1801, *Generic Aging Lessons Learned (GALL) Report*
- NEI 95-10, *Industry Guideline for Implementing the Requirements of 10 CFR 54 – the License Renewal Rule*
- 10 CFR 54, *Requirements for Renewal of Operating Licenses for Nuclear Power Plants*
- Prior license renewal applications
- Plant-specific document reviews and interviews with plant personnel

Keyword searches were performed on the Callaway CLB to determine whether each of these potential TLAAs exists in the licensing basis The keyword search was also used to identify additional potential plant specific TLAAs. The CLB search included:

- The Final Safety Analysis Report (FSAR) - Standard Plant (SP)
- The Final Safety Analysis Report (FSAR) - Site Addendum (SA)
- Technical Specifications and Bases
- The NRC Safety Evaluation Reports (SERs) for the original operating license
- Subsequent NRC Safety Evaluations (SEs)
- Ameren Missouri and NRC docketed licensing correspondences

The list of potential TLAAs was then reviewed with respect to the six 10 CFR 54.3(a) criteria; based on information in the CLB source documents and from source documents for the potential TLAAs such as:

- Vendor, NRC sponsored, and licensee topical reports
- Design calculations

- Code stress reports or code design reports
- Drawings
- Specifications

These TLAA source documents provided the information and the basis for the dispositions in this chapter.

4.1.2 Identification of Exemptions

10 CFR 54.21(c)(2) requires a list of plant-specific exemptions granted pursuant to 10 CFR 50.12 and in effect that are based on time-limited aging analyses as defined in 10 CFR 54.3. The applicant shall provide an evaluation that justifies the continuation of these exemptions for the period of extended operation.

Docketed correspondence, the operating license, and the FSAR were searched to identify exemptions in effect. Each exemption in effect was then evaluated to determine whether it involved a TLAA as defined in 10 CFR 54.3.

There are only two exemptions “currently in effect,” that are based in part on a time-limited aging analysis. These are the use of the Leak-Before-Break (LBB) evaluation of reactor coolant system piping and the use of Code Case N-514. The LBB analysis is described in Section 4.7.7, *Fatigue Crack Growth Assessment in Support of a Fracture Mechanics Analyses for the Leak-Before-Break (LBB) Elimination of Dynamic Effects of Piping Failures*. ASME Code Case N-514 supports the implementation of the LTOP limits which are described in Section 4.2.5, *Low Temperature Overpressure Protection*.

4.1.3 Summary of Results

Sections 4.2 through 4.7 of this chapter list and describe six general categories of TLAAs. They are listed in Table 4.1-1, *List of TLAAs*. They are presented in the order in which they appear in Sections 4.2 through 4.7 of the NUREG-1800, *Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants* (the SRP).

Standard Review Plan Tables 4.1-2 and 4.1-3 list examples of analyses that could be TLAAs, depending on the applicant's current licensing basis (CLB). Table 4.1-2, *Review of Analyses Listed in NUREG-1800, Tables 4.1-2 and 4.1-3* summarizes the applicability of the analyses identified in SRP Tables 4.1-2 and 4.1-3 to the Callaway CLB.

Table 4.1-1 List of TLAAs

TLAA Category	Description	Disposition Category(1)	Section
1.	**Reactor Vessel Neutron Embrittlement Analysis**	**N/A**	**4.2**
	Neutron Fluence Values	ii	4.2.1
	Charpy Upper-Shelf Energy	ii	4.2.2
	Pressurized Thermal Shock	ii	4.2.3
	Pressure-Temperature (P-T) Limits	iii	4.2.4
	Low Temperature Overpressure Protection	iii	4.2.5
2	**Metal Fatigue**	**N/A**	**4.3**
	Fatigue Monitoring Program	N/A	4.3.1
	ASME Section III Class I Fatigue Analysis of Vessels, Piping and Components	iii	4.3.2
	Reactor Coolant Pump Thermal Barrier Flange	iii	4.3.2.1
	Pressurizer Insurge-Outsurge Transients	iii	4.3.2.2
	Steam Generator ASME Section III Class 1, Class 2 Secondary Side, and Feedwater Nozzle Fatigue Analyses	i	4.3.2.3
	NRC Bulletin 88-11 Revised Fatigue Analysis of the Pressurizer Surge Line for Thermal Cycling and Stratification	iii	4.3.2.4
	ASME Section III Subsection NG Fatigue Analysis of Reactor Pressure Vessel Internals	iii	4.3.3
	Effects of the Reactor Coolant System Environment on Fatigue Life of Piping and Components (Generic Safety Issue 190)	iii	4.3.4
	Assumed Thermal Cycle Count for Allowable Secondary Stress Range Reduction Factor in ANSI B31.1 and ASME Section III Class 2 and 3 Piping	i	4.3.5
	Fatigue Design of Spent Fuel Pool Liner and Racks for Seismic Events	i	4.3.6
	Fatigue Design and Analysis of Class 1E Electrical Raceway Support Angle Fittings for Seismic Events	i	4.3.7
	Fatigue Analyses of Class 2 Heat Exchangers	ii, iii	4.3.8
3.	**Environmental Qualification (EQ) of Electric Equipment**	**iii**	**4.4**

Table 4.1-1 List of TLAAs

TLAA Category	Description	Disposition Category[1]	Section
4.	**Concrete Containment Tendon Prestress**	**i, ii**	**4.5**
5.	**Containment Liner Plate, Metal Containments, and Penetrations Fatigue Analyses**	**N/A**	**4.6**
	Design Cycles for the Main Steam Line and Feedwater Penetrations	i, ii	4.6.1
	Fatigue Waiver Evaluations for the Equipment Hatch and Leak Chase Channels	i	4.6.2
6.	**Other Plant-Specific Time-Limited Aging Analyses**	**N/A**	**4.7**
	Containment Polar Crane, Fuel Building Cask Handling Crane, Spent Fuel Pool Bridge Crane, and Refueling Machine CMAA 70 Load Cycle Limits	i	4.7.1
	In-service Flaw Analyses that Demonstrate Structural Integrity for 40 years	i	4.7.2
	Corrosion Analysis of the Reactor Vessel Cladding Indications	i	4.7.3
	Absence of a TLAA for Reactor Vessel Underclad Cracking Analyses	N/A	4.7.4
	Reactor Coolant Pump Flywheel Fatigue Crack Growth Analysis	i	4.7.5
	High Energy Line Break Postulation Based on Fatigue Cumulative Usage Factors	iii	4.7.6
	Fatigue Crack Growth Assessment in Support of a Fracture Mechanics Analysis for the Leak-Before-Break (LBB) Elimination of Dynamic Effects of Piping Failures	i	4.7.7
	Replacement Class 3 Buried Piping	i	4.7.8
	Replacement Steam Generator Tube Wear	i	4.7.9

1 (i) 10 CFR 54.21(c)(1)(i), Validation: The analyses remain valid for the period of extended operation.
(ii) 10 CFR 54.21(c)(1)(ii), Projection: The analyses have been projected to the end of the period of extended operation.
(iii) 10 CFR 54.21(c)(1)(iii), Aging Management: The effects of aging on the intended function(s) will be adequately managed for the period of extended operation.
N/A Not Applicable: Section heading or no TLAA. Disposition categories are not applicable.

Table 4.1-2 Review of Analyses Listed in NUREG-1800, Tables 4.1-2 and 4.1-3

NUREG-1800 Examples	Applicability to Callaway	Section
NUREG-1800, Table 4.1-2 – Potential TLAAs		
Reactor Vessel Neutron Embrittlement	Yes	4.2
Metal Fatigue	Yes	4.3
Environmental Qualification (EQ) of Electric Equipment	Yes	4.4
Concrete Containment Tendon Prestress	Yes	4.5
In-Service Local Metal Containment Corrosion Analyses	Yes	4.7.3
NUREG-1800, Table 4.1-3 – Additional Examples of Plant-Specific TLAAs		
Intergranular Separation in the Heat-Affected Zone (HAZ) of Reactor Vessel Low-Alloy Steel Under Austenitic SS Cladding	No – No HAZ analyses were identified within the CLB.	4.7.4
Low-Temperature Overpressure (LTOP) Analyses	Yes	4.2.5
Fatigue Analysis for the Main Steam Supply Lines to the Turbine-Driven Auxiliary Feedwater Pumps	Yes	4.3.5
Fatigue Analysis for the Reactor Coolant Pump Flywheel	Yes	4.7.5
Fatigue Analysis of Polar Crane	Yes	4.7.1
Flow-Induced Vibration Endurance Limit for the Reactor Vessel Internals	No-No explicit basis based on plant life applies.	4.3.3
Transient Cycle Count Assumptions for the Reactor Vessel Internals	Yes	4.3.3
Ductility Reduction of Fracture Toughness for the Reactor Vessel Internals	No-No explicit basis based on plant life applies.	4.3.3
Leak Before Break	Yes	4.7.7
Fatigue Analysis for the Containment Liner Plate	No – No fatigue or cycle-based analysis supports design of the liner.	4.6.0
Containment Penetration Pressurization Cycles	Yes	4.6.2

Table 4.1-2 Review of Analyses Listed in NUREG-1800, Tables 4.1-2 and 4.1-3

NUREG-1800 Examples	Applicability to Callaway	Section
Metal Corrosion Allowance	No-No explicit basis based on plant life applies.	-
High-Energy Line-Break Postulation Based on Fatigue Cumulative Usage Factor	Yes	4.7.6
In-Service Flaw Growth Analyses that Demonstrate Structure Stability for 40 Years	Yes	4.7.2

4.2 REACTOR VESSEL NEUTRON EMBRITTLEMENT ANALYSIS

Reactor pressure vessel (RPV) materials are subject to embrittlement, primarily due to exposure to neutron radiation. In accordance with 10 CFR 50, Appendix H, any materials exceeding 1 x 10^{17} n/cm^2 (E>1.0 MeV) must be monitored to evaluate the changes in fracture toughness. The area in the vicinity of the reactor core subject to fluence levels greater than this level is called the beltline region.

Materials not previously identified as beltline material because of low levels of neutron radiation must be evaluated to determine whether they will exceed the 1x10^{17} n/cm^2 fluence threshold at end-of-license extended (EOLE), and must therefore be evaluated for the effects of neutron embrittlement (extended beltline material).

The most pronounced material change due to neutron embrittlement is a reduction in fracture toughness. As fracture toughness decreases with cumulative fast neutron exposure, the material's resistance to crack propagation decreases. The reference temperature for nil-ductility transition (RT_{NDT}) is an indicator of the transition temperature range above which the material behaves in a ductile manner, and below which it behaves in a brittle manner. As fluence increases, the nil-ductility reference temperature increases. This means higher temperatures are required for the material to continue to act in a ductile manner.

The projected reduction in fracture toughness is a function of fluence and affects several analyses used to support operation of the Callaway reactor vessels. The effects of this evaluation are discussed in each of their respective sections:

- Neutron Fluence Values (Section 4.2.1)
- Charpy Upper-Shelf Energy (C_V USE) (Section 4.2.2)
- Pressurized Thermal Shock (PTS) (Section 4.2.3)
- Pressure-Temperature (P-T) Limits (Section 4.2.4)
- Low Temperature Overpressure Protection (LTOP) (Section 4.2.5)

These limits and effects are part of the licensing basis, and support the safety determinations and Technical Specification operating limits. The analyses for reduction of fracture toughness and the EOLE neutron fluence depend on the life of the plant, and their calculations are TLAAs.

Callaway FSAR Section 5.3 SP contains data on vessel material composition, properties, and the vessel coupon surveillance program which are meant to provide reasonable assurance that reactor vessel integrity is maintained.

4.2.1 Neutron Fluence Values

Loss of fracture toughness is an aging effect caused by the neutron embrittlement aging mechanism that results from prolonged exposure to neutron radiation. Neutron fluence projections are made in order to estimate the effect on these reactor vessel material properties (Section 4.2.2, *Charpy Upper-Shelf Energy*, and Section 4.2.3, *Pressurized Thermal Shock*).

Increased plant capacity factors prompted the increase in the lifetime capacity factor assumed for fluence estimates to 90 percent, and hence increased the assumed EOL effective full power years (EFPY) for the period of extended operation to 54 EFPY. This is consistent with the plant's average capacity factor between 2004 and 2009 of 88 percent, and the exposure of approximately 23 EFPY as of October 2011.

The fluence values for EOLE were projected based on the results of the Capsule X analysis, WCAP-15400-NP (Reference 1). The revised fluences were determined with transport calculations using the DORT discrete ordinates code and the BUGLE 96 cross-section library which is derived from ENDF/B-VI. The neutron transport and dosimetry evaluation methodologies follow the guidance and meet the requirements of Regulatory Guide 1.190 and are consistent with Westinghouse WCAP-14040-NP-A.

The vessel peak neutron fluences are listed in Table 4.2-1, *Calculated EOL Neutron Fluence Projections at the Peak Location on the Reactor Vessel Clad/Base Metal Interface for Callaway Beltline Materials* and Table 4.2-2, *Calculated EOL Neutron Fluence Projections at the Peak Location on the Reactor Vessel Clad/Base Metal Interface for Callaway Extended Beltline Materials* for the beltline and extended beltline materials, respectively.

The EOLE fluence projections were revised to quantify expected fluence at the end of the period of extended operation. Therefore this TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(ii).

Disposition: Projection, 10 CFR 54.21(c)(1)(ii)

Table 4.2-1 Calculated EOL Neutron Fluence Projections at the Peak Location on the Reactor Vessel Clad/Base Metal Interface for Callaway Beltline Materials

Location	**54 EFPY Fluence n/cm^2, (E > 1.0 MeV)**
Lower Shell Plates	2.94E19
Lower–Intermediate Circumferential Weld	2.94E19
Intermediate Shell Plates	2.94E19

Table 4.2-1 Calculated EOL Neutron Fluence Projections at the Peak Location on the Reactor Vessel Clad/Base Metal Interface for Callaway Beltline Materials

Location	**54 EFPY Fluence n/cm^2, (E > 1.0 MeV)**
Lower Shell Longitudinal Weld 90°	1.62E19
Lower Shell Longitudinal Weld 210°/330°	2.85E19
Intermediate Shell Longitudinal Weld 90°	1.62E19
Intermediate Shell Longitudinal Weld 210°/330°	2.85E19

Table 4.2-2 Calculated EOL Neutron Fluence Projections at the Peak Location on the Reactor Vessel Clad/Base Metal Interface for Callaway Extended Beltline Materials

Location	**54 EFPY Fluence n/cm^2, (E > 1.0 MeV)**
Intermediate-Upper Shell Circumferential Weld	7.26E17
Upper Shell Plates	7.26E17
Upper Shell Longitudinal Weld 90°	4.01E17
Upper Shell Longitudinal Weld 210°/330°	7.04E17
Inlet Nozzle to Shell Welds	1.09E17
Outlet Nozzle to Shell Welds	5.98E16
Lower Shell to Lower Head Weld	4.36E15

4.2.2 Charpy Upper-Shelf Energy

Charpy upper-shelf energy (C_V USE) is defined as the average energy values for all Charpy specimens whose test temperature is above the upper end of the transition region. Per Regulatory Guide 1.99, *Radiation Embrittlement of Reactor Vessel Materials*, the C_V USE is assumed to decrease as a function of fluence and copper content.

10 CFR 50, Appendix G, requires that the reactor vessel beltline materials must have a C_V USE of no less than 75 ft-lb initially, and must maintain C_V USE throughout the life of the vessel of no less than 50 ft-lb unless it is demonstrated in a manner approved by the Director, Office of Nuclear Reactor Regulation, that lower values of C_V USE will provide margins of safety against fracture equivalent to those required by ASME Boiler and Pressure Vessel Code, Section XI, Appendix G (10 CFR 50, Appendix G, Section IV.A.1.a).

The C_V USE results from surveillance Capsule X are reported in WCAP-15400-NP (Reference 1). The coupon examination results were deemed to be credible and show that the decline in C_V USE in plate and weld materials are less than originally predicted by Regulatory Guide 1.99 Revision 2, demonstrating the reactor vessel material ages consistently with Regulatory Guide 1.99 predictions. This provides a conservative means to satisfy the requirements of 10 CFR 50, Appendix G; thus providing assurance of the reactor vessel integrity.

The C_V USE values were projected to the end of the period of extended operation in WCAP-17168-NP (Reference 3). The extended beltline materials that are expected to receive fluence values greater than $1 \times 10^{17} n/cm^2$ (E>1.0 MeV) during the period of extended operation were also evaluated. The most limiting value of EOLE C_V USE for any vessel material was 61 ft-lbf for intermediate shell plate R2707-1, using Regulatory Position 1.2 of Regulatory Guide 1.99. This meets the 10 CFR 50, Appendix G 50 ft-lbf criterion. EOLE C_V USE values for all beltline components are given in Table 4.2-3, *Predicted USE Values at 54 EFPY (EOLE) for Callaway*. Therefore, these TLAAs are dispositioned in accordance with 10 CFR 54.21(c)(1)(ii).

Disposition: Projection, 10 CFR 54.21(c)(1)(ii)

Table 4.2-3 Predicted USE Values at 54 EFPY (EOLE) for Callaway

RPV Material	Cu (Wt. %)	1/4 T Fluence (n/cm^2) (1)	Initial USE (ft - lb)	USE Decrease (%)	USE (ft-lb)
Reactor Vessel Beltline Materials					
Intermediate Shell Plate R2707-1	0.05	1.752E19	78	22	61
Intermediate Shell Plate R2707-2	0.06	1.752E19	100	22	78
Intermediate Shell Plate R2707-3	0.06	1.752E19	99	22	77
Lower Shell Plate R2708-1	0.07	1.752E19	82	22	64
- Using Credible Surveillance Data	0.07	1.752E19	82	17	68
Lower Shell Plate R2708-2	0.06	1.752E19	105	22	82
Lower Shell Plate R2708-3	0.08	1.752E19	101	22	79
Intermediate Shell Longitudinal Weld Seams	0.04	1.752E19	143	22	112
- Using Credible Surveillance Data	0.04	1.752E19	143	17	119
Lower Shell Longitudinal Weld Seams	0.04	1.752E19	143	22	112
- Using Credible Surveillance Data	0.04	1.752E19	143	17	119
Intermediate to Lower Shell Circumferential Weld Seam	0.04	1.752E19	112	22	87
- Using Credible Surveillance Data	0.04	1.752E19	112	17	93
Reactor Vessel Extended Beltline Materials					
Nozzle Shell Plate R2706-1	0.045	4.326E17	102	9.2	93
Nozzle Shell Plate R2706-2	0.055	4.326E17	87	9.2	79
Nozzle Shell Plate R2706-3	0.075	4.326E17	101	9.2	92
Inlet Nozzle R2702-1	0.16	4.326E17	135	14	116
Inlet Nozzle R2702-2	0.16	4.326E17	137	14	118
Inlet Nozzle R2702-3	0.16	4.326E17	137	14	118

Table 4.2-3 Predicted USE Values at 54 EFPY (EOLE) for Callaway

RPV Material	Cu (Wt. %)	1/4 T Fluence (n/cm^2) [1]	Initial USE (ft - lb)	USE Decrease (%)	USE (ft-lb)
Inlet Nozzle R2702-4	0.16	4.326E17	134	14	115
Outlet Nozzle R2703-1	0.16	4.326E17	90	14	77
Outlet Nozzle R2703-2	0.16	4.326E17	114	14	98
Outlet Nozzle R2703-3	0.16	4.326E17	113	14	97
Outlet Nozzle R2703-4	0.16	4.326E17	118	14	101
Nozzle Shell to Intermediate Shell Weld Seam	0.04	4.326E17	145	9.2	132
Inlet Nozzle to Shell Weld Seams	0.163	4.326E17	101	17	84
Outlet Nozzle to Shell Weld Seams	0.163	4.326E17	99	17	82
Nozzle Shell Long Weld Seams	0.045	4.326E17	128	9.2	116

1 Fluence values are based on the limiting beltline and extended beltline fluence.

4.2.3 Pressurized Thermal Shock

10 CFR 50.61(b)(1) provides rules for protection against pressurized thermal shock (PTS) events for pressurized water reactors. Licensees are required to perform an updated assessment of the projected values of PTS reference temperature (RT_{PTS}) whenever there is a significant change in projected values of RT_{PTS}, or upon a request for a change in the expiration date for operation of the facility.

The license renewal rule 10 CFR 54.4(a)(3) also requires that the licensee evaluate those structures, systems, and components (SSCs) relied on in safety analyses or plant evaluations to perform a function that demonstrates compliance with 10 CFR 50.61, the PTS rule.

10 CFR 50.61(c) provides two methods for determining RT_{PTS}. These methods are also described as Positions 1 and 2 in Regulatory Guide 1.99. Position 1 applies for material that *does not* have credible surveillance data available and Position 2 is used for material that *does* have two or more credible surveillance data sets available. The adjusted reference temperatures are calculated for both Positions 1 and 2 by following the guidance in Regulatory Guide 1.99 (Sections 1.1 and 2.1, respectively), using the copper and nickel content of Callaway beltline materials, and the EOLE fluence projections.

10 CFR 50.61(b)(2) establishes screening criteria for RT_{PTS} as 270°F for plates, forgings, and axial welds and 300°F for circumferential welds. If the RT_{PTS} does not exceed the PTS screening criteria, then only the reactor pressure vessel is relied on to demonstrate compliance with the 10 CFR 50.61, the PTS rule.

The original Ameren Missouri response to the issuance of the PTS rule, 10 CFR 50.61, indicated that the projected RT_{PTS} does not exceed the PTS screening criteria, 270°F and 300°F, based on a 32 EFPY life. This is revised to account for new material information, capsule test results, and operating changes. The current RT_{PTS} are based on a 35 EFPY life and documented in FSAR Table 5.3-9 SP and Pressure Temperature Limits Report (PTLR) (Reference 2).

The Ameren Missouri responses to GL 92-01 did not amend the conclusions of the previous PTS submittal. In particular, the revised weld information contained in Combustion Engineering (CE) Owners Group report CE-NPSD-1039 did not affect the Callaway reactor vessel compliance with 10 CFR 50.61, nor did it change the limiting reactor vessel material. The material data results of CE-NPSD-1039 are used by WCAP-17168-NP (Reference 3) in its PTS evaluation for license renewal and resulted in a revision of the nickel content of the Intermediate and Lower Shells welds (G2.03 and E3.14) to 0.05 weight-percent.

The coupon examination results show that the shift in RT_{NDT} in plate and weld materials are in good agreement with or less than the Regulatory Guide 1.99 Revision 2 predictions and were determined to be credible. The results demonstrate that the Callaway reactor vessel and weld material ages consistently with Regulatory Guide 1.99 predictions, and provide a conservative means to satisfy the requirement of 10 CFR 50.61; thus providing assurance of the reactor vessel integrity.

The beltline and extended beltline materials that are expected to receive fluence values greater than 1×10^{17} n/cm^2 (E>1.0 MeV) during the period of extended operation were evaluated in WCAP-17168-NP (Reference 3). The most limiting predicted RT_{PTS} value to the end of the period of extended operation is 120ºF in lower shell plate R2708-3. The limiting RT_{PTS} value was calculated using Regulatory Guide 1.99 position 1.1. Projected RT_{PTS} values for all beltline components, including the extended beltline region, meet the requirements of 10 CFR 50.61 and are shown in Table 4.2-4, *Calculation of Callaway Unit 1 RT_{PTS} Values for 54 EFPY (EOLE) at the Clad/Base Metal Interface*. These TLAAs are dispositioned in accordance with 10 CFR 54.21(c)(1)(ii).

Disposition: Projection, 10 CFR 54.21(c)(1)(ii)

Table 4.2-4 Calculation of Callaway Unit 1 RT_{PTS} Values for 54 EFPY (EOLE) at the Clad/Base Metal Interface

RPV Material	Cu (Wt. %)	Ni (Wt. %)	CF (ºF)	Fluence (n/cm^2) (1)	FF	$RT_{NDT(U)}$ (ºF)	ΔRT_{NDT} (ºF)	σ_U (ºF)	σ_D (ºF)	M (°F)	RT_{PTS} (°F)
Reactor Vessel Beltline Materials											
Intermediate Shell Plate R2707-1	0.05	0.58	31	2.94E19	1.2859	40	39.9	0	17	34	114
Intermediate Shell Plate R2707-2	0.06	0.61	37	2.94E19	1.2859	10	47.6	0	17	34	92
Intermediate Shell Plate R2707-3	0.06	0.62	37	2.94E19	1.2859	-10	47.6	0	17	34	72
Lower Shell Plate R2708-1	0.07	0.58	44	2.94E19	1.2859	50	56.6	0	17	34	141 (2)
-Using Credible Surveillance Data	-	-	25.6	2.94E19	1.2859	50	32.9	0	8.5	17	100
Lower Shell Plate R2708-2	0.06	0.57	37	2.94E19	1.2859	10	47.6	0	17	34	92
Lower Shell Plate R2708-3	0.08	0.62	51	2.94E19	.2859	20	65.6	0	17	34	120 (2)
Intermediate Shell Longitudinal Weld Seams (G2.03)	0.04	0.05	28.8	2.94E19	1.2859	-60	37.0	0	18.5	37	14
-Using Credible Surveillance Data	-	-	40.8	2.94E19	1.2859	-60	52.5	0	14	28	20
Lower Shell Longitudinal Weld Seams (G2.03)	0.04	0.05	28.8	2.94E19	1.2859	-60	37	0	18.5	37	14
-Using Credible Surveillance Data	-	-	40.8	2.94E19	1.2859	-60	52.5	0	14	28	20
Intermediate to Lower Shell Circumferential Weld Seam (E3.14)	0.04	0.05	28.8	2.94E19	1.2859	-60	37	0	18.5	37	14
-Using Credible Surveillance Data	-	-	40.8	2.94E19	1.2859	-60	52.5	0	14	28	20

Table 4.2-4 Calculation of Callaway Unit 1 RT_{PTS} Values for 54 EFPY (EOLE) at the Clad/Base Metal Interface

RPV Material	Cu (Wt. %)	Ni (Wt. %)	CF (ºF)	Fluence (n/cm^2) (1)	FF	$RT_{NDT(U)}$ (ºF)	ΔRT_{NDT} (ºF)	σ_U (ºF)	σ_D (ºF)	M (°F)	RT_{PTS} (°F)
Reactor Vessel Extended Beltline Materials											
Nozzle Shell Plate R2706-1	0.045	0.615	28.5	7.26E17	0.3559	20	10.1	0	5.1	10.1	40
Nozzle Shell Plate R2706-2	0.055	0.665	34	7.26E17	0.3559	30	12.1	0	6.1	12.1	54
Nozzle Shell Plate R2706-3	0.075	0.6	47.5	7.26E17	0.3559	30	16.9	0	8.5	16.9	64
Inlet Nozzle R2702-1	0.16	0.885	123.9	7.26E17	0.3559	10	44.1	0	17	34	88
Inlet Nozzle R2702-2	0.16	0.875	123.8	7.26E17	0.3559	10	44.1	0	17	34	88
Inlet Nozzle R2702-3	0.16	0.79	122.8	7.26E17	0.3559	-10	43.7	0	17	34	68
Inlet Nozzle R2702-4	0.16	0.795	122.9	7.26E17	0.3559	-10	43.7	0	17	34	68
Outlet Nozzle R2703-1	0.16	0.64	119	7.26E17	0.3559	-10	42.4	0	17	34	66
Outlet Nozzle R2703-2	0.16	0.67	119.8	7.26E17	0.3559	10	42.6	0	17	34	87
Outlet Nozzle R2703-3	0.16	0.675	119.9	7.26E17	0.3559	10	42.7	0	17	34	87
Outlet Nozzle R2703-4	0.16	0.66	119.5	7.26E17	0.3559	0	42.5	0	17	34	77
Nozzle Shell to Intermediate Shell Weld Seam	0.04	1.005	54	7.26E17	0.3559	-60	19.2	0	9.6	19.2	-22
Inlet Nozzle to Shell Weld Seams	0.163	0.035	74.6	7.26E17	0.3559	-40	26.5	0	13.3	26.5	13

Table 4.2-4 Calculation of Callaway Unit 1 RT_{PTS} Values for 54 EFPY (EOLE) at the Clad/Base Metal Interface

RPV Material	Cu (Wt. %)	Ni (Wt. %)	CF (ºF)	Fluence (n/cm^2) [1]	FF	$RT_{NDT(U)}$ (ºF)	ΔRT_{NDT} (ºF)	σ_U (ºF)	σ_D (ºF)	M (°F)	RT_{PTS} (°F)
Outlet Nozzle to Shell Weld Seams	0.163	0.035	74.6	7.26E17	0.3559	-40	26.5	0	13.3	26.5	13
Nozzle Shell Long Weld Seams	0.035	1.005	47.5	7.26E17	0.3559	-40	16.9	0	8.5	16.9	-6

1 Fluence values are based on the limiting beltline and extended beltline fluence.

2 The limiting RT_{PTS} value for the axially oriented welds and plates is 120°F, which corresponds to the Lower Shell Plate R2708-3. Note that the Lower Shell Plate R2708-1 resulted in a higher RT_{PTS} value of 141°F when the surveillance data was not used; however, the Lower Shell Plate R2708-1 RT_{PTS} value is 100°F when the credible surveillance data was used. Thus, taking credit for the Lower Shell Plate R2708-1 credible surveillance data, the limiting material of the axially oriented welds and plates is the Lower Shell Plate R2708-3.

4.2.4 Pressure-Temperature (P-T) Limits

Appendix G of 10 CFR 50 requires that reactor vessel boltup, hydrotest, pressure tests, normal operation, and anticipated operational occurrences be accomplished within established pressure-temperature (P-T) limits. These limits are established by calculations that utilize the material properties (adjusted reference temperature, ART), effects of fluence on material properties obtained from the reactor surveillance capsules, and methodology of Appendix G of ASME Boiler and Pressure Vessel Code, Section XI.

These methods depend on the limiting ART of the beltline material and cause the calculation of the P-T limit curves to be a TLAA. Withdrawal and testing of the surveillance coupons verifies that the limiting ART value used in the P-T limit curves bounds the aging of the reactor vessel material. ART values are listed in the PTLR (Reference 2).

The current P-T limit curves and the assumed ART values are valid up to 28 EFPY based on a clad/base metal interface fluence of 1.625 x 10^{19} n/cm^2 from the Capsule X surveillance results, WCAP-15400-NP (Reference 1). The current curves assume a ¼T ART of 128°F and a ¾T ART of 112°F. These reference temperatures are based on the aging of lower shell R2708-1. These latest P-T limit curves were generated using the methodologies from ASME Section XI Appendix G and WCAP-14040-NP-A.

Ameren Missouri will revise the P-T limits curves before reaching 28 EFPY. These curves are required to be maintained and updated as necessary by Technical Specifications 3.4.3 and 5.6.6. Therefore the P-T limit curves will be managed, as required by its current license, through the period of extended operation. The TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(iii).

Disposition: Aging Management, 10 CFR 54.21(c)(1)(iii)

4.2.5 Low Temperature Overpressure Protection

Low temperature overpressure protection (LTOP) at Callaway is required by Technical Specifications 3.4.12 and 5.6.6, and is provided by the cold overpressure mitigation system (COMS), which opens the pressurizer power operated relief valves (PORVs) at a setpoint calculated to prevent violation of the pressure-temperature limits. The design basis for LTOP is discussed in Technical Specification Basis 3.4.12. COMS setpoints are listed in the PTLR (Reference 2).

Since the COMS setpoint is based on the P-T limit curves calculation, which is a TLAA, the calculation of the COMS setpoints and the supporting safety analyses are TLAAs. However, these LTOP analyses do not depend on any other time-dependent values beyond the ART at the critical locations and the P-T limits. Changes to the RCS P-T limit curves also require an evaluation of the LTOP temperature and PORV pressure setpoints, and supporting safety analyses. The methodology used to determine the COMS PORV setpoints conforms to WCAP-14040-NP-A and ASME Code Case N-514.

The COMS setpoints are established in the PTLR and managed consistent with the P-T curves, which will be managed through the period of extended operation as described in Section 4.2.4, *Pressure-Temperature (P-T) Limits*. Therefore the COMS setpoints will be managed through the period of extended operation. The TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(iii).

Disposition: Aging Management, 10 CFR 54.21(c)(1)(iii)

4.3 METAL FATIGUE

This section addresses the design of mechanical system components supported by fatigue analyses and components whose design depends on an assumed number of load cycles without a calculated fatigue usage factor.

Fatigue analyses are required for piping, vessels, and heat exchangers designed to American Society of Mechanical Engineers *Boiler and Pressure Vessel Code*, Section III, *Rules for Construction of Nuclear Power Plant Components*, Division 1*, Metal Components*, Subsection NB, *Requirements for Class 1 Components*, Class 1 (ASME III Class 1).

The design of piping and vessels to certain other codes and code sections, including ASME Section III Class 2, 3, and MC, ANSI ASME B31.1, and ASME Section VIII Division 2, may require a fatigue analysis or assume a stated number of full-range thermal and displacement cycles.

4.3.1 Fatigue Monitoring Program

ASME III Class 1 design specifications define a set of static and transient load conditions for which components are to be designed. The Callaway design specifications state that the transient conditions are for a 40 year design life. However, the fatigue analyses are based on a specified number of occurrences of each transient rather than on the design or licensed life.

The Fatigue Monitoring program (B3.1) manages fatigue cracking caused by the specified transient conditions by periodically counting and evaluating transient consistent with X.M1 of NUREG-1801. The program will require periodic reviews of the plant instrumentation and operator logs to ensure that the critical thermal and pressure transients have not exceeded the design transient severity or analyzed number, and to ensure that usage factors will not exceed the allowable value of 1.0 without corrective actions. Corrective actions include fatigue reanalysis, repair, or replacement. Action limits permit completion of corrective actions before the design limits are exceeded. The Fatigue Monitoring program is required by Callaway Technical Specification 5.5.5, *Component Cyclic or Transient Limit*.

Table 4.3-2, *Transient Accumulations and Projections* lists the transients monitored by the Fatigue Monitoring program. The transients included in the program were identified through a review of the design and licensing analyses. These identified transients will be reconciled with the transients identified in FSAR Table 3.9(N)-1 SP in accordance with 10 CFR 54.29. The individual transients required to be counted by the licensing basis are identified in FSAR Table 3.9(N)-1A SP. The ASME Boiler and Pressure Vessel Code does not require inclusion of emergency or faulted conditions in fatigue evaluations; therefore, the emergency and faulted conditions are not included in the Fatigue Monitoring program.

4.3.1.1 Fatigue Monitoring Methods

The Fatigue Monitoring program (B3.1) will include both manual cycle counting of certain transients along with automatic cycle counting of selected transients utilizing monitoring software. The program also monitors transient pressure and thermal conditions to calculate the actual fatigue usage for specified fatigue critical locations. Monitored locations will include locations identified by the evaluation of ASME Section III fatigue analyses, the NUREG/CR-6260 sample locations for a newer vintage Westinghouse Plant, and plant-specific bounding environmentally assisted fatigue (EAF) locations. The program also accounts for the effects of the reactor coolant environment on fatigue usage where applicable. See Section 4.3.4, *Effects of the Reactor Coolant System Environment on Fatigue Life of Piping and Components (Generic Safety Issue 190).*

The program will track the occurrences of plant transients listed in Table 4.3-2, *Transient Accumulations and Projections*, using cycle counting, and monitors the cumulative usage factors (CUFs) at the components listed in Table 4.3-1, *Fatigue Monitored Locations and Management Methods* using either cycle-based fatigue or stress-based fatigue.

1. The Cycle Counting monitoring method: This monitoring method tracks transient event cycles affecting the location (e.g. plant heatup and plant cooldown) to ensure that the numbers of transient events analyzed by the design calculations are not exceeded.

2. The Cycle-based Fatigue (CBF) monitoring method: This monitoring method utilizes the cycle counting results and stress intensity ranges generated with the ASME III methods that use six stress tensors to perform cumulative usage factor (CUF) calculations for a given location. The fatigue accumulation is tracked to determine if the ASME allowable fatigue limit of 1.0 is approached. CBF monitoring is consistent with ASME Section III, which requires six component stress tensors; and Regulatory Issue Summary (RIS) 2008-30.

3. The Stress-Based Fatigue (SBF) monitoring method: This monitoring method computes a “real time” stress history for a given component from data collected from plant instruments to calculate transient pressure and temperature, and the corresponding stress history at the critical location in the component. The stress history is analyzed to identify stress cycles, and then a CUF is computed. The CUF will be calculated using a three dimensional, six component stress tensor method meeting ASME III NB-3200 requirements, or Ameren Missouri will benchmark the method in line with RIS 2008-30. The benchmark for the charging nozzles has been completed.

Charging Nozzle SBF Benchmarking

RIS 2008-30 discussed NRC staff concerns about the use of a single stress term used in SBF algorithms. The RIS does not imply that all six stress components must be used. The RIS only requires that it be demonstrated that the simplification of the use of less than the six-stress tensors produces a conservative result. Callaway performed a benchmark to demonstrate that the charging nozzle SBF algorithm produces a conservative CUF as compared to an independent ASME Section III, Division 1, Subsection NB, Subarticle NB-3200 fatigue calculation of the same component (Reference 15).

The benchmarking consisted of inputting the temperature, pressure and flow rate time histories for the most severe transient pairs into the SBF algorithms. These time histories are the same as those assumed in the NB-3200 fatigue calculation and constitute about 88% of the NB-3200 CUF. A comparison demonstrated that the CUF for those transient pairs as computed by the SBF algorithms is more conservative than the CUF calculated with all transient pairs as computed using the detailed NB-3200 methodology.

Not all transient pairs resulted in a more severe transient for the SBF algorithms as compared to the NB-3200 methodology. For two of the transients, the SBF algorithms calculated stress ranges approximately one to two percent less than the NB-3200 analysis. The bulk of this difference is due to the use of Green's Functions (influence functions, based on constant material properties) rather than any effect of using a single stress term. The NRC has emphasized that the Green's Function methodology is not in question, and the small difference in results is within the accuracy of the analysis. Since the main source of any differences is not attributable to the use of a single stress term, the concerns expressed by the NRC staff in RIS 2008-30 are addressed and eliminated for the charging nozzles.

Table 4.3-1 Fatigue Monitored Locations and Management Methods

Component	Fatigue Monitoring Method	LRA Section
Accumulator SI Nozzle	CBF	4.3.2
Boron Injection Header Nozzles-Cold Leg (NUREG/CR 6260 locations)	CBF	4.3.4
RPV Inlet Nozzle (NUREG/CR-6260 locations)	CBF	4.3.4
RPV Outlet Nozzle (NUREG/CR-6260 locations)	CBF	4.3.4
RPV Lower Head (NUREG/CR-6260 locations)	CBF	4.3.4
Normal Charging Nozzle (NUREG/CR-6260 locations)	SBF	4.3.4
Alternate Charging Nozzle (NUREG/CR-6260 locations)	SBF	4.3.4
Pressurizer Lower Head	CBF/SBF(1)	4.3.2.2
Pressurizer Surge Nozzle	CBF/SBF(1)	4.3.2.2
Pressurizer Heater Well	CBF/SBF(1)	4.3.2.2
RHR Nozzle-Hot Leg Loops 1 and 4 (NUREG/CR-6260 locations)	CBF	4.3.4
Crossover Leg Loops 1 and 2 Drain Nozzles	CBF	4.3.2
Crossover Leg Loop 4 Excess Letdown Nozzles	CBF	4.3.2
Normal Letdown/Drain Line Loops 2 and 3	CBF	4.3.2
Pressurizer Safety and Relief Valve Piping	CBF	4.3.2

1 The method to monitor these locations has not been determined, but is a commitment as discussed in Section 4.3.2.2.

4.3.1.2 Projected Status of Monitored Transients

Cycle Count Baselining

A review of the Callaway operating history was performed under a 10 CFR 50 Appendix B program in order to baseline the transient event count in the Fatigue Monitoring program from initial startup (1983) to January 31, 2011 (Reference 16). These baselined results were then projected to 60 years. The results illustrate that the NSSS design transients for a 40-year plant design life reasonably bound the expected number for a 60-year plant life for all transients.

The baseline was performed covering two periods of Callaway operation. For Period 1, which covers plant startup through 5/10/1995, the manual records of the current program were used to re-create the event history for the plant. For Period 2, which covers 5/11/1995 through 1/31/2011, fatigue monitoring software was used to review plant instrument data in order to identify transient occurrences. If the plant instrumentation was unavailable for Period 2, then the manual plant records were used. Due to the sparseness of information for some of the transients, assumptions were made to avoid under-counting. These assumptions are noted in Table 4.3-2, *Transient Accumulations and Projections*.

Cycle Count Projection Method

The baseline cycle counting results were projected to a 60-year operating life based on the actual accumulation history since the start of plant life. A rate of future cycle accumulation is computed for each transient. The cycle projections are based on (1) a long term rate of cycle accumulation, based on the entire history, and (2) a short term rate of cycle accumulation. The period considered for the short-term is nine years, which is approximately a third of the plant operating period. These accumulation rates are then combined based on a weighting factor of 1 for the long term and three for the short term. By weighting the short-term operation more heavily than the long-term operation, more weight is given to the recent plant history in the future projection calculations. The assumption is that recent plant operating history is generally a better predictor of future plant operation than the early operating history.

These projections are intended to be a best estimate of the actual cycles expected. They do not represent a revision of the design basis for Callaway. The purpose is to demonstrate that the 40-year design numbers of transients are reasonable for 60 years. Future cycle count projections will be based on the actual accumulation history over the analysis period.

Table 4.3-2 Transient Accumulations and Projections

Transient Description	FSAR Design Cycles	Design Limiting Value(1)	Baseline (1983 – 2011)	Projected Events for 60 Years	Comments
Normal Condition Transients					
1a. Plant heatup at 100ºF/hr Pressurizer Heatup at 100°F/hr	200	200	29	65(2)	-
1b. Plant cooldown at 100ºF/hr Pressurizer Cooldown at 200°F/hr	200	200	29	65(2)	-
2a. Unit loading at 5% of full power per min	13200	11200	178	251(2)	The limiting value is from the RPV and CETNA fatigue analyses. 2000 transients are allocated to normal transient 11, “Reduced Temperature Return to Power”.
2b. Unit unloading at 5% of full power per min	13200	13200	184	276(2)	-
3a. Step increase 10% of full power	2000	2000	24	61	-
3b. Step decrease 10% of full power	2000	2000	20	48	-
4. Large step decrease with steam dump	200	200	6	13(2)	-
5a. Steady state fluctuations, Initial fluctuations	1.5 E5	1 E6	Not Counted (NC)	NC	The limiting value is from the reactor coolant loop (RCL) leak-before-break analysis described in Section 4.7.7. These fluctuations are assumed to occur only during the first 20 full power months of operation, therefore they do not need to be counted.

Table 4.3-2 Transient Accumulations and Projections

Transient Description	FSAR Design Cycles	Design Limiting Value(1)	Baseline (1983 – 2011)	Projected Events for 60 Years	Comments
5b. Steady state fluctuations, Random fluctuations	3.0 E6		NC	NC	The limiting value is from the RCL leak-before-break analysis described in Section 4.7.7. This number of cycles is beyond the endurance limit of the fatigue curve, therefore this transient does not need to be counted.
6. Feedwater cycling at hot shutdown (SG A / B / C / D)	2000	2000	134 / 132 / 134 / 134	186 / 175 / 183 / 180	-
7a. Loop out of service, Normal loop shutdown	80	80	0	0(2)	Callaway is not licensed for N-1 loop operation.
7b. Loop out of service, Normal loop startup	70	70	0	0(2)	
8a. Unit loading between 0 15% of full power	500	500	93	176	-
8b. Unit unloading between 0 15% of full power	500	500	92	175	-
9. Boron concentration equalization	26400	26400	NC	NC	The number is based on 2 load changes per day (1 loading & 1 unloading) for 40 years with a 90% capacity factor. Callaway does not load follow and will not approach the limit.
10a1. Reactor coolant pump startup and shutdown cold condition, RCS venting	800	3800	RCP A 139 RCP B 142	RCP A 216 RCP B 220	The limiting value is from the RSG fatigue analyses described in Section 4.3.2.3. The RCP startup and shutdown transients are monitored as a summation of all RCP startup and
10a2. Reactor coolant pump startup and shutdown cold condition, RCS heatup, cooldown	200				

Table 4.3-2 Transient Accumulations and Projections

Transient Description	FSAR Design Cycles	Design Limiting Value[1]	Baseline (1983 – 2011)	Projected Events for 60 Years	Comments
10b. Reactor coolant pump startup and shutdown pump restart condition, Hot functional, stops, starts	500		RCP C 139 RCP D 122	RCP C 219 RCP D 194	shutdown. Monitoring this group of transients is acceptable because the fatigue analyses treat these transients in this manner.
10c. Reactor coolant pump startup and shutdown hot condition, Transients and misc.	2500				
11. Reduced temperature return to power	2000	2000	0	0[2]	Maneuver is not utilized because Callaway does not load follow.
12. Refueling	80	80	17	39[2]	-
13. Turbine roll test	20	10	7	7[2]	The limiting value is from the RCL leak before break analysis described in Section 4.7.7. Test performed during initial startup and no more tests are expected.
14. Primary side leak test	200	50	8	10[2]	The limiting value is from the RCL leak before break analysis described in Section 4.7.7. Baseline result assumes 1 event for each opening of the primary system prior to 1995 in addition to the documented event.
15. Secondary side leak test	80	80	1	4	-
16a. Feedwater heaters out of service: One heater out of service	120	120	56	106	Baseline results judged to be conservative based on a review of instrumentation data available from 2000-2011.
16b. Feedwater heaters out of service: One bank out of service	120	120	12	16	

Table 4.3-2 Transient Accumulations and Projections

Transient Description	FSAR Design Cycles	Design Limiting Value(1)	Baseline (1983 – 2011)	Projected Events for 60 Years	Comments
17. RPV bolting/unbolting	-	57	20	45	The limiting value is from the RPV fatigue analysis. Baseline results assume transient coincides with refueling, plus pre-start test, and an additional RF17 event.
Upset Condition Transients					
1. Loss of load (without immediate reactor trip)	80	80	0	1(2)	-
2. Loss of power (with natural circulation in the RCS)	40	40	1	1(2)	The 60 year projection is kept at 1 event because this is the value analyzed in the EAF calculations. The justification is provided in Section 4.3.4.
3. Partial loss of flow (loss of one pump)	80	80	0	1(2)	-
4a. Reactor trip from full power, without cooldown.	230	230	66	92(2)	-
4b. Reactor trip from full power, with cooldown, without safety injection	160	160	0	1(2)	-
4c. Reactor trip from full power, with cooldown, with safety injection	10	10	0	1(2)	-
4d. Reactor trip from full power, with no inadvertent cooldown - emergency overspeed	20	20	NC	NC	Included as part of upset transient 4a, “Reactor Trip from Full Power, without Cooldown.”
5. Inadvertent RCS depressurization	20	20	2	5(2)	-

Table 4.3-2 Transient Accumulations and Projections

Transient Description	FSAR Design Cycles	Design Limiting Value(1)	Baseline (1983 – 2011)	Projected Events for 60 Years	Comments
5a. Inadvertent RCS depressurization due to inadvertent auxiliary spray	-	10	0	1(2)	The limiting value is from the Pressurizer, Class 1 Piping, Surge line, and NUREG/CR-6260 fatigue analyses.
6. Inadvertent startup of an inactive RCS loop	10	10	0	1(2)	-
7. Control rod drop	80	80	0	1(2)	-
8. Inadvertent safety injection actuation	60	60	2	2(2)	The 60 year projection is kept at 2 events because this is the value analyzed in the EAF calculations. The justification is provided in Section 4.3.4.
9. Operating basis earthquake (20 earthquakes of 10 cycles each)	200 cycles	20 events	0	1(2)	-
10. Excessive feedwater flow	30	30	0	1(2)	-
11. RCS cold overpressurization	10	10	0	1	-
Test Condition Transients					
1. Primary side hydrostatic test	10	5	1	1(2)	The limiting value is from the RCL leak before break analysis described in Section 4.7.7. Test performed during initial startup and no more tests are expected.
2. Secondary side hydrostatic test	10	10	1	1	Test performed during initial startup and no more tests are expected.

Table 4.3-2 Transient Accumulations and Projections

Transient Description	FSAR Design Cycles	Design Limiting Value(1)	Baseline (1983 – 2011)	Projected Events for 60 Years	Comments
3. Tube leakage test	800	800	0	1	Tests performed at 200, 400, 600, and 800 psig
4. Cold hydrostatic test	-	10	NC	NC	The limiting value is from the RCL leak before break analysis described in Section 4.7.7. Manufacturer test, this transient is not required to be monitored for fatigue by article NB-3226.e of the ASME code.
Auxiliary Transients					
1. Normal charging and letdown shutoff and return to service (Alt / Normal)	-	36	0 / 4	1 / 6	This transient is applicable to Class 1 piping, NUREG/CR-6260 locations described in Section 4.3.4, and the Class 2 heat exchanger analyses described in Section 4.3.8. The charging lines include a reduction to 60% of the design number based on alternating between the normal and alternate charging paths. The alternate charging line is now used to prevent transients in the normal charging line.
2. Letdown flow shutoff with prompt return to service (Alt / Normal)	-	120	1 / 11	4 / 23	
3. Letdown flow shutoff with delayed return to service (Alt / Normal)	-	12	2 / 12	8 / 24	
4. Charging flow shutoff with prompt return to service (Alt / Normal)	-	12	0 / 12	1 / 27	
5. Charging flow shutoff with delayed return to service (Alt / Normal)	-	12	1 / 9	4 / 15	
6. Charging flow decrease and return to normal	-	14400	NC	NC	This transient is applicable to NUREG/CR-6260 locations described in Section 4.3.4, Class 1 CVCS piping, and the Class 2 heat exchanger analyses

Table 4.3-2 Transient Accumulations and Projections

Transient Description	FSAR Design Cycles	Design Limiting Value[1]	Baseline (1983 – 2011)	Projected Events for 60 Years	Comments
7. Charging flow increase and return to normal	-	14400	NC	NC	described in Section 4.3.8. The number is based on 2 load changes per day (1 loading & 1 unloading) for 40 years and 80% capacity factor. The charging lines include an additional 60% reduction based on rotating between the normal and alternate charging paths. Callaway does not load follow and will not approach the limit during a 60 year plant life as described in Section 4.3.8.
8. Letdown flow decrease and return to normal	-	1200	NC	NC	This transient is applicable to NUREG/CR-6260 locations described in Section 4.3.4, Class 1 CVCS piping, and Class 2 heat exchanger analyses described in Section 4.3.8. The transient is not a normal operating transient, but is included for conservatism and is not a significant contributor to fatigue as described in Section 4.3.8. The charging lines include an additional 60% reduction based on rotating between the normal and alternate charging paths.

Table 4.3-2 Transient Accumulations and Projections

Transient Description	FSAR Design Cycles	Design Limiting Value(1)	Baseline (1983 – 2011)	Projected Events for 60 Years	Comments
9. Letdown flow increase and return	-	14400	NC	NC	This transient is applicable to NUREG/CR-6260 locations described in Section 4.3.4, Class 1 piping, and the Class 2 heat exchanger analyses described in Section 4.3.8. The charging lines include an additional 60% reduction based on rotating between the normal and alternate charging paths. Callaway does not load follow and will not approach the limit during a 60 year plant life as described in Section 4.3.8.
10. Load follow boration	-	24000	NC	NC	The transient is specified for the Class 2 heat exchanger. The number is based on 2 load changes per day (1 loading & 1 unloading) for 40 years and 80% capacity factor. Callaway does not load follow and will not approach the limit during a 60 year plant life as described in Section 4.3.8.
11. Accumulator actuation, accident operation	-	21	0	1	Transients are from the Class 1 valve fatigue analyses and accumulator leak before break analysis.
12. Inadvertent accumulator blowdown	-	4	0	1	
13. RHR operation - plant cooldown	-	200	29	62	Transients are from the Class 1 valve fatigue analyses and accumulator leak before break analysis. Baseline assumes a RHR event coincides with plant cooldown.
14. High head safety injection (Loop A / B / C / D)	-	110	3 / 0 / 0 / 0	4 / 1 / 1 / 1	Transients are from the Class 1 valve fatigue analyses and accumulator leak before break analysis.

Table 4.3-2 Transient Accumulations and Projections

Transient Description	FSAR Design Cycles	Design Limiting Value(1)	Baseline (1983 – 2011)	Projected Events for 60 Years	Comments
15. Seal injection flow temperature change	-	180	29	63	This transient is only applicable to the RCPs fatigue analysis described in Section 4.3.2.1. Baseline assumes event coincides with plant cooldown.
16. Elevated seal water injection temperature	-	200	55	121	This transient is only applicable to the RCPs described in Section 4.3.2.1. Baseline assumes event coincides with plant cooldown as specified plus one event per summer to account for seasonal temperature changes.
17. Loss of seal injection flow	-	40	3	7	This transient is only applicable to the RCPs described in Section 4.3.2.1.
18. Elevated CCW injection temperature	-	150	30	67	This transient is only applicable to the RCPs. An administration action limit of 150 cycles is imposed as described in Section 4.3.2.1. Baseline assumes event coincides with plant cooldown in addition to the documented events.
19. CCW – Seasonal temperature change	-	40	NC	NC	This transient is only applicable to the RCPs. Justification for not counting described in Section 4.3.2.1.

Table 4.3-2 Transient Accumulations and Projections

Transient Description	FSAR Design Cycles	Design Limiting Value(1)	Baseline (1983 – 2011)	Projected Events for 60 Years	Comments
20. Loss of CCW flow	-	200	35	81	This transient is only applicable to the RCPs and Class 2 heat exchangers described in Sections 4.3.2.1 and 4.3.8. Baseline assumes event coincides with plant cooldown in addition to the documented events.
21. Normal PORV activation	-	600	8	19	The limiting value is from the PORV fatigue analysis.
22. Pressurizer safety valve (PSV) operation	-	83	11	37	The limiting value is from the pressurizer safety valve fatigue analysis. No operational transients identified. Baseline result based on test events.
23. Low pressure safety injection	-	1	0	1	The limiting value is from the RHR pump discharge check valve fatigue analysis. Faulted condition, e.g. LOCA, which is combined with high head safety injection, transient #14, in the fatigue analysis. Per the Code, it is not required to be included in the fatigue analysis.
24. Cold shutdown depressurization	-	1	NC	NC	The limiting value is from the PSV fatigue analysis. Has a negligible contribution to fatigue.
25. Reactor vessel/pressurizer vent	-	1	NC	NC	The limiting value is from the PSV fatigue analysis. Has a negligible contribution to fatigue.

Table 4.3-2 Transient Accumulations and Projections

Transient Description	FSAR Design Cycles	Design Limiting Value[(1)]	Baseline (1983 – 2011)	Projected Events for 60 Years	Comments
26. Zero load	-	200	NC	NC[(2)]	The limiting value is from the fatigue crack growth analysis performed in support of the pressurizer SWOL described in Section 4.7.2 and NUREG/CR-6260 locations described in Section 4.3.4. Cycle counting for the 200 heatups and cooldowns will capture the 200 zero load states.
27. Pressurization	NS	400	NC	NC	The transient is specified for the Class 2 heat exchangers but can be satisfactorily managed by counting other transients as described in Section 4.3.8.
28. Excess letdown heat exchanger operation	NS	650	122	270	The transient is specified at 100 events for the Class 2 heat exchangers but was analyzed for 650 events as described in Section 4.3.8.

1 Design limiting value identified through a review of the design and licensing basis analyses.

2 These values will also be incorporated into the cycle counting action limits to ensure that the EAF results for the hot leg surge nozzle shown in Section 4.3.4 are not exceeded. This was necessary because of limitations in the CBF algorithm to account for insurge and outsurge transients.

4.3.2 ASME Section III Class I Fatigue Analysis of Vessels, Piping and Components

Fatigue analyses are performed for ASME III Division 1 Class 1 components per the ASME Section III, paragraph NB-3222.4(e). Each analysis is required to demonstrate that the Cumulative Usage Factor (CUF) for the component will not exceed the Code design limit 1.0 when the component is exposed to all of the postulated transients. A detailed fatigue evaluation is not required if components conform to the waiver of fatigue requirements, ASME Code paragraph NB 3222.4(d). These fatigue analyses and fatigue waivers depend on the numbers of anticipated transients over the life of the plant and therefore constitutes TLAAs.

For valves and pipes, the scope of the ASME Section III fatigue requirements are limited to only those Class 1 valves with an inlet piping connection greater than four inches; and Class 1 piping greater than one inch nominal pipe size.

The following lists all vessels, pumps, and components subject to Class 1 analyses.

- Reactor Pressure Vessel (RPV), Nozzles, Head, Head Adapter Plugs, and Studs:
  The RPV is designed to ASME Section III, Subsection NB (Class 1), 1971 Edition with addenda through Winter 1972.

- Control Rod Drive Mechanisms (CRDMs) and Core Exit Thermocouple Nozzle Assembly (CETNAs):
  The CRDMs and CETNAs are designed to ASME Section III, Subsection NB (Class 1) 1974 Edition. The CRDMs are designed with addenda through Winter 1974. The CRDMs were shown to satisfy the fatigue waiver requirements.

- Reactor Coolant Pumps:
  The reactor coolant pumps are Westinghouse Model 93A1. The pump pressure boundary was designed to ASME Section III, 1971 Edition with addenda through Summer 1973. The RCP casing, thermal barrier assembly, seal housing, and auxiliary nozzles were shown to satisfy the fatigue waiver requirements.

- Pressurizer and Pressurizer Nozzles:
  The pressurizer is a Westinghouse (SNUPPS) Model F, Series 84 Pressurizer (SCP) designed to ASME Section III 1974 Edition with addenda through Summer 1974.

- Steam Generators, and Feedwater Nozzles:
  The steam generators are replacement steam generators designed to ASME Section III 1989 Edition with no Addenda. ASME Section III requires no fatigue analysis for Class 2 secondary side of the steam generator; however the entire pressure boundary of the Callaway replacement steam generators is constructed in accordance with ASME Section III Class 1 requirements.

- ASME III Class 1 Valves:
  The Class 1 valves are designed to ASME Section III, Subsection NB, 1974 Edition with Addenda through Summer 1975.

- ASME III Class 1 Piping and Piping Nozzles:
  The Class 1 reactor coolant loop piping and surge line are designed to ASME Section III, 1974 Edition with addenda through Winter 1975. The fatigue analyses of piping outside the main loop used ASME Section III, 1977 Edition with addenda through Summer 1979.

The fatigue analyses for the components listed in Table 4.3-3, *ASME Class 1 Fatigue Analyses Under the Fatigue Monitoring Program* and the fatigue waiver evaluations were performed using the transients listed Table 4.3-2, *Transient Accumulations and Projections* . They will remain applicable as long as the numbers of specified design transients are not exceeded. The Fatigue Monitoring program, summarized in Appendix B, Section B3.1 will track the numbers of events and transient severities. Therefore the analyses will be managed for the period of extended operation, and the TLAAs are dispositioned in accordance with 10 CFR 54.21(c)(1)(iii).

Disposition: Aging Management, 10 CFR 54.21(c)(1)(iii)

Sections 4.3.2.1 through 4.3.2.4 include topics which required additional consideration when evaluating the ability of the Fatigue Monitoring program to manage fatigue and fatigue analyses which were not dispositioned in accordance with 10 CFR 54.21(c)(1)(iii).

Table 4.3-3 ASME Class 1 Fatigue Analyses Under the Fatigue Monitoring Program

Component	CUF
Reactor Pressure Vessel Components	
Inlet Nozzles Support	0.0795 0.0306
Outlet Nozzles Support	0.1078 0.0205
Head Flanges	0.0155
Vessel Flange	0.0196
Studs Studs Installed in Holes with Damaged Threads	0.4780 0.75
CRDM Housing	0.1093
Bottom Head to Shell Junction	0.0070
Bottom-Mounted Instrument Tubes	0.3184
Vessel Wall Transition	0.0105
Core Support Lugs	0.0617
Head Adapter Plug	0.0036
Core Exit Thermocouple Nozzle Assembly	
Head Port Adapter	0.123
Clamp	0.21
Upper Nozzle Housing	0.37
Drive Sleeve	0.02
Clamp Bolt	0.92
Reactor Coolant Pump Pressure Boundary Components	
Weir Plate	0.440
Casing at Discharge Nozzle Juncture	0.915
Bolting ring	0.086
Main closure bolts (studs)	0.45

Table 4.3-3 ASME Class 1 Fatigue Analyses Under the Fatigue Monitoring Program

Component	CUF
Casing at Large Support Feet Junctures	0.083
Thermal Barrier Flange at Component Cooling Water Connection (Flange Holes)	0.9334
Pressurizer Components	
Spray Nozzle	0.411
Upper Head	0.928
Surge Nozzle	0.963
Safety and Relief Nozzle	0.169
Support Skirt and Flange	0.734
Lower Head	0.112
Heater Well	0.128
Seismic Support Lug	0.444
Shell at Support Lug	0.992
Trunnion Buildup	0.567
Instrument Nozzle	0.236
Manway Bolt	0.915
Manway Pad	0.141
Valve Support Bracket	0.118
Immersion Heater	0.123
Class 1 Valves	
Pressurizer Safety Valves	0.018
PORV	0.139
PORV Solenoid	0.68
Loop SI / RHR Check Valves	0.17

Table 4.3-3 ASME Class 1 Fatigue Analyses Under the Fatigue Monitoring Program

Component	CUF
RHR and SI System Loop 2 & 3 Recirculation Supply Header Check Valves	0.17
RHR Pumps to RCS Cold Leg Check Valves	0.1647
RCS Cold Leg SI Accumulator Check Valves	0.26
SI Accumulator Outlet Upstream Check Valves	0.26
RHR Pump Suction Isolation Valves	0.64
RCS Hot Leg to RHR Pump Isolation Valves	0.64
Class 1 Piping	
Pressurizer Surge Line	0.099 Includes the effects of thermal stratification.
Spray/Aux. Spray Loops 1 & 2	0.84
Pressurizer Safety and Relief Valve Piping	0.975
Hot Leg	0.95
Crossover Leg	0.50
Cold Leg	0.37
Drain Line Loop 2	0.95
Normal Letdown/Drain Line Loop 3	0.95
Drain Line Loop 1	0.01
Excess Letdown/Drain Line Loop 4	0.191
Normal/Alternate Charging - Loops 1 & 4	0.93
Seal Water Injection Loop 1	0.066
Seal Water Injection Loop 2	0.066
Seal Water Injection Loop 3	0.114
Seal Water Injection Loop 4	0.067

Table 4.3-3 ASME Class 1 Fatigue Analyses Under the Fatigue Monitoring Program

Component	CUF
RHR Loops 1 & 4 Suction Line	0.296
Loop 1 Hot Leg Safety Injection Line	0.661
Loop 4 Hot Leg Safety Injection Line	0.110
Accumulator Lines - Loops 1, 2, 3, & 4	0.980
SI Hot Leg Loops 2 & 3	0.090
Boron Injection Header	0.773
Boron Injection Header Lines – Loops 1, 2, 3, & 4	0.930
Class 1 Piping Nozzles and Thermowells	
Pressurizer Spray Nozzle-Cold Leg Loop 1 & 2	0.84
Pressurizer Surge Nozzle-Hot Leg Loop 4	0.30 Includes the effects of thermal stratification.
Drain Nozzle-Crossover Leg Loop 1 & 2	0.70
Cold Leg Thermowells	0.025
Hot Leg Thermowells	0.017
Mid-Loop Level Tap from Hot Leg Loops 1 & 4	0.327
Hot Leg RTD Scoop Nozzles	0.65
Cold Leg RTD Nozzles	0.15
Excess Letdown-Crossover Leg Loop 4	0.804
Normal Letdown-Crossover Leg Loop 3	0.10
Normal/ Alternate Charging Nozzle-Cold Leg Loop 1 & 4	0.90
SIS Nozzle-Hot Leg Loops 2 & 3	0.10
Boron Injection Header Nozzles-Cold Leg Loops 1, 2, 3, & 4	0.999
Accumulator Nozzle-Cold Leg Loops 1, 2, 3, & 4	0.95

Table 4.3-3 ASME Class 1 Fatigue Analyses Under the Fatigue Monitoring Program

Component	CUF
RHR Nozzle-Hot Leg Loops 1 & 4	0.81
Pressurizer Thermowells	0.0
Spray Line Thermowells	0.021
Surge Line Thermowells	0.020

4.3.2.1 Reactor Coolant Pump Thermal Barrier Flange

The fatigue waiver conditions are satisfied for the pump, but a cumulative usage factor was calculated as part of simplified elastic-plastic analyses for the thermal barrier flange at component cooling water connection. This analysis was performed per Section NB-3228.3 of the ASME Code when the $3S_m$ limit on the range of local primary-plus-secondary stress intensity was exceeded. The fatigue analysis of the thermal barrier flange at component cooling water connection results in a CUF of 0.9334. The analysis uses auxiliary seal injection and component cooling water transients in addition to the design basis shown in FSAR 3.9(N)-1 SP. These transients used in the design of the RCP thermal barrier flange are:

No. 1 Seal Injection

- 180 cycles of Seal Injection Flow Temperature Change
- 200 cycles of Elevated Seal Water Injection Temperature
- 40 cycles of Loss of Seal Injection Flow

Component Cooling Water Connection

- 200 cycles of Elevated component cooling water (CCW) Injection Temperature
- 40 cycles of Seasonal Temperature Change
- 200 cycles of Loss of CCW Flow

The elastic plastic analysis for the thermal barrier flange at the component cooling water connection also indicates that the analysis considers the plant cooldown. The numbers of the plant cooldown, seal injection flow temperature change, elevated seal water injection temperature change, elevated CCW injection temperature, loss of seal injection, and complete loss of CCW flow transients will be tracked by the Fatigue Monitoring program as shown in Table 4.3-2, *Transient Accumulations and Projections*.

Since the seasonal temperature change is the only transient not counted its usage contribution during the period of extended operation can be estimated by multiplying its 40-year usage contribution by 1.5. If this is done, the CUF will exceed the Code allowable of 1.0. Inspection of the fatigue analysis for the thermal barrier flange at the component cooling water connection indicates that the transient that contributes most significantly to fatigue is the 200 cycles of elevated CCW injection temperature. To account for the increase in usage caused by the 20 additional years of operation and to keep the usage below the Code allowable of 1.0, the number of the most severe transient will be limited to 75 percent of its design value, i.e. limited to 150 elevated CCW injection temperature transients. This will keep the CUF less than 0.9.

The transients used in the fatigue analysis of the thermal barrier flange at the component cooling water connection will be tracked by the Fatigue Monitoring program, summarized in Appendix B, Section B3.1. Therefore the fatigue analysis will be managed for the period of extended operation, and the TLAAs are dispositioned in accordance with 10 CFR 54.21(c)(1)(iii).

Disposition: Aging Management, 10 CFR 54.21(c)(1)(iii)

4.3.2.2 Pressurizer Insurge-Outsurge Transients

Westinghouse Nuclear Safety Advisory Letter NSAL 04-5 describes the thermal transients resulting from a reactor coolant insurge-outsurge during normal heatup and cooldown operations. The limiting CUF locations for Westinghouse NSSS Plants are at the heater penetrations and pressurizer surge nozzle. This type of transient was not considered in the original design analyses of the pressurizer because it was assumed that when a pressurizer insurge occurred, the screen covering the surge nozzle opening inside the pressurizer caused mixing of the colder hot leg and hotter pressurizer water. However, instead of mixing, surge line stratification data led to the realization that the cooler, denser, hot leg water flows underneath the pressurizer water, resulting in a moving stratified condition.

To mitigate pressurizer insurge-outsurge transients Callaway has used modified operating procedures (MOPs) since 1996. Sample fatigue analyses for typical Westinghouse plants using MOPs show that the expected maximum fatigue for the pressurizer and pressurizer components is expected to remain below the ASME Code limit of 1.0.

Guidance on Operations and Engineering actions for monitoring and evaluating fatigue if the pressurizer surge line ΔT limits are exceeded is incorporated into the Plant Heatup and Cooldown procedures. These actions include direction to initiate an engineering evaluation of the surge line accumulated fatigue if the surge line ΔT exceeds 80°F. 80°F ΔT is the threshold below which an insurge-outsurge event will not significantly contribute to fatigue usage.

In order to determine if the pressurizer contains a limiting environmentally-assisted fatigue (EAF) location, the fatigue analyses will be revised to incorporate the effect of insurge-outsurge transients on the pressurizer lower head, surge nozzle, and heater well nozzles at plant specific conditions.

For license renewal Callaway has committed to monitor the CUF of the limiting location out of the pressurizer lower head, pressurizer surge line nozzle, and heater well nozzles using fatigue monitoring software consistent with RIS 2008-30. These TLAAs are dispositioned in accordance with 10 CFR 54.21(c)(1)(iii).

Disposition: Aging Management, 10 CFR 54.21(c)(1)(iii)

4.3.2.3 Steam Generator ASME Section III Class 1, Class 2 Secondary Side, and Feedwater Nozzle Fatigue Analyses

Although the ASME classification for the secondary side of the steam generators is specified to be Class 2, all pressure retaining parts of the steam generator, and thus both the primary and secondary pressure boundaries, are designed to satisfy the criteria specified in Section III of the ASME Code for Class 1 components.

Replacement steam generators (RSGs) were installed during Refuel 14 (Fall 2005). The RSGs reduced the susceptibility to PWSCC by eliminating all susceptible Alloy 600 and 82/182 material in the steam generators. The Class 1 fatigue analyses of the RSG components listed in Table 4.3-4, *Callaway Replacement Steam Generator Cumulative Fatigue Usage* used the design basis numbers of events assumed for a 40-year design life. The RSGs design lives end in 2045 which extends beyond the period of extended operation. Therefore, the corresponding TLAAs are dispositioned in accordance with 10 CFR 54.21(c)(1)(i).

Disposition: Validation, 10 CFR 54.21(c)(1)(i)

Table 4.3-4 Callaway Replacement Steam Generator Cumulative Fatigue Usage

Component	CUF
Lower Assembly Tubesheet (Perforated Region)	0.735
Lower Assembly Tubesheet (Non-Perforated)	0.428
Lower Assembly Channel Head	0.004
Lower Assembly Lower Shell	0.022
Lower Assembly Divider Plate	0.196
Primary Inlet Nozzle	0.005 (Safe End) 0.009 (Base Metal)
Primary Outlet Nozzle	0.001 (Safe End) 0.007 (Base Metal)
Primary Nozzle Dam Rings (Inlet Nozzle)	0.277
Primary Nozzle Dam Rings (Outlet Nozzle)	0.219
Primary Nozzles Drain Tube	0.316

Table 4.3-4 Callaway Replacement Steam Generator Cumulative Fatigue Usage

Component	CUF
Primary Manway Cover	0.349
Primary Manway Channel Head Flange	0.059
Primary Manway Studs	0.416 (thread base) 0.618 (stud/thread junct)
Primary Manway Drain Tube	0.391
Tube Bundle	0.068
Steam Outlet Nozzle	0.016
Upper Assembly Conical Shell	0.271
Feedwater Nozzle	0.941
Secondary Manway Cover	0.063
Secondary Manway Flange	0.03
Secondary Manway Studs	0.135 (thread base) 0.307(stud/thread junct)
Handhole Cover	0.042
Handhole Flange	0.172
Handhole Studs	0.287(thread base) 0.354(stud/thread junct)
Instrumentation Tap w/Stabilizer	0.119
Instrumentation Tap w/ Plug	0.002
Recirculation Nozzle	0.209
Bundle Wrapper Internal Supports	0.004
Inspection Port Cover	0.006
Inspection Port Flange	0.365
Inspection Port Studs	0.289(thread base) 0.589(stud/thread junct)

4.3.2.4 NRC Bulletin 88-11 Revised Fatigue Analysis of the Pressurizer Surge Line for Thermal Cycling and Stratification

The purpose of NRC Bulletin 88-11, *Pressurizer Surge Line Thermal Stratification* is to (1) request that addressees establish and implement a program to confirm pressurizer surge line integrity in view of the occurrence of thermal stratification and (2) require addressees to inform the staff of the actions taken to resolve this issue.

The Callaway pressurizer surge line is 14-inch diameter, schedule 160 piping, SA 376 Type 316, except the long-radius elbow, which is SA 376 Type 304. The surge line is designed to ASME Section III, 1974 Edition with addenda through Winter 1975. The fatigue analysis used code addenda through Summer 1979.

The surge line design was reanalyzed to the 1986 code in response to the NRC Bulletin 88-11 thermal stratification concerns. This analysis was later reevaluated for effects of snubber removals. The results of these analyses have been incorporated into the piping and main-loop nozzle code design reports.

The analysis of thermal stratification effects at Callaway evaluated the following locations:

Hot Leg Surge Nozzle: Westinghouse performed stress analyses of the reactor coolant loop (RCL) branch nozzles including the effects of thermal stratification. The fatigue result for the 14-in. pressurizer surge nozzle on hot leg loop 4 is 0.30 as shown in Table 4.3-3, *ASME Class 1 Fatigue Analyses Under the Fatigue Monitoring Program*.

Pressurizer Surge Line: Westinghouse performed stress analyses of the auxiliary piping systems connected to the RCL including the effects of thermal stratification. The fatigue result for the 14-in. pressurizer surge line is 0.099 as shown in Table 4.3-3, *ASME Class 1 Fatigue Analyses Under the Fatigue Monitoring Program*.

The Fatigue Monitoring program, summarized in Appendix B, Section B3.1, will track events in Table 4.3-2, *Transient Accumulations and Projections* to ensure that a design basis number of events is not exceeded. The effects of fatigue on the pressurizer surge line will therefore be managed for the period of extended operation, and the TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(iii).

Disposition: Aging Management, 10 CFR 54.21(c)(1)(iii)

4.3.3 ASME Section III Subsection NG Fatigue Analysis of Reactor Pressure Vessel Internals

The Callaway reactor vessel internals were designed after the incorporation of Subsection NG into the 1974 Edition (no addenda) of Section III of the ASME Boiler and Pressure Vessel Code. Plants designed after the incorporation of the Subsection NG have complete fatigue analyses of RVI component low-cycle and high-cycle fatigue usage. The Callaway reactor vessel internals meet Subsection NG in full.

Reactor Internal Design Basis for Low-Cycle Fatigue

The reactor vessel internals analyses of record for Callaway were verified to continue to satisfy the ASME Subsection NG requirements. The fatigue analyses were performed using the 40-year design transients in FSAR Table 3.9(N)-1 SP. The baffle, former, and barrel assemblies were qualified by fatigue tests in accordance with ASME Section III, Subsection NG, Article II-1221 for the number of cycles and severity required by the design specification. The fatigue tests were used in lieu of a fatigue analysis; therefore no CUF exists for these components. Maintaining those components within specified numbers of transients will ensure the tests remain valid.

The Fatigue Monitoring program, summarized in Appendix B, Section B3.1, will track the number of events in Table 4.3-2, *Transient Accumulations and Projections* to manage the fatigue analysis of the reactor internals listed in Table 4.3-5, *Reactor Internals Design Basis Fatigue Analysis Results*. Therefore, fatigue in the reactor vessel internals will be adequately managed for the period of extended operation, in accordance with 10 CFR 54.21(c)(1)(iii).

Disposition: Aging Management, 10 CFR 54.21(c)(1)(iii)

Absence of TLAAs for High Cycle / High Vibration Fatigue

High cycle fatigue vibrations may be a factor for some fatigue sensitive components. Protection from flow induced vibration is ensured by satisfying the requirements of Regulatory Guide 1.20 as discussed FSAR Sections 3.9(N).2.3, 3.9(N).2.4, and 3.9(N).2.6 SP, and includes the results of experimental tests and analyses. A review of the supporting references did not identify any dependence on time. The high cycle fatigue / flow-induced vibration stresses were not considered in the calculation of the cumulative usage factors for the components because the vibratory stresses are very small compared to thermal transient stresses and the usage from high cycle effects is insignificant, i.e. allowable number of cycles exceeds the endurance limit. Therefore evaluation of high cycle vibrational loads does not depend on the licensed period and is not a TLAA in accordance with 10 CFR 54.3(a), criterion 3.

Callaway reactor internals program, described in Appendix B, Section B2.1.6, will address the aging effects in the reactor internal components including those that could be induced by a flow-induced vibration mechanism.

Absence of TLAAs for Ductility Reduction of Fracture Toughness for the Reactor Vessel Internals

Table 4.1-3 of the NUREG-1800, *Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants,* identifies "ductility reduction of fracture toughness for the reactor vessel internals" as a potential plant-specific TLAA. However, a review of the Callaway licensing basis found no 40-year embrittlement analysis for reactor vessel internals.

Table 4.3-5 Reactor Internals Design Basis Fatigue Analysis Results

Component	CUF
Lower Support Columns	0.270
Core Barrel Nozzle	0.762
Lower Core Plate Assembly Perforated Region	0.0744
Upper Core Plate	0.183
Lower Support Plate	0.183
Radial Key Weld	0.001
Baffle-Former Bolts	Qualified by test CUF < 1
Barrel-Former Bolts	Qualified by test CUF < 1
Guide Tubes	0.102
Upper Support Plate Assembly	0.094
Baffle Edge Bolts	Qualified by Test CUF < 1
Lower Core Barrel	0.351
Upper Core Barrel	0.155
Guide Cards	0.083
Guide Tube Lower Flange	0.946 (bottom flange weld) 0.009 (bottom flange)

Table 4.3-5 Reactor Internals Design Basis Fatigue Analysis Results

Component	CUF
Thermal Shield Flexures	0.978
Hold Down Spring	0.004

4.3.4 Effects of the Reactor Coolant System Environment on Fatigue Life of Piping and Components (Generic Safety Issue 190)

The NRC concluded that effects of the reactor coolant environment might need to be included in the calculated fatigue life of components, and opened three generic safety issues to address this question, all finally closed to a single Generic Safety Issue 190. Subsequent research and studies refined the methods, which no longer use the interim fatigue curves of NUREG/CR-5999 but calculate an environmental fatigue effect multiplier F_{en}, which depends on material type, temperature, strain rate, and dissolved oxygen; and for carbon and low-alloy steel, sulfur content.

NUREG-1800, *Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants* states that “The applicant's consideration of the effects of coolant environment on component fatigue life for license renewal is an area of review,” noting the staff recommendation “…that the samples in NUREG/CR-6260 should be evaluated considering environmental effects for license renewal.”

The GSI-190 review requirements are therefore imposed by the Standard Review Plan and do not depend on the individual plant licensing basis. Callaway addressed GSI-190 review requirements by assessing the environmental effect on fatigue at the NUREG/CR-6260 locations for the newer-vintage Westinghouse Plant.

NUREG/CR-6260 identifies seven sample locations for newer vintage Westinghouse plants which need to consider the effects of reactor coolant environment on component fatigue life for license renewal:

1. Reactor Vessel Lower Head to Shell Juncture
2. Reactor Vessel Primary Coolant Inlet Nozzle
3. Reactor Vessel Primary Coolant Outlet Nozzle
4. Hot Leg Surge Nozzle
5. Charging Nozzles
6. Safety Injection Nozzles
7. Residual Heat Removal Line Inlet Transition

Table 4.3-6, *Summary of Fatigue Usage Factors at NUREG/CR 6260 Sample Locations* is a summary of environmentally-assisted fatigue of the NUREG/CR-6260 locations. The F_{en} relationships are calculated from NUREG/CR-6583 for carbon and low-alloy steels and from NUREG/CR-5704 for stainless steels, as appropriate for the material at each of these locations.

The NUREG/CR-6260 locations in Table 4.3-6, *Summary of Fatigue Usage Factors at NUREG/CR 6260 Sample Locations* with an EAF CUF below 1.0, when using the design basis CUF and the maximum F_{en}, require no further analysis. Three of the NUREG/CR-6260 locations, (1) RPV lower head to shell juncture, (2) RPV inlet nozzle, and (3) RPV outlet nozzles meet this criterion (Reference 4). All three locations are low alloy steel locations.

The maximum F_{en} for low alloy steel assumes the dissolved oxygen level to be less than 0.05 ppm, which corresponds to a low oxygen environment. This is consistent with the Callaway primary chemistry program, which maintains RSC hydrogen level at 25 to 50 cc/kg. A minimum hydrogen concentration will ensure the RCS is free of oxygen. Sulfur content is assumed to be at the maximum concentration in the NUREG.

The remaining NUREG/CR-6260 locations were reevaluated with a refined fatigue analysis using NB-3200 methods in a 3-D finite element analysis model using the design number of transients to reduce the CUF values. After reanalysis the RHR inlet transition was the only location to pass the EAF CUF criterion of 1.0 (Reference 5).

Two options are available to further reduce the EAF CUFs for the charging system nozzles, safety injection nozzles, and hot leg surge line nozzle: (1) calculate a strain rate dependent F_{en}; and (2) calculate CUF based on the 60 year projected numbers of transient events or both.

Revision of F_{en} Based on Strain-Rate

The strain-rate dependent F_{en} values are calculated for the significant load set pairs in the fatigue analyses. Load set pairs that produce no significant stress range or fatigue contribution were assigned the maximum F_{en} for the material. The integrated strain rate method described in MRP-47, *Guidelines for Addressing Fatigue Environmental Effects in a License Renewal Application*, was used to calculate F_{en} values for individual load pairs that produce significant stress ranges. Dissolved oxygen of less than 0.05 ppm is assumed, which corresponds to a low oxygen environment. This is conservative since lower dissolved oxygen concentrations yield higher F_{en} values for stainless steel. Sulfur content is only applicable to low alloy steel locations.

Revision of CUF Based on 60-Year Projections of Transients

However, multiplying the revised CUF by the weighted average F_{en} value computed above still results in EAF CUFs greater than 1.0 for the charging system nozzles, safety injection nozzles, and hot leg surge line nozzle after conservatism has been removed. In order to demonstrate that monitoring fatigue in these locations is a sufficient form of aging management, the EAF CUF was calculated based on the numbers of transients projected to 60 years in Table 4.3-2, *Transient Accumulations and Projections*. If the transient is not projected, then the full number of design basis events is used. There were two transients that were not analyzed at the 60 year projection. The exceptions are the “inadvertent safety injection” and “loss of power” events, which were analyzed at the events to-date. The only EAF CUF calculation significantly affected by the transients is the safety injection nozzle, e.g. affected greater than the order of magnitude. This is addressed below.

The projected normal and alternate charging nozzles EAF CUFs are 0.57 and 0.53 based on SBF usage factors of 0.092 and 0.078, and F_{en} of 6.22 and 6.75 (Reference 6). The SBF usage factors were generated with computer software that was benchmarked against NB-3200 methods consistent with RIS 2008-30 as discussed in Section 4.3.1.1, *Fatigue Monitoring Methods*.

The projected safety injection nozzle EAF CUF is 0.74 based on the usage factor of 0.11 and F_{en} of 6.5 (Reference 7). Even though this location is analyzed for the numbers of “inadvertent safety injection” and “loss of power” events to-date, it is monitored with CBF; therefore EAF CUF will be updated as additional events occur.

The projected hot leg surge line nozzle EAF CUF is 0.765 based on the usage factor of 0.076 and F_{en} of 10.10 (Reference 8).

All of the locations specified in NUREG/CR-6260 for newer vintage Westinghouse plants listed in Table 4.3-6, *Summary of Fatigue Usage Factors at NUREG/CR 6260 Sample Locations* will be monitored by the Fatigue Monitoring program, described in Appendix B3.1. Most of the locations will be monitored using CBF or SBF. The hot leg surge nozzle will be monitored by incorporating the 60 year cycle projections into the cycle counting action limits to ensure that the results for the hot leg surge presented in this section are not exceeded. Therefore, the effects of the reactor coolant environment on fatigue usage factors will be managed for the period of extended operation. These TLAAs are dispositioned in accordance with 10 CFR 54.21(c)(1)(iii).

Disposition: Aging Management, 10 CFR 54.21(c)(1)(iii)

Evaluation of Limiting Locations for Environmental Assisted Fatigue

In order to assure that the limiting plant-specific EAF locations are identified, Callaway performed a systematic review of all wetted, RCPB components with a Class 1 fatigue analysis. This was done either to show that the NUREG/CR-6260 locations are bounding or to incorporate EAF into the licensing basis for those more limiting components. The first step in the screening was to apply the maximum F_{en} to all non-NUREG/CR-6260 locations using NUREG/CR-6583 for carbon and low alloy steels, NUREG/CR-5704 for austenitic stainless steels, and NUREG/CR-6909 for nickel alloys. For those locations with an EAF CUF less than 1.0, no further work is required. Those locations with an EAF CUF greater than 1.0 were categorized based on the strain-rate of the dominant transient. The classification was determined with a qualitative assessment based on experience and not a quantitative stress analysis for the strain-rate classification. The strain-rate classification, an assumed low dissolved oxygen environment, the maximum fluid/metal temperature, and the maximum concentration for sulfur content were used to calculate the F_{en} value based on the same NUREGs used in the initial screening. The F_{en} and the design basis CUFs were used to identify the limiting EAF CUF for each material type in each system including those systems not considered in the NUREG/CR-6260 evaluation (e.g., steam generator primary side and pressurizer, pressurizer spray line, etc.). Table 4.3-7, *Preliminary Identification of Additional Sentinel Locations for EAF* identifies the locations, in addition to the NUREG/CR-6260 locations, which were determined to be candidate sentinel locations. The results presented in Table 4.3-7, *Preliminary Identification of Additional Sentinel Locations for EAF* are preliminary and do not represent the final list of bounding EAF locations. Prior to the period of extended operation Callaway will submit to the NRC for approval a finalized list of bounding EAF locations which will be monitored for EAF with the Fatigue Monitoring program. The supporting F_{en} calculations will be performed with NUREG/CR-6909 or NUREG/CR-6583 for carbon and low alloy steels, NUREG/CR-6909 or NUREG/CR-5704 for austenitic stainless steels, and NUREG/CR-6909 for nickel alloys.

Table 4.3-6 Summary of Fatigue Usage Factors at NUREG/CR 6260 Sample Locations

Location	Material	CUF	F_{en}	EAF CUF	CUF-F_{en} Basis
RPV Bottom Head to Shell Junction	SA 533, Grade B, Class 1, Low Alloy Steel	0.0070	2.45	0.01715	Design basis CUF NUREG/CR-6583 maximum F_{en}
RPV Inlet Nozzle	SA 508, Class 2, Low Alloy Steel	0.0795	2.45	0.195	Design basis CUF NUREG/CR-6583 maximum F_{en}
RPV Outlet Nozzle	SA 508, Class 2, Low Alloy Steel	0.1078	2.45	0.264	Design basis CUF NUREG/CR-6583 maximum F_{en}
Hot Leg Surge Line Nozzle	SA 182, Type 316, Stainless Steel	0.07572	10.097	0.7646	CUF re-evaluated with NB-3200 methods based on 60 year cycle projections, NUREG/CR-5704 strain-rate dependent F_{en}
Charging System Nozzle [Normal and Alternate]	SA 182 Type 316, Stainless Steel	0.0919 / 0.0782	6.22 / 6.75	0.5715 / 0.5273	CUF re-evaluated with SBF and 60 year cycle projections, NUREG/CR-5704 strain-rate dependent F_{en}
Safety Injection Nozzle [Boron Injection Header nozzles]	SA 182 Type 316, Stainless Steel	0.1135	6.495	0.7374	CUF re-evaluated with NB-3200 methods based on 60 year cycle projections, NUREG/CR-5704 strain-rate dependent F_{en}
Residual Heat Removal Inlet Nozzle [RHR nozzle-hot-leg]	SA 182 Type 316, Stainless Steel	0.0234	15.35	0.3591	CUF re-evaluated with NB-3200 methods based on design cycles, NUREG/CR-5704 maximum F_{en}

Table 4.3-7 Preliminary Identification of Additional Sentinel Locations for EAF

System	Thermal Zone	Component	Recommended Candidate Sentinel Locations
Reactor Pressure Vessel	RPV Nozzle	RPV Inlet Nozzle	RPV Nozzle - 6260 - LAS
	RPV Nozzle	RPV Outlet Nozzle	RPV Nozzle - 6260 -LAS
	RPV Upper Head	RPV Core Exit Thermocouple Nozzle Assembly Upper Nozzle Housing	RPV Upper Head - SS
	RPV Upper Head	RPV Vessel Flange	RPV Upper Head - LAS
	RPV Bottom Head	RPV Bottom Head-to-Shell Juncture	RPV Bottom Head - 6260 - LAS
	RPV Bottom Head	RPV Bottom Head Instrument Tubes (pos. 2)	RPV Bottom Head - Ni-Cr-Fe
Pressurizer	Pressurizer Lower Head	Pressurizer Heater Penetration	Pressurizer Lower Head - SS
	Pressurizer Lower Head	Pressurizer Surge Nozzle	Pressurizer Lower Head - SS
	Pressurizer Lower Head	Pressurizer Shell at Support Lug	Pressurizer Lower Head - SS
	Pressurizer Lower Head	Pressurizer Lower Head/Support Skirt	Pressurizer Lower Head - LAS
	Pressurizer Upper Head	Pressurizer 6-inch and 3-inch Pressurizer Safety and Relief Valve Piping	Pressurizer Upper Head - SS
	Pressurizer Upper Head	Pressurizer 3-inch x 6-inch Power Operated Relief Valve Solenoid	Pressurizer Upper Head - SS
	Pressurizer Upper Head	Pressurizer Upper Head/Upper Shell	Pressurizer Upper Head - LAS

Table 4.3-7 Preliminary Identification of Additional Sentinel Locations for EAF

System	Thermal Zone	Component	Recommended Candidate Sentinel Locations
Surge Piping	Surge Line Piping	14-inch Hot Leg Surge Nozzle	Surge Line Piping - 6260 - SS
Spray Piping	Spray Line Piping	4-inch Spray Piping at Pressurizer Spray Nozzle	Spray Piping - SS
CVCS	Charging	CVCS 3-inch Cold Leg Loop 1 Normal Charging Nozzle	Charging - 6260 - SS
	Charging	CVCS 3-inch Cold Leg Loop 4 Alternate Charging Nozzle	Charging - 6260 - SS
	Letdown	CVCS 3-inch Normal Letdown, Crossover Loop 3	Letdown - SS
	Letdown	CVCS 2-inch Crossover Leg Loop 4 Excess Letdown Nozzle	Letdown - SS
	Auxiliary Spray	Auxiliary Spray Piping	Auxiliary Spray - SS
	Drain	CVCS Drain Line, Loop 2	Drain - SS
	Drain	CVCS Drain Line, Loop 3	Drain - SS
	Seal Water	CVCS 1-1/2-inch, 2-inch Seal Water Injection Loops 3 Piping	Seal Water - SS
RCS	RCS Cold Leg	RCS 2-inch Crossover Leg Loops 1, 2 Drain Nozzles	RCS Cold Leg - CS
	RCS Cold Leg	RCP Casing/Discharge Nozzle Junction	RCS Cold Leg - CS
	RCS Hot Leg	RCS Hot Leg Loops 1, 2, 3, 4	RCS Hot Leg - CS
RHR	RHR Inlet	RHR 12-inch Hot Leg Loops 1, 4 RHR Nozzles	RHR Inlet - 6260 - SS
SI	BIT	SI 3-inch Cold Leg (All Loops) Boron Injection Nozzle	BIT - 6260 - SS
	Accumulator	SI 10-inch Cold Leg (All Loops) Accumulator Nozzle	Accumulator - SS
Steam Generator	Primary Head	RSG Primary Manway Drain Tube	Primary Head - LAS
	Primary Head	RSG Primary Manway Cover	Primary Head - LAS
	Primary Head	RSG Primary Nozzle Drain Tube	Primary Head - LAS
	Tubesheet	RSG Tubesheet (Continuous Region)	Tubesheet - LAS

4.3.5 Assumed Thermal Cycle Count for Allowable Secondary Stress Range Reduction Factor in ANSI B31.1 and ASME Section III Class 2 and 3 Piping

Piping in the scope of license renewal that is designed to ANSI B31.1 or ASME Section III Class 2 and 3 requires the application of a stress range reduction factor to the allowable stress range (expansion and displacement) to account for thermal cyclic conditions. If the number of equivalent full temperature cycles exceeds 7,000, a factor less than 1 must be used. These piping analyses would be TLAAs because they are part of the current licensing basis, are used to support safety determinations, and depend on an assumed number of thermal cycles that can be linked to plant life.

None of ANSI B31.1 or the ASME Section III Subsections NC and ND for Class 2 and 3 piping invokes fatigue analyses. If the number of full-range thermal cycles is expected to exceed 7,000, these codes require the application of a stress range reduction factor to the allowable stress range for expansion stresses (secondary stresses). The allowable secondary stress range is 1.0 SA for 7,000 equivalent full-temperature thermal cycles or less and is reduced in steps to 0.5 SA for greater than 100,000 cycles.

Temperature screening criteria were used to identify components that might be subject to significant thermal fatigue effects. Normal and upset operating temperatures less than 220°F in carbon steel components, or 270°F in stainless steel, will not produce significant thermal stresses, and will not therefore produce significant fatigue effects.

Piping systems that exceed the temperature screening criteria are subject to thermal fatigue effects and are therefore included in the aging management review (AMR) results presented in Chapter 3. A systematic survey of all plant ANSI B31.1 or ASME Section III Class 2 and 3 piping systems found that the systems that exceed the temperature screening criteria are:

- Main Steam Supply System
- Main Turbine System
- Condensate System
- Main Feedwater System
- Reactor Coolant System
- Chemical and Volume Control System
- Steam Generator Blowdown System
- Fuel Pool Cooling and Cleanup System
- Residual Heat Removal System
- High Pressure Coolant Injection System
- Auxiliary Feedwater System
- Containment Hydrogen Control System
- Containment Purge System
- Decontamination System
- Boron Recycle System

- Standby Diesel Generator Engine System
- Nuclear Sampling System

With the exception of reactor coolant sample lines described below, these piping and components in the scope of license renewal clearly do not operate in a cycling mode that would expose the piping to more than three thermal cycles per week, i.e. to more than 7,000 cycles in 60 years.

For most of these systems, the assumed thermal cycle count for the analyses depend on reactor operating cycles, and can therefore conservatively be approximated by the thermal cycles used in the ASME III Class 1 vessel and piping fatigue analyses. Thermal cycles likely to produce full-range thermal cycles in balance-of-plant Class 2, 3, and B31.1 piping, in a 40-year plant lifetime, are the 200 heatup cycles, 200 cooldown cycles, and 400 reactor trips.

Other events may contribute part-range cycles; however, even if the part–range cycles are assumed to be full-range cycles, the total number of design basis thermal events from FSAR Table 3.9(N)-1 SP is only 2,190. This discounts those transients whose design values are unrealistically overestimated (loading/unloading and feedwater cycling) and those transients applicable to load following operation (boron concentration equalization, and reduced temperature return to power). The total number of design basis thermal events actually expected in a 60-year life is about 1,537 including those overestimated transients previously excluded (loading/unloading and feedwater cycling). See Table 4.3-2, *Transient Accumulations and Projections*.

The total count of expected full-range thermal cycles for these systems is less than 1,600 for a 60-year plant life, which is a fraction of the 7,000 cycle threshold for which a stress range reduction factor is required in the applicable piping codes.

Reactor Coolant Sample Lines

A survey of plant piping systems found that some reactor coolant sample lines may be subject to more than 7,000 thermal cycles. Review of FSAR Table 9.3 3 SP and Callaway Chemistry Schedule identified that the only sample piping in the scope of license renewal that meets the temperature screening criteria, and could possibly exceed 7,000 cycles, is the RCS hot leg sample piping.

Review of operating practice at Callaway indicates that RCS samples are taken weekly from the hot leg during operation. Therefore none of the lines associated with this sample location will exceed 7,000 cycles during the period of extended operation.

The existing analyses of ANSI B31.1 or ASME Section III Class 2 and 3 piping within the scope of license renewal for which the allowable range of secondary stresses depends on the number of assumed thermal cycles are valid for the period of extended operation. These TLAAs are dispositioned in accordance with 10 CFR 54.21(c)(1)(i).

Disposition: Validation, 10 CFR 54.21(c)(1)(i)

4.3.6 Fatigue Design of Spent Fuel Pool Liner and Racks for Seismic Events

The replacement spent fuel pool racks and liner are designed to the stress limits of, and analyzed in accordance with, Section III, Division 1, Subsection NF of the ASME Boiler and Pressure Vessel Code, 1989 Edition. These analyses are described in FSAR Section 9.1A.4.3.5.4 SP.

The spent fuel pool racks were replaced in 1999 and were analyzed for fatigue effects of 1 safe-shutdown earthquake (SSE) and 20 operating basis earthquakes (OBE) using methods similar to those for ASME Section III Class 1 analyses. The analysis calculated a cumulative usage factor of 0.404. The design also includes a fatigue evaluation of the pool liner for the loads imposed by the new racks, and uses the same 20 OBE plus 1 SSE events. The analysis calculates a CUF due to seismic events of less than 0.00352 for the liner.

No OBE events have occurred in the operating history of the plant to date, so that the design basis number of events remains sufficient for the remainder of the original licensed operating period, plus the 20-year licensed operating period extension, and the replacement racks are therefore presently qualified for the number of these events now expected for the remainder of a 60-year life. Therefore the analyses are valid for the period of extended operation, and the TLAAs are dispositioned in accordance with 10 CFR 54.21(c)(1)(i).

Disposition: Validation, 10 CFR 54.21(c)(1)(i)

4.3.7 Fatigue Design and Analysis of Class 1E Electrical Raceway Support Angle Fittings for Seismic Events

The design of Class 1E electrical raceway included a fatigue evaluation of the effects of operating basis and safe shutdown earthquake loads (OBE and SSE loads).

A cumulative usage factor was calculated based on tests of typical designs to failure, and the number of fatigue cycles to failure was divided by a factor of safety of 1.5 in order to establish an allowable number of fatigue cycles for design. The design assumed the number of OBE and SSE events recommended by IEEE 344-1975, which states that the maximum number of OBE and SSE events plausible during a plant lifetime is 5 and 1, respectively.

The analysis assumes 150 alternating stress cycles per OBE or SSE seismic event based on a design basis maximum acceleration period of approximately 15 seconds, and a conservative support first-mode resonance of 10 Hz. This assumption results in a total of 750 cycles for the 5 OBE events assumed plus 150 for the single SSE. This is conservative compared to the 200 OBE cycles specified in FSAR Table 3.9(N)-1 SP, 20 earthquakes of 10 cycles each.

No OBE events have occurred in the operating history of the plant to date. The design basis number of events therefore remains sufficient for the remainder of the original licensed operating period, plus the 20-year licensed operating period extension, and the Class 1E electrical raceway support angle fittings are therefore presently qualified for the number of these events now expected for the remainder of a 60-year life. Therefore, the analysis is valid for the period of extended operation, and the TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(i).

Disposition: Validation, 10 CFR 54.21(c)(1)(i)

4.3.8 Fatigue Analyses of Class 2 Heat Exchangers

The shell and tube sides of the regenerative heat exchanger, and the tube side of the letdown, letdown reheat, residual heat removal (RHR), and excess letdown exchangers heat exchangers are designed and constructed to ASME III Class 2 1974 Edition. As required by the design specification, thermal fatigue analyses, in accordance with ASME III, NB-3222.4, were performed to qualify the heat exchanger to the Code design requirements; therefore the analyses are included in the CLB.

The regenerative, letdown, and letdown reheat heat exchanger components were evaluated for the following transients:

1. Letdown flow shutoff with prompt return to service – 200 cycles
2. Charging flow shutoff with prompt return to service – 100 cycles
3. Charging and letdown shutoff and return to service – 100 cycles
4. Charging flow step decrease and return to normal – 24,000 cycles
5. Charging flow step increase and return to normal – 24,000 cycles
6. Letdown flow step decrease and return to normal – 2,000 cycles
7. Letdown flow step increase and return to normal – 24,000 cycles
8. Plant cooldown – 200 cycles
9. Plant heatup – 200 cycles
10. Loss of CCW Flow – 200 cycles
11. Load follow boration – 24,000 cycles

Regenerative Heat Exchanger

The fatigue analysis of the Callaway regenerative heat exchanger evaluated the tubesheets, the shell side nozzles, the tube side nozzles, and the cross shell juncture. The analysis found the most limiting fatigue usage factor of 0.50 at the outlet tubesheet. The only transients that contribute the CUF are transients 1 and 2. The analysis of the regenerative heat exchanger also contains a fatigue waiver for the tubeside inlet nozzle. The waiver was performed using transients 1, 2, 3, 8, and 9. The thermal analysis of the shell side nozzles, the tubeside outlet nozzle, and cross shell junction indicated these areas are not subject to fatigue.

These transients will be counted by the Fatigue Monitoring program (B3.1) as shown in Table 4.3-2, *Transient Accumulations and Projections*. Therefore the fatigue analysis of the regenerative heat exchanger will be managed for the period of extended operation, and this TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(iii).

Disposition: Aging Management, 10 CFR 54.21(c)(1)(iii)

Letdown Heat Exchanger

The fatigue analysis for the letdown heat exchanger indicated a maximum CUF of 1.84 for the flange. This CUF is the result of a recent reanalysis to account for operation with a letdown flow of 140 gpm. The CVCS design specification identifies the nominal letdown flow of 75 gpm with maximum flow of 120 gpm. Callaway operated from 1993 to 2011 at the maximum letdown flow, but has returned to the nominal value of 75 gpm. The analysis with an increased letdown flow was to account for this period. The CUF is driven mainly by transient 4, "Charging flow step decreased and return to normal." This is a load following transient. Callaway does not practice load following operation and the number expected to be experienced is a small fraction of the number of assumed transients. The assumed number of this transient was dropped by an order of magnitude, which is about equal to 3 transients a month for 60 years and is more consistent with Callaway's operation, and the CUF dropped to 0.894.

The fatigue analyses of the other components in the Callaway letdown heat exchanger included the tubesheet, tube side nozzles, and the studs. These components have CUFs of 0.910, 0.843, and 0.635. The fatigue analyses included transients 1, 2, 4, 5, 6, 7, 8, 9, and 10. Transients 1, 2, 8, 9, and 10 will be monitored by the Fatigue Monitoring program (B3.1). The remaining transients, Transients 4, 5, 6, and 7, are not monitored. Transients 4, 5, and 7 assume 24,000 events and are load following events. They are based on 2 load changes per day (1 loading and 1 unloading) for 40 years with an 80 percent capacity factor. Callaway does not load follow and this high limiting number of events will not be approached during a 60-year plant life. Transient 6, letdown flow step decrease and return to normal, is not a normal operating event with the plant at power; however, this transient was included for conservatism. It was assumed to occur approximately once a week for 40 years. If this assumption is extended through the period of extended operation, then 3,000 events will be assumed to occur and the CUF will increase to 0.995, 0.880, and 0.696.

Therefore these CUFs are projected through the period of extended operation and the TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(ii).

Disposition: Projection, 10 CFR 54.21(c)(1)(ii)

Letdown Reheat Heat Exchanger

The fatigue analysis for the letdown reheat heat exchanger indicated a maximum CUF of 4.431 for the studs. This CUF is the result of the reanalysis to account for operation with a letdown flow of 140 gpm. The CUF is driven mainly by transient 7, “Letdown flow step increase and return to normal,” and transient 11, “Load follow boration.” These are load following transients and Callaway does not practice load following operation. The assumed number of these transients was dropped by an order of magnitude and the CUF dropped to about 0.503.

The fatigue analysis of the Callaway letdown reheat heat exchanger evaluated the shell and tube side nozzles and the tubesheet. These components have maximum CUFs of 0.054 and 0.47 respectively. These fatigue analyses included transients 1, 2, 4, 5, 6, 7, and 11. Transients 1 and 2 will be monitored by the Fatigue Monitoring program (B3.1). The remaining transients, transients 4, 5, 6, 7, and 11, are not monitored. Transients 4, 5, 7, and 11 assume 24,000 events and are load following events. As stated above, Callaway will not approach the limiting number of events during a 60-year plant life. For Transient 6, if the number of events is extended through the period of extended operation, then 3,000 events will be assumed to occur and the CUFs will increase to 0.57 for the tubesheet and 0.0563 for the tube side nozzles. The nozzles CUFs are not affected by this increase.

Therefore these CUFs are projected through the period of extended operation and the TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(ii).

Disposition: Projection, 10 CFR 54.21(c)(1)(ii)

Residual Heat Removal Heat Exchangers

From the design specification, the residual heat removal (RHR) heat exchanger is designed for the following transients

- RHR operation - plant cooldown, 200 events
- Plant Cooldown, 200 events
- Plant Heatup, 200 events
- Pressurization, 400 events
- Refueling, 80 events

The fatigue analysis for the Callaway RHR heat exchangers explains that a fatigue analysis is not necessary for these transients since they are very weak. When these transients were put through the criteria of NB-3222.4(d), it was concluded that a detailed fatigue analysis is not required. All of these transients except “pressurization” are monitored by the Fatigue Monitoring program. The specification describes the “pressurization” event as pressurization to the design pressure, at the design temperature. These pressurizations can occur coincidentally with plant cooldown and plant heatup. Therefore monitoring RHR operation, plant cooldown, and plant heatup through the Fatigue Monitoring program (B3.1) is sufficient to monitor the pressurization events and the fatigue waiver of the RHR heat exchanger will be managed for the period of extended operation. This TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(iii).

Disposition: Aging Management, 10 CFR 54.21(c)(1)(iii)

Excess Letdown Heat Exchanger

The fatigue analysis of the Callaway excess letdown heat exchanger calculated a component maximum CUF of 0.154. From the design specification, the excess letdown heat exchanger is designed for 100 operating cycles. These operating cycles facilitates unusual maintenance or repair operations which require isolation of the normal letdown path. Callaway has initiated excess letdown approximately 49 times over the past 11 years. If this sample is extrapolated, then 270 excess letdown initiation transient events would be anticipated for 60 years, resulting in a CUF of 0.415. While the number of cycles is greater than the specified value, it is below the Code maximum allowable of 650. Therefore the excess letdown heat exchanger CUF is projected through the period of extended operation and the TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(ii).

Disposition: Projection, 10 CFR 54.21(c)(1)(ii)

4.4 ENVIRONMENTAL QUALIFICATION (EQ) OF ELECTRIC EQUIPMENT

10 CFR 50.49, *Environmental Qualification of Electric Equipment Important to Safety for Nuclear Power Plants*, requires that certain electrical and instrumentation and control (I&C) equipment, important to safety and located in harsh environments, be qualified to perform their safety related functions in those harsh environments after the effects of in service aging. Aging evaluations that qualify components to at least the end of the current licensed operating period are TLAAs.

10 CFR 50.49, defines the scope of components to be included, and requires the preparation and maintenance of documentation that includes component performance specifications, electrical characteristics, and environmental conditions.

10 CFR 50.49(e)(5) contains provisions for aging that require, in part, consideration of all significant types of aging degradation that can affect component functional capability. 10 CFR 50.49(e)(5) also requires component replacement or maintenance prior to the end of designated life, unless additional life is established through ongoing qualification.

The Environmental Qualification (EQ) program is described in FSAR Sections 3.11(B) and 3.11(N) SP. The Callaway EQ program is consistent with the requirements of NUREG-0588, Category I. This demonstrates conformance to 10 CFR 50.49 for SNUPPS plants. The NRC acceptance of the Callaway EQ Program is documented in Safety Evaluation Report (SER), Supplement No. 3. Callaway is also committed to Regulatory Guide 1.89, Rev. 0.

The EQ program manages applicable component thermal, radiation, and cyclic aging effects through the aging evaluations for the current operating license using methods for qualification for aging and accident conditions established by 10 CFR 50.49(f). Qualification methods employed to meet the IEEE 323-1974 aging requirements for safety related equipment are documented in the individual equipment qualification data package (EQDP). Re-analysis of an aging evaluation to extend the qualification of components is performed on a routine basis as part of the EQ program. The important attributes of reanalysis include analytical methods, data collection and reduction methods, underlying assumptions, acceptance criteria, and corrective actions (if acceptance criteria are not met).

<u>Analytical Methods:</u> The analytical models used in the reanalysis of an aging evaluation are the same as those previously applied during the prior evaluation. The Arrhenius methodology is an acceptable model for a thermal aging evaluation. For license renewal radiation aging evaluation, 60-year normal radiation dose is established by extrapolating the 40-year normal dose (40-year dose times 1.5) plus accident radiation dose. 60-year cyclical

aging is established in a similar manner. Other models may be justified on a case-by-case basis.

<u>Data Collection and Reduction Methods:</u> Reducing excess conservatism in the component service conditions (for example, temperature, radiation, and cycles) used in the prior aging evaluation is the chief method used for a reanalysis. Actual monitored service conditions such as temperature are generally lower than the design service conditions used in the prior aging evaluation and therefore can support extended thermal life of the equipment.

<u>Underlying Assumptions</u>: EQ component aging evaluations contain sufficient conservatism to account for most environmental changes occurring due to plant modifications and events. When unexpected adverse conditions are identified during operational or maintenance activities that affect the normal operating environment of a qualified component, the affected EQ component is evaluated and appropriate corrective actions are taken, which may include changes to the qualification bases and conclusions.

Excess conservatism in thermal life analysis may be reduced to support extended life at elevated temperature. Similar methods of reducing excess conservatism in the component service conditions and material properties used in prior aging evaluations may be used for radiation and cyclical aging.

<u>Acceptance Criteria and Corrective Actions</u>: If qualification cannot be extended by reanalysis, the component is refurbished or replaced prior to exceeding the period for which the current qualification remains valid. A reanalysis is to be performed in a timely manner (that is, sufficient time is available to refurbish, replace or re-qualify the component if reanalysis is unsuccessful).

Mechanical Equipment

FSAR Section 3.11(B).6 SP describes the Mechanical EQ program at Callaway. The program includes identification of aging concerns and establishment of replacement intervals as required. As part of the qualification review, replacement intervals were identified either on the basis of aging performed during an IEEE 323-1974 qualification program or on the basis of published material aging data. The qualifications for some of the mechanical equipment extend beyond 40 years and are TLAAs.

The Environmental Qualification (EQ) of Electric Components program, summarized in Appendix B, Section B3.2, ensures that the aging effects will be managed and that the EQ components will continue to perform their intended functions for the period of extended operation. This program also manages the aging of mechanical EQ components. Aging effects addressed by the EQ program will therefore be managed for the period of extended operation, and the TLAAs are dispositioned in accordance with 10 CFR 54.21(c)(1)(iii).

Disposition: Aging Management, 10 CFR 54.21(c)(1)(iii)

4.5 CONCRETE CONTAINMENT TENDON PRESTRESS

The Callaway containment structure is a prestressed, post-tensioned concrete structure with a cylindrical wall, a hemispherical dome, and a flat foundation slab. Post-tensioned tendons compress the concrete and permit the structure to withstand design basis accident internal pressures.

The Callaway post-tensioning system consists of the following tendon groups:

- 86 vertical, inverted U-shaped tendons, extending through the full height of the cylindrical walls and over the dome, and anchored at the bottom of the base slab.

- 165 horizontal hoop tendons. Together, 135 cylinder hoop tendons and 30 dome hoop tendons make up the horizontal tendon group. The 135 cylinder hoop tendons are anchored at buttresses located 240 degrees apart. Three adjacent cylinder tendons anchored at alternate buttresses result in two complete hoop tendons. The 30 hemispherical dome hoop tendons start at the springline and continue up to an approximate 45-degree vertical angle from the springline. The inverted U-shaped tendons discussed above are also utilized to prestress the hemispherical dome.

Each tendon consists of approximately 170, ¼ in. high strength steel wires. The ultimate strength of each tendon is approximately 1,000 tons. The prestressing load is transferred to the steel bearing plates embedded in the structure. The unbonded tendons are installed in tendon ducts (sheathing), which is filled with a petroleum-based corrosion inhibitor after tensioning.

The steel tendons, in tension, relax with time; and the concrete structure, which the tendons hold in compression, both creeps and shrinks with time. Therefore, to ensure the integrity of the containment pressure boundary under design basis accident loads, tendon surveillances are performed under the inservice inspection program per ASME Section XI Subsection IWL. The acceptance criteria compare the individual tendons against the predicted lower limit (PLL) force lines, and the surveillance includes a regression analysis for the vertical and horizontal tendon groups, to confirm whether average prestresses are expected to remain above their minimum required values (MRVs) for the remainder of the licensed operating period. (The dome tendons are included in the horizontal tendon group regression analysis.) The PLL and the regression analyses predict the future performance of the post-tensioning system to the end of design life and are TLAAs.

The tendon surveillance results from 2010, the 25-year tendon surveillance (Reference 9), found (1) no significant abnormal degradation, and (2) no lift off values from this surveillance below the predicted force line (the first action limit).

The discussion below reviews the three parameters used in the implementation of the tendon surveillance program: MRV, PLL force lines, and the regression analysis.

Minimum Required Value

The MRV is the average tendon prestress force used in the prestressed concrete containment design analysis. The design prestress must account for the loss of prestressing force after the initial tensioning in accordance with Regulatory Guide 1.35.1. The MRV is the acceptance criterion for the average tendon prestressing force over the entire plant life and does not vary with the plant life. Therefore the MRV is not a TLAA, in accordance with 10 CFR 54.3(a) criterion 3.

Predicted Lower Limit

Predicted force lines are incorporated in the tendon surveillance program to identify any abnormal degradation in tendon prestressing force. The predicted loss lines determine the PLL force lines which are the acceptance criteria of individual tendons. The calculations of PLL lines are consistent with NRC Regulatory Guide 1.35.1, *Determining Prestressing Forces for Inspection of Prestressed Concrete Containments*. As part of the Tendon Surveillance program, described in Appendix B, Section B3.3, the PLL force lines will be extended to 60 years. This TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(ii).

Disposition: Projection, 10 CFR 54.21(c)(1)(ii)

Regression Analysis

The lift-off trend lines are necessary to demonstrate that the tendon prestressing force will remain above the MRV at least until the next scheduled surveillance. The tendon surveillances are scheduled every five years. The trend lines are calculated by regression of individual tendon lift off data and are therefore consistent with NRC Information Notice 99-10, Revision 1, Attachment 3.

The regression analysis trend lines indicate lift-offs in excess of the MRV for at least 60 years. The IWL Inspection Report includes the results through the 2010, 25-year surveillance. Table 4.5-1, *Vertical Tendon Regression Analysis* and Table 4.5-2, *Horizontal Tendon (Cylinder and Dome) Regression Analysis* summarize the input data of the 2010 regression analyses. Figure 4.5-1, *Regression Analysis of Vertical Tendons* and Figure 4.5-2, *Regression Analysis of Horizontal Tendons* show the results of the surveillance and the regression analyses.

The current analysis demonstrates that the average tendon prestresses in each of the vertical group and hoop tendon group will remain above their MRVs through 60 years of operation; therefore the analysis is valid for the period of extended operation. The TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(i).

Disposition: Validation, 10 CFR 54.21(c)(1)(i)

Table 4.5-1 Vertical Tendon Regression Analysis

Year	Nom. Years Post SIT	Tendon	Age (Time Stressed)	Liftoff Force, Kips
1985	1	V20	3.75	1411
		V35	4.08	1418
		V65	3.76	1449.5
		V74	4.08	1451
1987	3	V1	6.31	1446
		V18	5.92	1451
		V47	5.91	1397
		V65	5.92	1446
1989	5	V1	8.31	1375.5
		V27	8.2	1385.5
		V41	8.18	1402
		V65	7.91	1382.5
		V84	8.22	1361
1994	10	V15	13.2	1432.5
		V65	12.9	1438.5
		V68	13.2	1428
1999	15	V9	18.1	1426
		V65	17.8	1415

Table 4.5-1 Vertical Tendon Regression Analysis

Year	Nom. Years Post SIT	Tendon	Age (Time Stressed)	Liftoff Force, Kips
		V76	18.1	1422.5
2004	20	V13	23.27	1397
		V30	22.99	1365
		V65	22.97	1407
2010	25	V7	28.90	1432.91
		V53	28.59	1409.36
		V65	28.58	1419.42

Table 4.5-2 Horizontal Tendon (Cylinder and Dome) Regression Analysis

Year	Nom. Years Post SIT	Tendon	Age (Time Stressed)	Liftoff Force, Kips
1985	1	1CB	3.85	1371
		9CB	3.85	1324
		9AC	3.88	1339.5
		26AC	4.03	1339
		5BA	3.89	1357
		45BA	3.69	1312.5
		51BA	3.72	1283.5
1987	3	5AC	6.00	1320.5
		11BC	5.99	1322
		14AB	5.9	1389
		18AB	5.89	1380.3
		35AB	5.87	1414
		45AB	5.83	1345.55

Table 4.5-2 Horizontal Tendon (Cylinder and Dome) Regression Analysis

Year	Nom. Years Post SIT	Tendon	Age (Time Stressed)	Liftoff Force, Kips
		47AB	5.85	1285.5
1989	5	12AC	7.9	1311.5
		20AC	7.92	1275
		42AC	8.1	1278
		52AC	8.05	1269.5
		20BA	7.91	1319.5
		44BA	8.1	1325
		45BA	7.85	1248
		20CB	7.93	1289.5
1994	10	45AC	12.8	1357
		45BC	12.8	1313.5
		12CB	12.9	1310
1999	15	6AC	17.7	1339.5
		40CB	17.6	1327
		45BA	17.6	1340.5
2004	20	44CB	22.81	1366
		45BA	22.8	1298
		48AC	23.1	1314
2010	25	27CB	28.82	1336.47
		33CB	28.81	1365.57
		45BA	28.42	1303.26
		49AC	28.50	1284.92

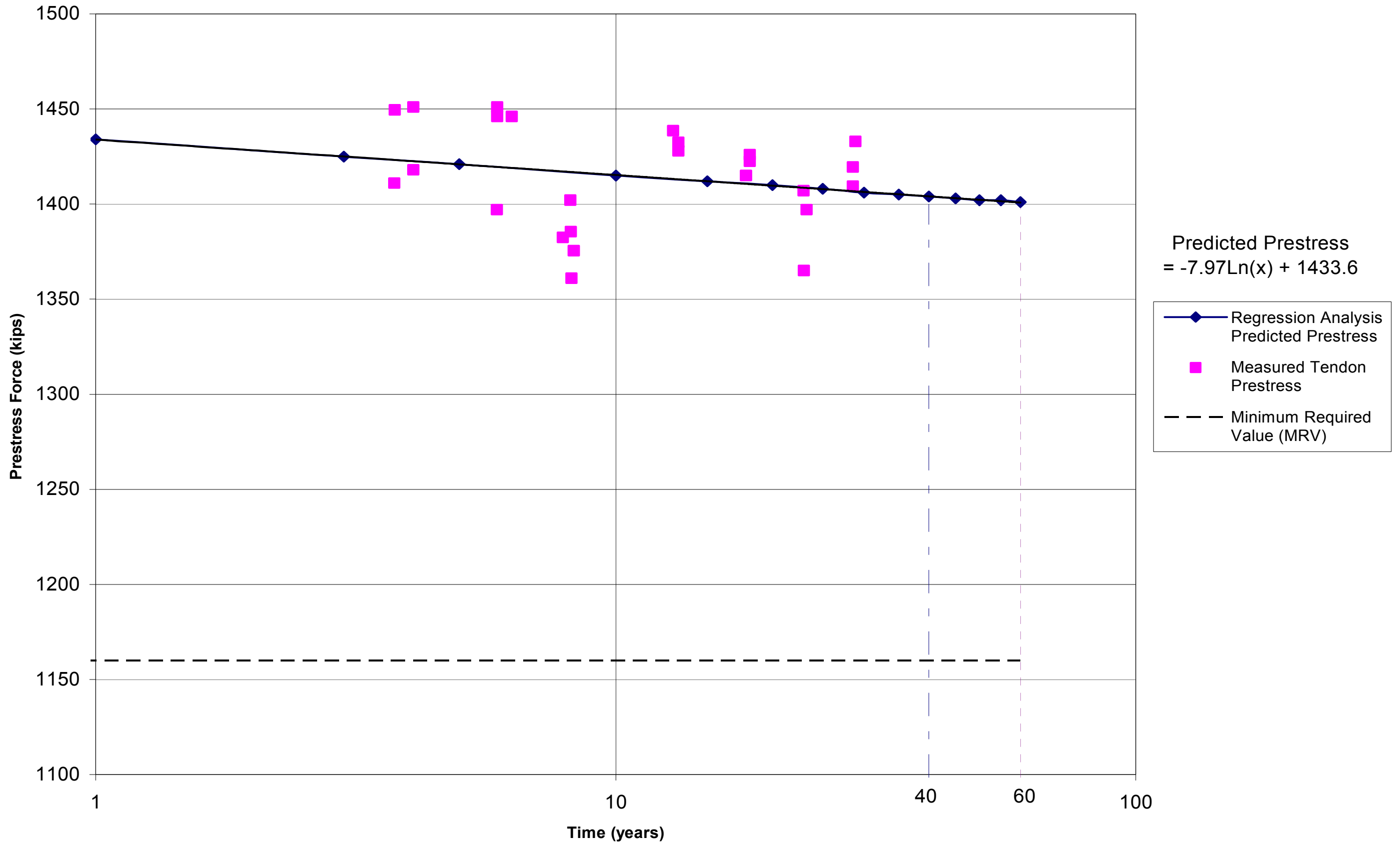


Figure 4.5-1 - Regression Analysis of Vertical Tendons

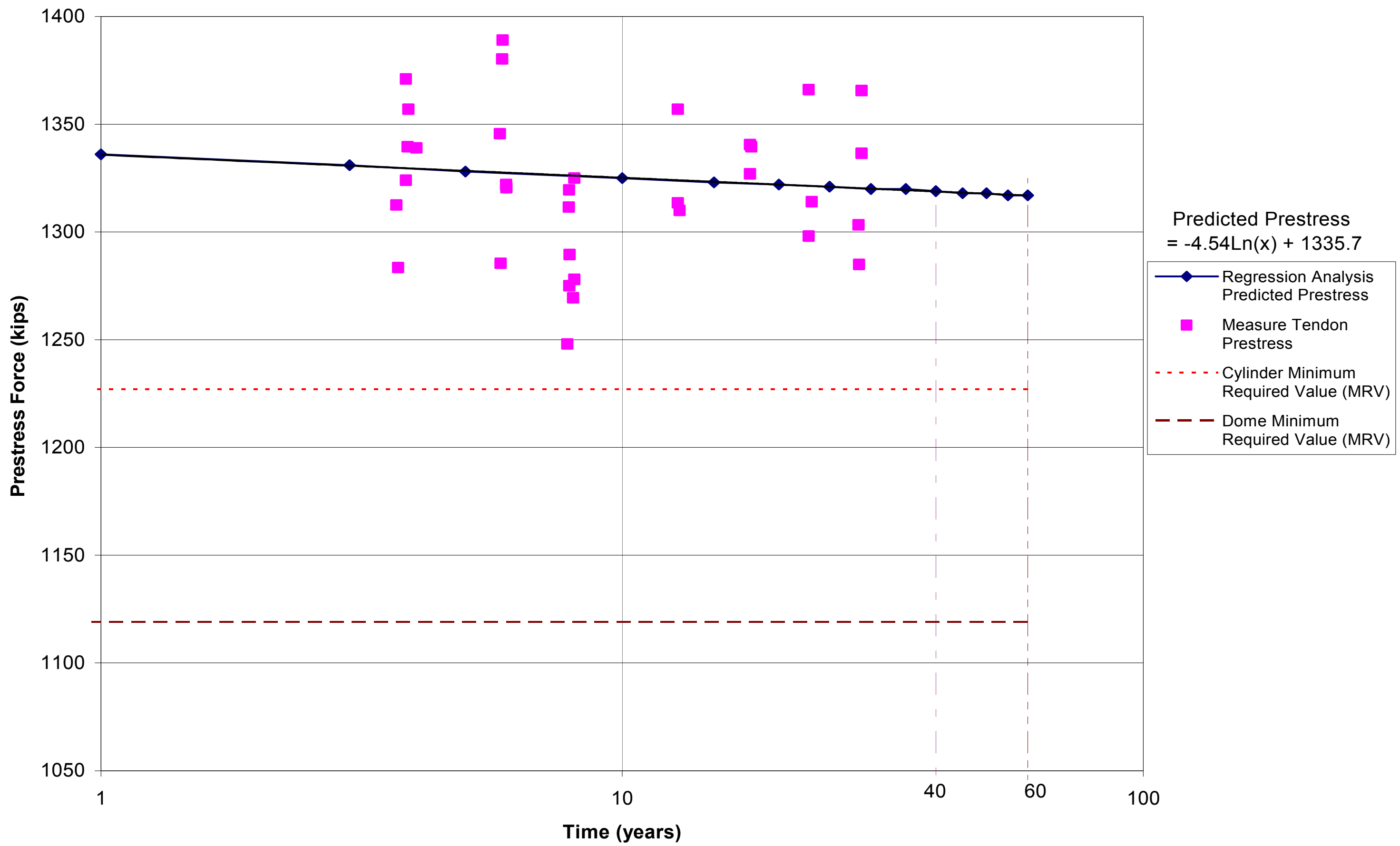


Figure 4.5-2 - Regression Analysis of Horizontal Tendons

4.6 CONTAINMENT LINER PLATE, METAL CONTAINMENTS, AND PENETRATIONS FATIGUE ANALYSES

The Callaway prestressed concrete containment vessel is designed to Bechtel Topical Report BC-TOP-5-A, Revision 3. It is poured against a steel membrane liner designed to BC-TOP-1 Revision 1. No credit is taken for the liner for the pressure design of the containment vessel, but the liner and penetrations ensure the vessel is leak-tight.

The Callaway containment liner and other metal containment (MC) components, e.g. containment penetrations, were designed to stress limit criteria of BC-TOP-1 Revision 1, independent of the number of load cycles, and require no fatigue analyses with the exception of the main steam and feedwater penetrations, the containment access hatches, and the leak chases.

4.6.1 Design Cycles for the Main Steam Line and Feedwater Penetrations

The BC-TOP-1 Containment Building Liner Plate Design Report accounts for cyclical loads in the design of the main steam penetrations. These cyclic loads include:

- 10 steady state operating thermal gradient plus steam pipe rupture cyclic loads (BC-TOP-1 Part II “Loading Condition IV”), and

- 100 lifetime steady state operating thermal gradient plus normal operating cyclic loads, i.e. Startup-Shutdown (BC-TOP-1 Part II “Loading Condition V”).

The BC-TOP-1 analysis of effects of Loading Condition IV and V cyclic loads does not calculate a usage factor, but uses a simplified ASME Section III Subparagraph NB-3228.3 elastic-plastic analysis. The elastic-plastic analysis compares the maximum allowed alternating stress range, S_a, from ASME Section III, I-9-1, for the assumed number of event cycles, to the maximum calculated alternating stress intensity for the load combination, $S_a' = ½S_n K_c$, where K_c is a simplified elastic-plastic multiplier and S_n is the primary and secondary stress range. The design is acceptable if $S_a' < S_a$. The analysis is only required if the penetration fails to meet the primary plus secondary stress intensity ($3S_M$) requirement of NB-3222.2.

The analyses in BC-TOP-1 do not qualify the components on a generic basis, but represent an acceptable method in which to demonstrate the component will meet the requirements of BC-TOP-5-A, Appendix C. However the analyses must be performed, or at least verified to be conservative, on a plant-specific basis. At Callaway, the specific analyses were performed for the main steam line penetrations and the feedwater penetrations.

BC-TOP-1 Loading Condition IV - Normal Plus Pipe Rupture - 10 Cycles

For BC-TOP-1 Part II Loading Condition IV (normal thermal gradient plus pipe rupture), the analysis compares the allowed value of S_a from the S-N diagram for 10 cycles to S_a'.

A main steam line or feedwater line rupture is anticipated to be a single event during the design lifetime. BC-TOP-1 appears to have used 10 cycles instead of just 1 for this load combination because 10 is the lowest number of cycles on the S-N diagram. Since the evaluation accounts for 10 occurrences when only 1 occurrence is anticipated the evaluation of BC-TOP-1 Part II Loading Condition IV is valid for the extended period of operation. Therefore the analysis will remain valid for the period of extended operation and the TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(i).

Disposition: Validation, 10 CFR 54.21(c)(1)(i)

BC-TOP-1 Loading Condition V - Normal Penetration Thermal Gradient Plus Startup-Shutdown - 100 Cycles

For BC-TOP-1 Part II Loading Condition V (normal thermal gradient plus operating cycle), the analysis compares the allowed value of S_a from the S-N diagram for 100 cycles to S_a'.

The Callaway analysis determined that the feedwater penetrations would not exceed the primary plus secondary stress intensity ($3S_M$) requirement of NB-3222.2 for loading condition V and does not require an elastic-plastic analysis. Therefore the analysis of the feedwater penetrations for loading condition V does not include a cyclic loading aging effect and is not a TLAA in accordance with 10 CFR 54.3(a) Criterion 2.

The analyses performed specifically for Callaway for the main steam line penetrations included an elastic-plastic analysis. The allowable stress is based on 100 startup-shutdown cycles for an assumed plant design life of 40 years. A review of the ASME Section III Table I-9-1 shows that the allowable stress for 500 cycles envelopes the calculated stress. The 500 cycles exceeds the number projected for 60 years; therefore the TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(ii).

Disposition: Projection, 10 CFR 54.21(c)(1)(ii)

4.6.2 Fatigue Waiver Evaluations for the Access Hatches and Leak Chase Channels

Access Hatches

The Callaway FSAR SP identifies the access hatches as ASME Section III, Class MC components. The specification states that the number of atmospheric-to-operating pressure cycles during the life of the plant is estimated to be 1,920 cycles, and the number of temperature fluctuations between 50°F and 120°F during the life of the plant is estimated to be 160 cycles. In order to meet the ASME Section III Subsection NE requirement, the design basis calculations incorporate these assumptions into fatigue waiver evaluations per NE-3222.4(d). Fatigue waiver evaluations per NE-3222.4(d) depend on meeting six criteria. Some of the six NE-3222.4(d) criteria may use time-dependent operational assumptions based on the plant life; therefore these fatigue waiver evaluations are potentially TLAAs.

The criteria of the fatigue waiver that use time-dependent assumptions are:

- The evaluation assumes 1,920 pressure fluctuations from atmospheric to design pressure and back to atmospheric pressure during normal operation to satisfy fatigue waiver criterion 1. The only time containment will fluctuate between atmospheric and design pressure is during the integrated leak rate test (ILRT). Callaway is only required to perform these pressure tests every ten years. This results in much fewer pressure tests over the 60-year plant life than the assumed 1,920 pressure fluctuations.

- The evaluation assumes 160 temperature fluctuations between 50°F and 120°F during startup and shutdown to satisfy fatigue waiver criterion 3. As shown in Table 4.3-2, *Transient Accumulations and Projections*, the 160 temperature fluctuations exceeds the number of startup and shutdown expect during 60-year plant life.

The number of pressure tests and startup and cooldown cycles assumed in the access hatch fatigue waiver evaluations will not be exceeded during the period of extended operation; therefore the TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(i).

Disposition: Validation, 10 CFR 54.21(c)(1)(i)

Leak Chase Channels

In addition to the equipment hatch, the leak chase channels were also evaluated for fatigue. These components were not originally designed as metal containment (MC) components, but were redefined as the containment pressure boundary in order to support not venting the channeling during integrated leak rate testing (ILRT). The NRC agreed on the redefinition of the containment pressure boundary based in part on the channels meeting the requirements of ASME Section III, Division I, Subsection NE. This includes a fatigue waiver evaluation per NE-3222.4(d).

Callaway performed an engineering analysis of the 3 x 4.1 leak chase channel used on walls and floor, 2 x 2 x ¼ angles on floor corner joints, and 1¾ x 1¾ x 3/16 angles on wall joint around the transfer tube. The criteria of the fatigue waiver evaluation that use time-dependent assumptions are:

- The evaluation assumes 40 Type A pressure tests to satisfy fatigue waiver criteria 1 and 2. Callaway is only required to perform a Type A pressure test every ten years. This results in much fewer Type A pressure tests over the 60-year plant life than assumed in the evaluation.

- The evaluation assumes 1,265 thermal transients, consistent with the significant 40-year design basis numbers of transients identified in FSAR Table 3.9(N)-1A SP, to satisfy fatigue waiver criterion 3. Although this fatigue waiver evaluation considers all design basis transients in FSAR Table 3.9(N)-1A SP, the only transients that will affect the containment components are the heatups and cooldowns, which have a design number of 200 cycles. Therefore 1,265 thermal transients assumed will bound those experienced during the 60-year plant life.

The numbers of pressure tests and thermal cycles assumed in the leak chase fatigue waiver evaluation will not be exceeded during the period of extended operation; therefore the TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(i).

Disposition: Validation, 10 CFR 54.21(c)(1)(i)

4.7 OTHER PLANT-SPECIFIC TIME-LIMITED AGING ANALYSES

4.7.1 Containment Polar Crane, Fuel Building Cask Handling Crane, Spent Fuel Pool Bridge Crane, and Refueling Machine CMAA 70 Load Cycle Limits

FSAR Section 9.1.4 SP and licensing correspondence describe the design of these lifting machines to Crane Manufacturers Association of America Specification 70 (1975). The CMAA 70 crane service classification for each machine depends, in part, on the assumption that the number of stress cycles at or near the maximum allowable stress will not exceed the number assumed for that design class. In operation, this means the number of lifts which approach or equal the design load (significant lifts) will not exceed the number of stress cycles assumed for that design class. Therefore, the design of cranes for these standard numbers of lifts for the plant lifetime is a TLAA.

Design Lifts of Heavy-Lift Cranes

The cask handling crane is CMAA 70 Class A and the polar crane is Class C. Class A and B cranes are designed for 100,000 full-capacity lifts in a design lifetime, Class C cranes for 500,000. To reach 100,000 full-capacity lifts in 60 years, a crane would have to perform 1,666 lifts per year or 1,250 lifts per outage (assuming 80 refueling outages over 60 years, consistent with FSAR Table 3.9(N)-1 SP) which is not credible under normal services conditions.

The cask handling crane has raised no significant number of heavy lifts to date. Callaway has not yet shipped spent fuel, nor yet moved any to on-site storage outside the spent fuel pool. Assuming all fuel used during the 80 postulated refueling operations is transferred to dry storage prior to the end of the period of extended operation, approximately 200 casks will be moved (80 refuelings * 90 assemblies per refueling + 193 initial core load, divided by 37 assemblies per cask), resulting in about 400 total lifts over its service life.

Therefore, given the frequency of cask handling crane operation, it will not exceed the 100,000 cycles specified for CMAA 70 Class A service.

The polar crane trolley is rated at 260 tons (520,000 lbf.). The bridge is rated for 440 tons. A second temporary trolley, rated at 220 tons, was installed to permit heavier lifts during construction. The number of polar crane dual trolley capacity construction lifts is estimated to be 14 with about 70 additional lifts at the single trolley capacity including replacement steam generator lifts.

Polar crane duty for the remainder of plant life is largely determined by refueling cycles, consisting primarily of lifts associated with vessel disassembly and reassembly. The polar crane specification anticipated 16 rated lifts per year, which would be 960 rated lifts for a 60-year design life. The polar crane is used only for removal and reinstallation of the vessel head, upper internals, and lower internals, which will result in only 480 lifts over a 60 year life, (2 lifts * 3 components * 80 refuelings). Even if the specified number is used, the polar crane will only experience 1,044 lifts over its service life (14 dual trolley construction lifts + 70 single trolley construction lifts + 960 specified lifts).

Therefore, given the frequency of polar crane operation, it will not exceed the 500,000 cycles specified for CMAA 70 Class C service.

Design Lifts of the Spent Fuel Bridge and Refueling Machine

The spent fuel bridge is CMAA 70 Class B and the refueling machines are CMAA 70; therefore they are rated for up to 100,000 lifetime lifts.

The spent fuel bridge crane has a five ton auxiliary trolley and manual chain hoist and a two ton motorized fuel handling hoist and trolley on a common five ton traveling bridge monorail. The five ton manual hoist is used to lift the fuel storage pool transfer gates and to move them to and from the storage racks. The two ton motorized hoist is used to move new and spent fuel assemblies.

The spent fuel bridge crane is conservatively expected to perform about 736 lifts per fuel cycle, consisting of:

- Off load – 193 lifts/fuel cycle
- Reload – 193 lifts/fuel cycle
- New Fuel Receipt – 90 lifts/fuel cycle
- Cleaning – 100 lifts/fuel cycle
- Fuel Reshuffle – 160 lifts/fuel cycle

Once Callaway commences dry cask storage additional lifts will be necessary. The number of lifts is estimated to be the total number of new fuel assemblies received over 80 assumed refuelings plus 193 lifts for initial core loading. Additionally, moving the fuel storage pool gate adds about 160 lifetime lifts for the spent fuel bridge crane (2 lifts per refueling). The total expected lifetime lifts for the spent fuel bridge crane is (736 * 80) + (90 * 80 + 193) + 160 = 66,433 lifts.

The refueling machine 2.4 ton main hoist is used to load, unload, and move fuel assemblies within the reactor core, and to transfer fuel to and from the fuel transfer tube.

A refueling outage requires only about two refueling machine lifts per fuel assembly. There are 193 assemblies in a full core or roughly 400 lifts for the refueling machine in a normal refueling outage. Callaway is designed for 80 refuels, for about 32,000 fuel handling lifts. The fuel handing lifts are only about half the rating of the hoists.

The spent fuel bridge and refueling machines will therefore experience only a fraction of their rated lifetime number of lifts, most of them half or less of rated capacity. Therefore the spent fuel bridge and refueling machines will not exceed the 100,000 cycles specified.

The design standard number of full-capacity lifts in Table 4.7-1, *Summary of 60 Years Operation of CMAA Cranes*, even with a significant number of unforeseen lifts, far exceeds the number expected of each machine for a 60-year life. The lifting machine designs therefore remain valid for the period of extended operation. These TLAAs are dispositioned in accordance with 10 CFR 54.21(c)(1)(i).

Disposition: Validation, 10 CFR 54.21(c)(1)(i)

Table 4.7-1 Summary of 60 Years Operation of CMAA Cranes

Crane	CMAA Class	Maximum Number of Design Lifts	Estimate Number of Lifts for 60 Years	Valid for 60 Years
Cask Handling Crane	CMAA 70 Class A	100,000	400	Yes
Polar Crane	CMAA 70 Class C	500,000	1,044	Yes
Spent Fuel Bridge Crane	CMAA 70 Class B	100,000	66,433	Yes
Refueling Machine	CMAA 70	100,000	32,000	Yes

4.7.2 In-Service Flaw Analyses that Demonstrate Structural Integrity for 40 years

In-service flaw growth is identified in NUREG-1800 as a potential TLAA. Flaws of such size that they cannot be dispositioned through comparison with the Code tables must be analyzed. These analyses depend on a specified number of operating events or years, and thus may be TLAAs.

A search of the CLB did not identify any flaws evaluated for the remaining life of the plant other than those identified below.

Cold Leg Elbow-to-Safe End Weld Flaw Indications

During the Refuel 13 (Spring 2004), two flaw indications were identified in the cold leg elbow-to-safe end weld. The weld and base metal material for the subject weld is stainless steel. The safe end is forged stainless steel (SA-182 F316). The weld is a stainless steel weld (ER308). The elbow is statically cast stainless steel (SA-351 CF8A, which is the same as wrought Type 304).

Flaw Indication #1: The flaw was an embedded flaw that was found acceptable in accordance with IWB-3500 (Acceptance Standards), but was conservatively treated as inside diameter surface breaking flaw (Reference 10). The depth of flaw #1 is 0.49 in. including inspection uncertainty. This represents 21.1 percent of the local pipe wall. The flaw length is 4.75 in. (5.1 percent of circumference based on nominal diameter).

Flaw Indication #2: The flaw was an inside diameter surface breaking flaw that was found to be greater than the size allowed by IWB-3500 (Reference 10). The depth of flaw #2 was found to be 0.94 in. including inspection uncertainty. This represents 40.5 percent of the local pipe wall. The length of the flaw was determined to be 2.625 in. (2.8 percent of circumference based on nominal diameter).

The root cause evaluation determined that these flaws were formed during initial plant construction. Low cycle fatigue, such as that experienced during pressurization, heatup and cooldown, caused flaw #2 to break through. Subsequent volumetric examinations did not identify any degradation in either of the flaws. These flaws will continue to be inspected through the ISI program at regular 10-year intervals after the two remaining followup inspections.

The continued operation with these flaws in place was justified in accordance with IWB-3640, which is supported by a flaw evaluation. The evaluation concluded that wide margin exists for both flaws, which allows further services throughout the remainder of the plant design life, as long as the same plant operation conditions as those considered in the analysis are maintained.

The evaluation of the two flaws considers two possible modes of failure. A fatigue crack growth analysis is used to demonstrate that the crack will satisfy the IWB-3640 requirements for the remainder of the plant life. A fracture mechanic analysis was also performed to predict crack instability.

Fracture Mechanics

Operation with a crack is acceptable with respect to unstable ductile tearing mechanism if the applied J-integral remains below the J_{Ic} fracture toughness. The only aging mechanism that affects the criteria is thermal aging. The forged safe end material is not subject to thermal aging. The gas tungsten arc welds are subject to thermal aging, but the effects are considered negligible. The fracture mechanics analysis does not consider aging effects and is not a TLAA, by 10 CFR 54.3(a), Criterion 2.

Fatigue Crack Growth

The analysis procedure involves postulating an initial flaw at start of life and predicting the flaw growth due to an imposed series of loading transients. The incremental growth is then added to the original crack size, and the analysis proceeds to the next cycle or transient. The procedure is continued in this manner until all of the analytical transients known to occur have been analyzed. The transients considered were distributed evenly over the plant design life, with the exception of the preoperational tests, which are considered first. The design numbers of transients assumed to occur over the plant life are consistent with those of FSAR Table 3.9(N)-1 SP. As long as the plant design basis numbers of transients are maintained the same as those considered in the analysis, regardless of whether the transients occur over a 40 or 60-year plant life, the analysis and conclusions will remain valid.

This fatigue growth analysis does not consider intergranular stress corrosion cracking as a credible aging mechanism. This is based on stress corrosion cracking having been observed to occur in stainless steel in operating BWR piping systems, but not in PWR plants due to hydrogen overpressure. While the RPV inlet and outlet nozzles are Alloy 600 and the nozzle-to-safe end welds are Alloy 182, the cracks were identified in the safe end-to-elbow region which is a gas tungsten-arc process, with a root pass TIG weld and does not contain any susceptible material. The analyses are only applicable in this region, and primary water stress corrosion cracking (PWSCC) was not considered a viable mechanism because expert and industry experience indicate stainless steels have been shown to be very resistant to PWSCC.

The projected transient accumulations in Table 4.3-2, *Transient Accumulations and Projections* show that the numbers of transient cycles are expected to remain within the assumed numbers and therefore the analyses are valid through the period of extended operation. This TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(i).

Disposition: Validation, 10 CFR 54.21(c)(1)(i)

Canopy Seal Weld Overlay

During Refuel 3 (Spring 1989), leaking CRDM canopy seal welds (CSW) were identified. Failure analysis concluded that transgranular stress corrosion cracking (TGSCC) was the mode of failure, resulting in local through-wall cracks and leakage.

A weld overlay repair was developed for application to the leaking CRDM CSW. The design is based on meeting the requirements of ASME Section XI, IWB-3640, 1986 Edition no addenda, and NUREG-0313, Rev. 2 for the repair of SCC flaws. This repair employs three layers of Alloy 625 filler metal using the GTAW (TIG) weld process, each layer being 0.12 in. thick. The remaining life of the repair was determined with a fracture mechanics crack growth analysis that accounts for the SCC resistance of the repair.

The fracture mechanics crack growth analysis accounts for the residual stress distribution, which is significant in providing the driving force for SCC. The residual stress is thus used as a principal input to the appropriate fracture mechanics SCC crack growth law to compute the remaining life of the repair. The results of a SCC crack growth law are a function of time (e.g. years) and not monitored plant events (e.g. plant heatups). The fracture mechanics crack growth analysis for the CSW overlay repairs indicates that the design is adequate for 57 years of operation. Since the repairs were performed in 1992, the repairs are valid through the period of extended operation, until 2049. Therefore this TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(i).

Disposition: Validation, 10 CFR 54.21(c)(1)(i)

Pressurizer SWOL Fatigue Crack Growth Analysis

During Refuel 15 (Spring 2007), Callaway performed Structural Weld Overlays (SWOL) on the five Alloy 82/182/600 pressurizer steam space piping locations (the pressurizer spray nozzle, the three safety nozzles, and the relief nozzle) and the pressurizer surge nozzle as a preemptive measure addressing concerns about pressurizer dissimilar welds and PWSCC.

Ameren Missouri requested relief from certain ASME Code, Section XI requirements using Code Cases N-504-2 and N-638-1 for the purpose of performing preemptive structural weld overlays on the Callaway pressurizer spray, relief, and safety nozzles. Westinghouse performed a fatigue crack growth evaluation to support implementation of Code Case N-504-2. The 40-year FSAR design transients were used in the fatigue crack growth analysis. The pressurizer surge nozzle SWOL qualification also considered postulated insurges-outsurges transient during heatup and cooldown operations and the effects of thermal stratification.

The pressurizer nozzle SWOLs, performed in 2007, depend on 40-year fatigue crack growth analyses, which will remain valid until 2047 as long as the assumed numbers of cycles are not exceeded. The projected transient accumulations in Table 4.3-2, *Transient Accumulations and Projections* show that the numbers of transient cycles are expected to remain within the assumed numbers and therefore the analyses are valid through the period of extended operation. These TLAAs are dispositioned in accordance with 10 CFR 54.21(c)(1)(i).

Disposition: Validation, 10 CFR 54.21(c)(1)(i)

4.7.3 Corrosion Analysis of the Reactor Vessel Cladding Indications

FSAR Section 5.2.3.2.2 SP identifies two areas where the reactor pressure vessel low-alloy steel has been left exposed to the reactor coolant. The first area is 1.5 in. x 0.75 in. and is located between penetrations #54 and 58 and approximately 6 inches above the penetrations. The second area is 0.53 in. x 0.3 in. and is located approximately 4 in. above penetration #51. The existence of these areas has been evaluated as acceptable.

The first area was identified during Refuel 13 (Spring 2004) while performing bottom mounted instrumentation inspections inside the reactor pressure vessel, when a small rust colored mark was identified on the lower reactor vessel wall. The rust stain is indicative of exposed low-alloy steel. These findings support the characterization of this indication as an area where the cladding is missing. This indication was determined to be acceptable with IWB-3510.1(d) which states that indications entirely within the cladding are acceptable.

The second area was identified during Refuel 15 (Spring 2007). The flaw was characterized as the same type of flaw identified during Refuel 13 and the analysis, calculation BB-183 (Reference 11), was updated to include both flaws within the scope of its structural integrity evaluation.

The evaluation demonstrated that the ASME Code criteria will continue to be met relative to the corrosion exposure area and vessel minimum wall thickness. The corrosion evaluation compared the exposed area of the reactor pressure vessel low-alloy steel, 1.5 in. x 0.625 in. and 0.53 in. x 0.3 in., to the NB-3332.1 acceptance criteria for openings not requiring reinforcement, 4.356 in. diameter. This limit would not be approached even when considering the metal would experience 0.119 in. of corrosion. The evaluation considered a plant life of 40 years, which includes 20 years under the current license plus 20 years for plant life extension. The amount of corrosion was calculated assuming a corrosion rate of 0.001 in/yr for normal operating conditions; an outage corrosion rate of 0.015 in./yr with the average outage duration of less than 8 weeks every 18 months; and a 2-week startup period after each outage with a corrosion rate of 0.010 in./yr. The corrosion rates are from EPRI Technical Report, *Boric Acid Corrosion Guidebook*, Revision 1."

If an outage corrosion rate was assumed for the entire 40 years, the metal would experience 0.6 in. of corrosion and the diameter of the damaged area would still be is much less than the allowable diameter. The vessel minimum wall thickness evaluation demonstrated that the wall thickness, 5.38 in., minus the maximum degraded area depth, 0.28 in., meets the criterion of NB-3324.2, 4.329 in.

Visual inspections of the flaws are performed when the opportunity permits, but the inspection frequency and characterization of the indications will not change as the evaluation determined that frequent inspections of the damaged area would not be required.

The corrosion analysis includes the period of extended operation. Therefore the TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(i).

Disposition: Validation, 10 CFR 54.21(c)(1)(i)

4.7.4 Absence of a TLAA for Reactor Vessel Underclad Cracking Analyses

NUREG-1800 identifies "Intergranular separation in the heat-affected zone (HAZ) of reactor vessel low-alloy steel under austenitic SS cladding" as a potential TLAA. No such cracks have been discovered, nor therefore, analyzed at Callaway. In the absence of any analyses no TLAAs exist. This phenomenon has been addressed in the Callaway vessel by weld cladding processes designed to avoid these defects, consistent with Regulatory Guide 1.43.

Regulatory Guide 1.43 states that underclad cracking has been reported only in forgings and plate material of SA-508 Class 2 when clad using "high-heat-input" processes such as the submerged-arc wide-strip and the submerged-arc 6-wire processes. Cracking was not observed in SA-508 Class 2 materials clad by "low-heat-input" processes controlled to minimize heating of the base metal. Further, cracking was not observed in clad SA-533 Grade B Class 1 plate material, regardless of the welding process used.

Callaway Vessel Material Subject to Underclad Cracking

The vessel shell and head plates are vacuum treated SA-533, Grade A, B, or C, Class 1 or 2 (Grade A or B, Class 1 for beltline plates). Only the vessel nozzles and flanges are SA-508 Class 2 forgings. The cladding is stainless steel weld metal, Analysis A-8; and Ni-Cr-Fe Weld Metal, F-Number 43.

The Callaway ISI program examines flanges under IWB Table-2500-1 Category B-A using Code Case N-623, and examines RV nozzles under Category B-D using Code Case N-648-1. A review of inservice inspection reports found no record of indications of underclad cracking in the RV nozzles or flanges.

Qualification of Clad Welding Processes to Avoid Underclad Cracking

Although the Callaway vessel contains these SA-508 forgings clad by high-heat-input processes, freedom from underclad cracking is assured by special evaluation of the procedure qualification for cladding applied on low alloy steel (SA-508, Class 2).

This special evaluation is documented in FSAR SP, Appendix 3A and determined that Callaway meets the requirement of Regulatory Guide 1.43 by requiring qualification of any "high heat input" processes, such as the submerged arc wide strip welding process and the submerged-arc 6-wire process used on ASME SA-508, Class 2, material, with a performance test as described in Regulatory Position C.2 of the guide. No qualifications are required by the regulatory guide for ASME SA-533 material and equivalent chemistry for forging grade ASME SA-508, Class 3, material.

The fabricator monitors and records the weld parameters to verify agreement with the parameters established by the procedure qualification as stated in Regulatory Position C.3. Stainless steel weld cladding of low-alloy steel components is not employed on components outside the NSSS.

Applicability of Westinghouse Owners Group Generic 60-Year Flaw Growth Analysis

Westinghouse prepared a topical report on underclad cracking which included fatigue crack growth analyses and ASME Section XI allowable flaw size evaluations for typical Westinghouse vessels, and found that the expected maximum flaw predicted by the crack growth analysis is less than the Section XI allowable flaw size. The NRC safety evaluation of this topical report determined that it might be incorporated by reference in a license renewal application, provided that the analysis is applicable to the applicant's plant. However, no underclad cracks have been discovered and this analysis is not invoked in the Callaway CLB, therefore it is not a TLAA by 10 CFR 54.3(a) criterion 6.

4.7.5 Reactor Coolant Pump Flywheel Fatigue Crack Growth Analysis

NUREG-1800 identifies "Fatigue analysis of the reactor coolant pump flywheel" as a potential TLAA. At Callaway fatigue in the flywheels is a recognized and analyzed aging effect.

A reactor coolant pump flywheel could conceivably burst because of centrifugal stresses, which could produce missiles inside containment and could also damage pump seals or other pressure boundary components. This concern is the subject of Regulatory Guide 1.14, which recommended bore and keyway volumetric inspection of the flywheels at 3-year intervals; plus accessible surface and complete volumetric inspections at 10-year intervals. Callaway's Commitment to Regulatory Guide 1.14 is described in FSAR Appendix 3A SP.

The surveillance interval has since been extended to 20 years in Callaway Amendment 163 based on Westinghouse Topical Report WCAP-15666-A, *Extension of Reactor Coolant Pump Motor Flywheel Examination* (Reference 12). The NRC accepted WCAP-15666-A for use in license applications. This exception to Regulatory Guide 1.14 is described in FSAR Appendix 3A SP.

The supporting WCAP-15666-A includes a fatigue crack growth analysis. It assumes an initial flaw from a flywheel bore keyway equal to 10 percent of the keyway-to-outer-radius dimension, and demonstrates that 6,000 start-stop cycles (over an assumed 60 year life) will produce only about an 80 mil extension of the crack.

The 6,000 events in WCAP-15666-A are based on the sum of the RCP starts/stops in FSAR Table 3.9(N)-1 SP multiplied by 1.5, which is the general design number of events for the NSSS system extrapolated to 60 years. Only 220 RCP starts/stops events are projected to occur in 60 years. See Table 4.3-2, *Transient Accumulations and Projections.* Therefore, the analysis remains valid through the end of the period of extended operation and the TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(i).

Disposition: Validation, 10 CFR 54.21(c)(1)(i)

4.7.6 High Energy Line Break Postulation Based on Fatigue Cumulative Usage Factors

NRC Branch Technical Position (BTP) MEB 3-1 provides guidance for determining the types and locations of postulated high-energy line breaks (HELB) outside containment, and has historically been used for the same purpose inside containment. BTP MEB 3-1 guidance for ASME III Class 1 piping identifies breaks based on a limiting stress criterion and on a cumulative usage factor criterion. BTP MEB 3-1 is used at Callaway as the basis of the criteria for the selection of postulated high energy line breaks locations. The postulations of break locations based on the fatigue criterion are TLAAs.

ASME III, Class 1 Piping HELB Locations

FSAR Section 3.6.2.1.1.a SP specifies that ASME Section III, Class 1 pipe break locations are postulated at (a) the terminal ends of piping, (b) intermediate locations where stresses exceed $2.4S_m$, (c) intermediate locations where the CUF exceeds 0.1, and (d) if there are no intermediate locations that exceed the $2.4S_m$ and 0.1 CUF criteria, intermediate breaks are postulated at points of maximum stresses using ASME III, NB-3653, Equation 10. Only Class 1 piping requires the calculation of CUFs; thus it is the only class of piping which utilize CUFs in the selection of postulated HELB locations. These criteria apply to all Class 1 piping except the reactor coolant loop (RCL), accumulator injection lines (ACC), and residual heat removal (RHR) system piping as a result of the application of LBB technology allowed by the revised GDC-4. See Section 4.7.7, *Fatigue Crack Growth Assessment in*

Support of a Fracture Mechanics Analysis for the Leak-Before-Break (LBB) Elimination of Dynamic Effects of Piping Failures for a discussion on the LBB flaw growth analyses. The break types and locations are given in FSAR Table 3.6-3 SP and FSAR Figures 3.6-1 and 3.6-3 SP.

ASME III, Class 1 piping break locations were determined using CUFs based on 40-year design transient cycles. No additional break locations will result from license renewal as long as the current design basis cumulative usage factor analyses remain valid. The Fatigue Monitoring program, summarized in Appendix B, Section B3.1, ensures that the analytical bases of the HELB locations are maintained. These TLAAs are dispositioned in accordance with 10 CFR 54.21(c)(1)(iii).

Disposition: Validation, 10 CFR 54.21(c)(1)(iii)

4.7.7 Fatigue Crack Growth Assessment in Support of a Fracture Mechanics Analysis for the Leak-Before-Break (LBB) Elimination of Dynamic Effects of Piping Failures

The original design basis criteria for the reactor coolant loops postulated pipe break locations. Leak-before-break (LBB) analyses eliminated postulated breaks in the reactor coolant loops (RCL), accumulator (ACC) injection lines, and residual heat removal (RHR) hot leg suction lines.

Reactor Coolant Loops

The reactor coolant loop LBB analysis included a fracture mechanics analysis, which accounts for reduction in fracture toughness of the cast austenitic stainless steel (CASS) in the primary loops from thermal aging. The leak-before-break LBB submittal is also supported by a fatigue crack growth assessment for a 40-year life, which is a TLAA.

Fracture Mechanics Analysis (not a TLAA)

The fracture mechanics analysis in support of the leak-before-break submittal for Callaway was performed for a reference material with fully-aged fracture toughness material properties. Since the fracture toughness material properties used in the analysis are not time-dependent this analysis is not a TLAA by 10 CFR 54.3(a), criterion 3.

Fatigue Crack Growth Assessment

The LBB analysis performed a fatigue crack growth analysis at three cross sections of the vessel inlet nozzle which contain (1) Inconel (dissimilar metal weld), (2) SA-508 Class 2 or 3 low alloy steel (RPV inlet nozzle), and (3) stainless steel (safe end forging and weld). The 40-year fatigue crack growth evaluation resulted in a maximum postulated crack growth of

0.04921 in. for all assumed materials. Margin assessment determined that there is a critical flaw size margin of 2 or more from a flaw having a leak rate of 10 gpm; a leak rate margin of 10 between the leakage flaw and the leak detection capability of 1 gpm; and has shown that the leakage flaw is stable under faulted loads.

The fatigue crack growth analysis associated with the leak-before-break analyses depend on design transient cycle assumptions, and will remain valid as long as the assumed numbers of cycles are not exceeded. The projected transient accumulations in Table 4.3-2, *Transient Accumulations and Projections* show that the numbers of transient cycles are expected to remain within the assumed numbers and therefore the analyses will remain valid for the period of extended operation. Therefore, these TLAAs are dispositioned in accordance with 10 CFR 54.21(c)(1)(i).

Disposition: Validation, 10 CFR 54.21(c)(1)(i)

ISI Flaw Indication

Section 4.7.2, *In-Service Flaw Analyses that Demonstrate Structural Integrity for 40 Years* discusses two flaw indications identified during Refuel 13 (Spring 2004) in the vessel inlet nozzle stainless steel elbow-to-safe end weld. These flaws are bounded by the location, material, and crack morphology in the LBB analysis, and are not projected to propagate through wall. These flaws were determined to be the result of initial construction and not an indication of fatigue cracking or an active stress corrosion cracking degradation mechanism. Therefore these flaws did not affect the current LBB analysis for RCL.

Accumulator Injection and Residual Heat Removal Lines

Westinghouse performed LBB analyses of the 10 in. accumulator (ACC) lines and the 12 in. residual heat removal (RHR) lines to minimize pipe breaks and reduce hardware (i.e. pipe whip restraints and jet shield) which would mitigate the dynamic consequences of the postulated breaks. The LBB analyses consist of fracture mechanics and fatigue crack growth analyses. These lines and associated fittings are forged and are not subject to thermal aging; therefore the fracture mechanics analyses are not TLAAs by 10 CFR 54.3(a), criterion 2.

Fatigue Crack Growth Assessment

Margin assessments for ACC and RHR lines determined that there is a critical flaw size margin of 2 or more from a flaw having a leak rate of 10 gpm, a leak rate margin of 10 between the leakage flaw and the leak detection capability of 1 gpm, and has shown that the leakage flaw is stable under faulted loads. The NRC SE of Amendment 161 approved the application of LBB for the accumulator and RHR lines.

Normal operating and upset thermal transients were selected from the design specification and system design criteria to select transients representative of the conditions considered to occur during plant operation. These analyses are based on assumed 40-year design transients and are therefore TLAAs. The projected transient accumulations in Table 4.3-2, *Transient Accumulations and Projections* show that the numbers of transient cycles are expected to remain within the assumed numbers and therefore the analyses will remain valid for the period of extended operation. Therefore, these TLAAs are dispositioned in accordance with 10 CFR 54.21(c)(1)(i).

Disposition: Validation, 10 CFR 54.21(c)(1)(i)

PWSCC Susceptibility Effect on LBB Analyses

NRC Regulatory Issue Summary (RIS) 2010-07 discusses the regulatory issues associated with the application of weld overlays and other PWSCC mitigation techniques used in piping systems approved by the NRC for LBB. A weld overlay may change the weld geometry of the original weld upon which the LBB analysis was based, thus potentially invalidating the original LBB analysis.

The reactor pressure vessel inlet and outlet nozzles are identified as PWSCC susceptible locations. The RCL LBB analysis addresses the concerns of RIS 2010-07 because no cracks within the PWSCC susceptible material have been identified and no weld overlay or other mitigation techniques have been performed on the Alloy 600 material or 82/182 welds. The PSWCC susceptible material will continue to be inspected in accordance with the ISI program and the requirements of MRP-139, *Materials Reliability Program: Primary System Piping Butt Weld Inspection and Evaluation Guideline*, which are incorporated into ASME Code Case N-770-1.

No PWSCC susceptible Alloy 82/182 weld material is found in the ACC or RHR lines at Callaway; therefore RIS 2010-07 is not applicable to the LBB analysis for the ACC or RHR lines.

4.7.8 Replacement Class 3 Buried Piping

Callaway's Essential Service Water (ESW) system was designed with unlined carbon steel piping, which has shown to be susceptible to fouling, corrosion, and microbiologically induced corrosion (MIC) for raw water applications.

Ameren Missouri has replaced the buried ESW carbon steel piping from the pump house to the control building and from the control building to the ultimate heat sink (UHS) cooling tower with high-density polyethylene (HDPE) piping, which does not rust, rot, corrode, tuberculate, or support biological growth. At Callaway the buried HDPE ESW piping is designed for a service life of 40 years under normal system operation conditions.

Callaway submitted Relief Request I3R-10 in order to allow the replacement of the carbon steel piping with HDPE material in the ESW system as an alternative to ASME Boiler and Pressure Vessel (B&PV) Code, Section XI. The replacement of the ESW piping was done in accordance with ASME Code Case N-755 with the exceptions identified in the relief request. The NRC concluded that the use of HDPE pipe for the buried section of the ESW system will provide an acceptable level of quality and safety.

The design accounts for pressure, soil and surcharge loads, floatation loads, longitudinal stress, thermal loads, and seismic loads. These design calculations were sent to the NRC in Enclosure of ULNRC-05553 (Reference 13) and Attachment 1 of ULNRC-05542 (Reference 14), respectively. The design specification input includes a service life of 40 years under the normal system operating conditions.

The requirement for a service life of 40 years affects the design in two ways.

- The acceptance criteria in the analysis of the design pressure, longitudinal stress, and thermal loads are based on a service life of 40 years.
- The modulus of elasticity, used as input to the analysis of the soil and surcharge loads, and thermal loads, are based on a service life of 40 years or greater.

Since the input and acceptance to the design analyses for replacement of the ESW piping vary based on the service life of 40 years, these analyses are therefore TLAAs.

The replacement of buried ESW piping with HDPE material began in 2008 with a service life of 40 years, which extends beyond the period of extended operation. Therefore the design of buried HDPE ESW piping will remain valid for the period of extended operation, and the TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(i).

Disposition: Validation, 10 CFR 54.21(c)(1)(i)

4.7.9 Replacement Steam Generator Tube Wear

For the replacement steam generators (RSG) the time-averaged wear work rates at the tube support locations were analyzed due to the impact/sliding motion of the tubes against their supports. This analysis assumed a cumulative operating service of 45 years and compared the calculated wear of 0.010 in. to the maximum allowable wear of 40 percent of the tube wall thickness, 0.0156 in. Since analysis is dependent on the 45-year RSG design life, it is a TLAA.

The 45-year design life of the RSG tubes extends beyond the period of extended operation. Therefore, the design of the RSG tubes, is valid through the period of extended operation and the corresponding TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(i).

Disposition: Validation, 10 CFR 54.21(c)(1)(i)

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APPENDIX A

FINAL SAFETY ANALYSIS REPORT SUPPLEMENT

A0 APPENDIX A INTRODUCTION

Introduction

This appendix provides the information to be submitted in a Supplement to the Final Safety Analysis Report (FSAR) Update as required by 10 CFR 54.21(d) for the Callaway Plant License Renewal Application. Section A1 of this appendix contains summary descriptions of the programs used to manage the effects of aging during the period of extended operation. Section A2 contains summary descriptions of programs used for management of time-limited aging analyses during the period of extended operation. Section A3 contains evaluation summaries of TLAAs for the period of extended operation. Section A4 contains summary descriptions of license renewal commitments. These summary descriptions of aging management programs, time-limited aging analyses, and license renewal commitments will be incorporated in the Callaway Plant FSAR Update following issuance of the renewed operating license in accordance with 10 CFR 50.71(e).

A1 SUMMARY DESCRIPTIONS OF AGING MANAGEMENT PROGRAMS

The integrated plant assessment and evaluation of time-limited aging analyses (TLAA) identified existing and new aging management programs necessary to provide reasonable assurance that components within the scope of license renewal will continue to perform their intended functions consistent with the current licensing basis (CLB) for the period of extended operation. Sections A1 and A2 describe the programs and their implementation activities.

Three elements common to all aging management programs discussed in Sections A1 and A2 are corrective actions, confirmation process, and administrative controls. These elements are included in the Callaway Plant QA Program, which implements the requirements of 10 CFR 50, Appendix B. The Callaway Plant QA Program is applicable to safety-related systems, structures and components that are subject to aging management review activities for license renewal. These three elements will also be applied to the nonsafety-related systems, structures and components subject to aging management activities after enhancement to existing Callaway procedures.

A1.1 ASME SECTION XI INSERVICE INSPECTION, SUBSECTIONS IWB, IWC, AND IWD

ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program manages cracking, loss of fracture toughness, and loss of material. The program consists of periodic volumetric, surface, and/or visual examinations and leakage testing of ASME Class 1, 2, and 3 pressure-retaining components, including welds, pump casings, valve bodies, integral attachments, and pressure-retaining bolting for assessment, signs of degradation, and corrective actions. Callaway inspections meet ASME Section XI requirements. Callaway will use the ASME Code Section XI edition and addenda consistent with the provisions of 10 CFR 50.55a during the period of extended operation.

A1.2 WATER CHEMISTRY

The Water Chemistry program manages loss of material, cracking, reduction of heat transfer, and wall thinning in components exposed to a treated water environment. The Water Chemistry program is used to control water chemistry for impurities that accelerate corrosion. The program is a mitigation program that relies on monitoring and control of primary and secondary water chemistry to keep peak levels of various contaminants below system-specific limits based on EPRI guidelines. The Water Chemistry program is based on EPRI 1014986, *PWR Primary Water Chemistry Guidelines*, Revision 6 and EPRI 1016555, *PWR Secondary Water Chemistry Guidelines*, Revision 7.

The One-Time Inspection program (A1.18) verifies the effectiveness of the Water Chemistry program.

A1.3 REACTOR HEAD CLOSURE STUD BOLTING

The Reactor Head Closure Stud Bolting program manages cracking and loss of material by conducting ASME Section XI inspections of reactor vessel flange stud hole threads, reactor head closure studs, nuts, and washers.

The Reactor Head Closure Stud Bolting program includes periodic visual and volumetric examinations of reactor vessel flange stud hole threads, reactor head closure studs, nuts, and washers and performs visual inspection of the reactor vessel flange during primary system leakage tests. The program is implemented through station procedures consistent with the examination and inspection requirements specified in ASME Section XI, Subsection IWB, Table IWB-2500-1. Callaway will use the ASME Code edition consistent with the provisions of 10 CFR 50.55a during the period of extended operation.

The program includes preventive measures as recommended in Regulatory Guide 1.65, *Materials and Inspections for Reactor Vessel Closure Studs* to use stable lubricants and NUREG-1339, *Resolution of Generic Safety Issue 29: Bolting Degradation or Failure in Nuclear Plants*, to use bolting material for closure studs that has an actual yield strength less than 150 kilo-pounds per square inch.

A1.4 BORIC ACID CORROSION

The Boric Acid Corrosion program manages loss of material and increased resistance of connection due to borated water or reactor coolant leakage. The program includes provisions to identify leakage through inspection and examination. When leakage is identified, an inspection is performed that includes identification of the leakage path, visual inspections of adjacent structures, components and supports, and cleaning of the leakage. When it is determined that an evaluation is necessary, it is performed in a timely manner. If the evaluation identifies aging effects, corrective action will be taken. Monitoring is provided by tracking and trending of existing and repaired leaks and the establishment of a component-based visual history of leakage. The principal industry guidance document used is WCAP-15988-NP, *Generic Guidance for an Effective Boric Acid Inspection Program for Pressurized Water Reactors*. The program relies in part on implementation of recommendations of NRC Generic Letter 88-05, *Boric Acid Corrosion of Carbon Steel Reactor Pressure Boundary Components in PWR Plants*. Additionally, the program includes examinations conducted during ISI pressure tests performed in accordance with ASME Section XI requirements.

The effects of boric acid corrosion on reactor coolant pressure boundary materials in the vicinity of nickel-alloy components are managed by the Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components program (A1.5).

A1.5 CRACKING OF NICKEL-ALLOY COMPONENTS AND LOSS OF MATERIAL DUE TO BORIC ACID-INDUCED CORROSION IN REACTOR COOLANT PRESSURE BOUNDARY COMPONENTS

The Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components program manages cracking of nickel-alloy components and associated welds in reactor coolant pressure boundary components. This program also manages loss of material due to boric acid-induced corrosion in susceptible, safety-related components in the vicinity of nickel-alloy reactor coolant pressure boundary components.

The program provides inspection requirements for the reactor pressure vessel, pressurizer, and reactor coolant pressure boundary piping components if they contain primary water stress corrosion cracking susceptible materials designated alloys 600/82/182. The program also includes inspection requirements for the reactor pressure vessel upper head.

A1.6 PWR VESSEL INTERNALS

The PWR Vessel Internals program relies on implementation of the guidance included in Electric Power Research Institute (EPRI) 1016596 (MRP-227), *PWR Internals Inspection and Evaluation Guideline* and EPRI 1016609, *Inspection Standard for PWR Internals* (MRP-228) to manage the aging effects of reactor vessel internal (RVI) components.

This program is used to manage (a) various forms of cracking, including stress corrosion cracking (SCC), primary water stress corrosion cracking (PWSCC), irradiation assisted stress corrosion cracking (IASCC), or cracking due to fatigue/cyclical loading; (b) loss of material induced by wear; (c) loss of fracture toughness due to either thermal aging or neutron irradiation embrittlement; (d) changes in dimension due to void swelling and irradiation growth; and (e) loss of preload due to thermal and irradiation-enhanced stress relaxation or creep.

The PWR Vessel Internals program is a new program and will be implemented within 24 months after the issuance of MRP-227-A, *PWR Internals Inspection and Evaluation Guideline*.

Industry and plant-specific operating experience will be evaluated in the development and implementation of this program.

A1.7 FLOW-ACCELERATED CORROSION

The Flow-Accelerated Corrosion (FAC) program manages aging effects of wall thinning on the internal surfaces of carbon or low alloy steel piping, elbows, reducers, expanders, and valve bodies which contain high energy fluids (both single phase and two phases). The program implements the EPRI guidelines in NSAC-202L-R3 to detect, measure, monitor, predict, and mitigate component wall thinning.

Analytical evaluations and periodic examinations of locations that are most susceptible to wall thinning due to FAC are used to predict the amount of wall thinning. Program activities include analyses to determine critical locations, baseline inspections to determine the extent of thinning at these critical locations, and follow-up inspections to confirm the predictions. Inspections are performed using ultrasonic, visual or other approved testing techniques capable of detecting wall thinning. Repairs and replacements are performed as necessary.

A1.8 BOLTING INTEGRITY

The Bolting Integrity program manages cracking, loss of material and loss of preload for pressure retaining bolting. The program includes periodic inspection of closure bolting for pressure-retaining components consistent with recommendations as delineated in NUREG-1339, *Resolution of Generic Safety Issue 29: Bolting Degradation or Failure in Nuclear Power Plants and* EPRI NP-5769, *Degradation and Failure of Bolting in Nuclear Power Plants*, Volume 1 and 2 with the exceptions noted in NUREG-1339. The Bolting Integrity program also includes activities for preload control, material selection and control, and use of lubricants/sealants as delineated in EPRI NP-104213, *Bolted Joint Maintenance and Application Guide.*

The ASME Section XI Inservice Inspection, Subsections IWB, IWC and IWD program supplements the Bolting Integrity program by providing the requirements for inservice inspection of ASME Class 1, 2, and 3 safety-related pressure retaining bolting. The integrity of non-ASME Class 1, 2, 3 system and component bolted joints is evaluated by detection of visible leakage during maintenance or routine observation such as system walkdowns.

Safety-related and nonsafety-related structural bolting is managed by the following programs:

(a) ASME Section XI, Subsection IWE program (A1.26) provides the requirements for inspection of structural bolting.

(b) ASME Section XI, Subsection IWF program (A1.28) provides the requirements for inservice inspection of safety-related component support bolting.

(c) Structures Monitoring program (A1.31) monitors the condition of structures and structural supports that are within the scope of license renewal.

(d) RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants program (A1.32) provides the requirements for inspection of water control structures associated with emergency cooling water systems.

(e) Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems program (A1.12) provides the requirements for inspection of handling systems within the scope of license renewal.

Reactor pressure vessel head closure studs are managed by the Reactor Head Closure Stud Bolting program (A1.3).

A1.9 STEAM GENERATORS

The Steam Generators program manages cracking, loss of material, and wall thinning of the steam generator tubes, plugs, and tube supports. The program provides preventive measures in the form of predictive assessment, tube plugging, foreign material exclusion, foreign object search, secondary side cleaning and maintenance, and maintaining the chemistry. The program detects degradation through nondestructive examinations, visual inspection, and in situ pressure testing. Assessments are used to verify that the steam generator performance criteria defined in the Technical Specifications have been met over the last operating interval and ensure that the criteria will be met over the next operating interval.

NDE inspection and primary to secondary leak rate monitoring are conducted consistent with the requirements of Callaway Technical Specifications and NEI 97-06, *Steam Generator Program Guidelines*. The program ensures that performance criteria are maintained for operational leakage, accident induced leakage, and structural integrity as prescribed in the Technical Specifications. Tube structural integrity limits consistent with Regulatory Guide 1.121, *Bases for Plugging Degraded PWR Steam Generator Tubes* are applied.

A1.10 OPEN-CYCLE COOLING WATER SYSTEM

The Open-Cycle Cooling Water System program manages loss of material, reduction of heat transfer, cracking, blistering, change in color, and hardening and loss of strength for components within the scope of license renewal and exposed to the raw water of the essential service water system and heat exchangers and other components in other systems serviced by the essential service water system.

The program is consistent with commitments as established in responses to NRC Generic Letter 89-13, *Service Water System Problems Affecting Safety-Related Components* and includes:

(a) surveillance and control of biofouling,
(b) tests to verify heat transfer,
(c) routine inspection and maintenance program,
(d) system walkdown inspection, and
(e) review of maintenance, operating, and training practices and procedures.

The Open-Cycle Cooling Water System program includes the essential service water system that transfers heat from the safety-related structures, systems and components to the ultimate heat sink as defined in NRC Generic Letter 89-13. Periodic heat transfer testing or inspection and cleaning of heat exchangers with a heat transfer intended function is performed in accordance with commitments to NRC Generic Letter 89-13 to verify heat transfer capabilities.

A1.11 CLOSED TREATED WATER SYSTEMS

The Closed Treated Water Systems program manages loss of material, cracking, and reduction of heat transfer for components within the scope of license renewal in the closed-cycle cooling water systems.

The Closed Treated Water Systems program is a preventive program that relies on water treatment, including the use of corrosion inhibitors to modify the chemistry of the water and chemical testing to ensure that water chemistry is maintained within acceptable guidelines. The program also conducts periodic inspections to determine the presence or extent of corrosion, fouling, and/or cracking.

A1.12 INSPECTION OF OVERHEAD HEAVY LOAD AND LIGHT LOAD (RELATED TO REFUELING) HANDLING SYSTEMS

The Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems program manages loss of material and loss of preload for bolting for all cranes, trolley and hoist structural components, fuel handling equipment and applicable rails within the scope of license renewal. Visual inspections will manage loss of material due to corrosion of structural members and bolting, loss of materials due to wear of rails, and loss of preload for bolted connections.

Crane inspections are performed in accordance with the ASME B30 standards. Inspections are performed at a frequency that meets the requirements of the ASME B30 series. For cranes that are infrequently in service, such as the containment polar crane, periodic inspections are performed once every refueling cycle just prior to use.

A1.13 FIRE PROTECTION

The Fire Protection program manages loss of material for fire rated doors, fire dampers and the Halon system, concrete cracking, spalling, and loss of material for fire barrier walls, ceilings and floors and increased hardness, shrinkage, and loss of strength of fire barrier penetration seals.

Periodic visual inspections of fire barrier penetration seals, fire dampers, fire barrier walls, ceilings and floors are performed to ensure that they can perform their intended functions. Visual inspections and functional tests are performed on fire-rated doors. The program also includes periodic visual inspection and functional testing of the Halon system.

A1.14 FIRE WATER SYSTEM

The Fire Water System program manages loss of material for water-based fire protection systems. Consistent with National Fire Protection Association commitments, the program consists of periodic full-flow flush tests, system performance tests to prevent corrosion from biofouling in the fire protection system, and testing or replacement of sprinklers that have been in place for 50 years. The fire protection system is normally maintained at required operating pressure and is monitored such that loss of system pressure is immediately detected and corrective actions initiated.

The Fire Water System program conducts flow tests through each open head spray/sprinkler nozzle to verify water flow is unobstructed. Wall thickness evaluations are performed on fire protection piping to identify loss of material. As an alternative, visual internal inspections are used when the internal surface of the piping is exposed during plant maintenance. These inspections evaluate (a) wall thickness to ensure against catastrophic failure and (b) the inner diameter of the piping as it applies to the design flow of the fire protection system.

A1.15 ABOVEGROUND METALLIC TANKS

The Aboveground Metallic Tanks program manages loss of material and cracking on the external surfaces of aboveground metallic tanks within the scope of license renewal that are supported on concrete or soil. The program also manages cracking, blistering, and change in color of the acrylic/urethane insulation on the condensate storage tank. The program applies to the condensate storage tank, refueling water storage tank, and the two fire water storage tanks.

This program performs visual inspections to monitor for aging of the tank external surface paint or damage of the insulation covering. Removal of the tank insulation is on an opportunistic basis to permit inspection of the tank external surface for aging. Insulated tank exterior surfaces that have not been opportunistically inspected will be examined with thickness measurements from the internal surface, to determine the tank wall thickness.

Thickness measurements are taken from inside the emptied tanks to determine the thickness of the tank bottom, or insulated tank exterior surfaces that have not had an opportunistic inspection. The thickness measurements ensure significant loss of material is not occurring, so that the intended function of each tank is maintained during the period of extended operation.

The Aboveground Metallic Tanks program is a new program that will be implemented prior to the period of extended operation.

Industry and plant-specific operating experience will be evaluated in the development and implementation of this program.

A1.16 FUEL OIL CHEMISTRY

The Fuel Oil Chemistry program manages loss of material on the internal surface of components in the emergency diesel engine fuel oil storage and transfer system, fire protection system, standby diesel generator engine system, and EOF and TSC diesels security building system. The program includes (a) surveillance and monitoring procedures for maintaining fuel oil quality by controlling contaminants in accordance with plant technical specifications and ASTM Standards D1796-83 and D2276-78, (b) periodic draining of the emergency fuel oil system storage tanks and day tanks, (c) cleaning and visual inspection of internal surfaces of the emergency fuel oil system storage tanks and day tanks during periodic draining, (d) ultrasonic measurements of the emergency fuel oil system storage tank and fuel oil day tank bottom thickness if there are indications of reduced cross sectional thickness found during the visual inspection, (e) periodic volumetric examination of tank bottom from the external surface the diesel fire pump fuel oil day tank and security diesel generator fuel oil day tank where tank design prevents cleaning and inspection from the inside, and (f) inspection of new fuel oil before introduction to storage tanks.

The One-Time Inspection program (A1.18) will be used to verify the effectiveness of the Fuel Oil Chemistry program.

A1.17 REACTOR VESSEL SURVEILLANCE

The Reactor Vessel Surveillance program manages loss of fracture toughness and is consistent with ASTM E 185. The surveillance capsules contain reactor vessel steel specimens of the limiting beltline material; and associated weld metal and weld heat affected zone metal. The surveillance coupons are tested by a qualified offsite vendor, to its procedures. The testing program and reporting conform to requirements of 10 CFR 50, Appendix H, *Reactor Vessel Material Surveillance Program Requirements*.

Vessel fluence will be determined by ex-vessel dosimetry after all capsules have been removed.

A1.18 ONE-TIME INSPECTION

The One-Time Inspection program conducts one-time inspections of selected components in susceptible locations to verify the effectiveness of the Water Chemistry program (A1.2), Fuel Oil Chemistry program (A1.16), and Lubricating Oil Analysis program (A1.24). The aging effects evaluated by the One-Time Inspection program are loss of material, cracking, and reduction of heat transfer. The One-Time Inspection program provides inspections that verify that unacceptable aging effects are not occurring.

The elements of the program include: (a) determination of the sample size based on 20 percent of the components in each material-environment group up to a maximum of 25 components, (b) identification of the inspection locations in each material-environment-aging effect group based on the potential for the aging effect to occur, (c) determination of the examination technique, including acceptance criteria that would be effective in detecting the aging effect for which the component is examined, (d) evaluation of aging effects and the need for follow-up examinations using the corrective action program.

The One-Time Inspection program is not used for structures or components with known aging effects or when a component is in a different environment in the period of extended operation than it experienced in the prior 40 years.

The One-Time Inspection program is a new program that will be implemented and completed within the 10-year period prior to the period of extended operation.

Industry and plant-specific operating experience will be evaluated in the development and implementation of this program.

A1.19 SELECTIVE LEACHING

The Selective Leaching program manages loss of material due to selective leaching for gray cast iron and copper alloy with greater than 15 percent zinc components that are exposed to treated water, raw water, waste water, or groundwater environments and require aging management. The material of copper alloy greater than eight percent aluminum (aluminum-bronze) was not used in systems that require aging management at Callaway.

The Selective Leaching program includes a one-time visual inspection and other mechanical inspection techniques of selected components that may be susceptible to selective leaching. If these inspections detect selective leaching, then a follow-up evaluation is performed. The evaluation may require confirmation of selective leaching through a metallurgical evaluation. This is to determine whether loss of material due to selective leaching is occurring, and whether the process will affect the ability of the components to perform their intended functions for the period of extended operation.

The Selective Leaching program is a new program and inspections will be completed within the five-year period prior to the period of extended operation.

Industry and plant-specific operating experience will be evaluated in the development and implementation of this program.

A1.20 ONE-TIME INSPECTION OF ASME CODE CLASS 1 SMALL-BORE PIPING

The One-Time Inspection of ASME Code Class 1 Small-Bore Piping program manages cracking of ASME Code Class 1 piping less than four inches nominal pipe size (NPS 4) and greater than or equal to NPS 1.

For ASME Code Class 1 small-bore piping, the Risk-informed (RI-ISI) ISI program requires volumetric examinations (by ultrasonic testing) on selected butt weld locations to detect cracking. Weld locations are selected based on the guidelines provided in EPRI TR-112657, *Revised Risk-Informed Inservice Inspection Evaluation Procedure*. Ultrasonic examinations are conducted in accordance with ASME Section XI with acceptance criteria from paragraph IWB-3000 for butt welds.

The program will include a volumetric or opportunistic destructive examination of socket welds to identify potential cracking. Callaway has experienced one case of cracking, in 1995, of an ASME Code Class 1 small-bore piping butt weld resulting from cyclical loading which was mitigated with a design change to prevent recurrence. Two small-bore Class 1 socket welds will be selected for examination, which represents 10 percent of the population. There are 19 Class 1 small-bore socket welds in the population of ASME Code Class 1 piping less than NPS 4 and greater than or equal to NPS 1 at Callaway. Alternatively, an opportunistic destructive examination may be used in lieu of volumetric examinations. An opportunistic destructive examination may be performed when a weld is removed from service for reasons other than inspection.

Socket welds that fall within the weld examination sample will be examined following ASME Section XI Code requirements. If a qualified volumetric examination procedure for socket welds endorsed by the industry or the NRC is available and incorporated into the ASME Section XI Code at the time of the small-bore inspections, then this will be used for the volumetric examinations. If no volumetric examination procedure for ASME Code Class 1 small-bore socket welds has been endorsed by the industry or the NRC and incorporated into ASME Section XI at the time Callaway performs inspections of small-bore piping, a plant procedure for volumetric examination of ASME Code Class 1 small-bore piping with socket welds will be used.

The program includes controls to implement an alternate plant-specific periodic inspection aging management program should evidence of ASME Class 1 small bore piping cracking caused by intergranular stress corrosion cracking or fatigue be confirmed by review of Callaway operating experience prior to the period of extended operation or by the examinations performed as part of this program.

The One-Time Inspection of ASME Code Class 1 Small-Bore Piping program is a new program and inspections will be completed and evaluated within six years prior to the period of extended operation.

In conformance with 10 CFR 50.55a(g)(4)(ii), the ISI program is updated during each successive 120-month inspection interval to comply with the requirements of the latest edition of the ASME Code specified twelve months before the start of the inspection interval. Callaway will use the ASME Code Edition consistent with the provisions of 10 CFR 50.55a during the 10-year period prior to the period of extended operation (fourth interval).

A1.21 EXTERNAL SURFACES MONITORING OF MECHANICAL COMPONENTS

The External Surfaces Monitoring of Mechanical Components program manages loss of material and cracking for metallic components and cracking and changes in material properties for cement board components. The program also manages loss of material, cracking, and hardening and loss of strength for polymeric components. Periodic visual inspections of external surfaces conducted through engineering walkdowns will be used to identify loss of material and leakage. Periodic polymeric inspections will also include manual or physical manipulation in order to verify the absence of cracking, hardening, or loss of strength. Periodic monitoring of stainless steel components will also include visual inspection for cracking when exposed to an air environment containing halides.

The External Surfaces Monitoring of Mechanical Components program is a new program that will be implemented prior to the period of extended operation.

Industry and plant-specific operating experience will be evaluated in the development and implementation of this program.

A1.22 FLUX THIMBLE TUBE INSPECTION

The Flux Thimble Tube Inspection program manages loss of material by performing wall thickness eddy current testing of all flux thimble tubes that form part of the reactor coolant system pressure boundary. The pressure boundary includes the length of the tube inside the reactor vessel out to the seal fittings outside the reactor vessel. Eddy current inspection is performed on the portion of the tubes inside the reactor vessel. The Flux Thimble Tube Inspection program does not prevent loss of material but provides measures for inspection and evaluation to detect the loss of material prior to loss of intended function.

All flux thimble tubes are periodically inspected during refueling outages. Wall thickness measurements are trended and wear rates are calculated. The refueling outage for the next inspection is determined from the wear rate calculations. If the current measured wear exceeds the acceptance criteria or the predicted wear for a given flux thimble tube is projected to exceed the established acceptance criteria prior to the next refueling outage, corrective actions are taken to reposition, cap or replace the tube.

The Flux Thimble Tube Inspection program implements the recommendations of NRC Bulletin 88-09, *Thimble Tube Thinning in Westinghouse Reactors*.

A1.23 INSPECTION OF INTERNAL SURFACES IN MISCELLANEOUS PIPING AND DUCTING COMPONENTS

The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program manages cracking, loss of material, hardening and loss of strength of the internal surfaces of piping, piping components, ducting, and other components that are not inspected by other aging management programs. The program inspects a representative sample of components with internal surfaces exposed to plant indoor air, ventilation atmosphere, atmosphere/weather, condensation, borated water leakage, diesel exhaust, lubricating oil, and water system environment not managed by Open-Cycle Cooling Water System (A1.10), Closed Treated Water System (A1.11), Fire Water System (A1.14), and Water Chemistry (A1.2) programs.

Internal inspections are normally performed at opportunities where the internal surfaces are made accessible, such as periodic system and component surveillance activities or maintenance activities. Visual inspections of internal surfaces of plant components are performed by qualified personnel. For certain materials, such as polymers, visual inspections will be augmented by physical manipulation or pressurization to detect hardening, loss of strength, and cracking. The program includes inspections to detect material degradation that could result in a loss of component intended function.

The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program is a new program and will be implemented prior to the period of extended operation.

Industry and plant-specific operating experience will be evaluated in the development and implementation of this program.

A1.24 LUBRICATING OIL ANALYSIS

The Lubricating Oil Analysis program manages oil environments in order to prevent loss of material and reduction of heat transfer. The program does not manage component surfaces directly but maintains lubricating oil contaminants (primarily water and particulates) within acceptable limits, thereby preserving an environment that is not conducive to loss of material or reduction of heat transfer.

The One-Time Inspection program (A1.18) verifies the effectiveness of the Lubricating Oil Analysis program.

A1.25 BURIED AND UNDERGROUND PIPING AND TANKS

The Buried and Underground Piping and Tanks program manages loss of material, cracking, blistering, and change of color of the external surfaces of buried and underground piping and tanks. The program augments other programs that manage the aging of internal surfaces of buried and underground piping and tanks. The materials managed by this program include steel, stainless steel and high-density polyethylene. The program manages aging through preventive, mitigative, and inspection activities. .

Preventive and mitigative actions include selection of component materials, external coatings for corrosion control, backfill quality control and the application of cathodic protection. Inspection activities include electrochemical verification of the effectiveness of cathodic protection, non-destructive evaluation of pipe or tank wall thickness, and visual inspection of the exterior, as permitted by opportunistic or directed excavations.

The Buried and Underground Piping and Tanks program is a new program that will be implemented within the 10-year period prior to entering the period of extended operation.

Industry and plant-specific operating experience will be evaluated in the development and implementation of this program.

A1.26 ASME SECTION XI, SUBSECTION IWE

The ASME Section XI, Subsection IWE program manages cracking, loss of material, loss of sealing, loss of preload, and loss of leak tightness by providing aging management of the steel liner of the concrete containment building, including the containment liner plate and its integral attachments, containment hatches and airlocks, and pressure-retaining bolting. IWE inspections are performed in order to identify and manage any containment liner aging effects that could result in loss of intended function. Acceptance criteria for components subject to Subsection IWE examination requirements are specified in Article IWE 3000. The Callaway containment inservice inspections program is consistent with the requirements of 2001 Edition of ASME Section XI, Subsection IWE (through the 2003 addenda), supplemented with the applicable requirements of 10 CFR 50.55a(b)(2)(ix). In conformance with 10 CFR 50.55a(g)(4)(ii), the Callaway containment inservice inspections program will be updated during each successive 120-month inspection interval to comply with the requirements of the latest edition and addenda of the Code specified 12 months before the start of the inspection interval.

A1.27 ASME SECTION XI, SUBSECTION IWL

The ASME Section XI, Subsection IWL program manages the following aging effects of the concrete containment building and post tensioned system:

- Cracking
- Cracking, loss of bond, and loss of material (spalling, scaling)
- Increase in porosity and permeability, cracking, loss of material (spalling, scaling)
- Increase in porosity and permeability, loss of strength
- Loss of material
- Loss of material (spalling, scaling) and cracking

Inspections will be performed to identify and manage any aging effects of the containment concrete, post-tensioning tendons, tendon anchorages, and concrete surface around the anchorage that could result in loss of intended function. In conformance with 10 CFR 50.55a(g)(4)(ii), the ASME Section XI, Subsection IWL program will be updated during each successive 120-month inspection interval to comply with the requirements of the latest edition and addenda of the Code specified 12 months before the start of the inspection interval.

A1.28 ASME SECTION XI, SUBSECTION IWF

The ASME Section XI, Subsection IWF program manages loss of material, cracking, fatigue, loss of preload, and loss of mechanical function for supports of Class 1, 2, and 3 components. There are no Class MC supports at Callaway. In conformance with 10 CFR 50.55a(g)(4)(ii), the Callaway ISI program is updated during each successive 120-month inspection interval to comply with the requirements of the latest edition and addenda of the code specified 12 months before the start of the inspection interval.

A1.29 10 CFR PART 50, APPENDIX J

The 10 CFR Part 50, Appendix J program manages cracking, loss of material, loss of leak tightness, loss of sealing, and loss of preload. The program monitors leakage rates through the containment pressure boundary, including the penetrations and access openings, in order to detect degradation of containment pressure boundary. Containment leak rate tests are performed in accordance with 10 CFR 50 Appendix J, *Primary Reactor Containment Leakage Testing for Water Cooled Power Reactors (Option B)*; NRC Regulatory Guide 1.163, *Performance-Based Containment Leak-Test Program*, NEI 94-01, *Industry Guideline for Implementing Performance Based Option of 10 CFR Part 50 Appendix J*; and ANSI/ANS 56.8, *Containment System Leakage Testing Requirements*.

Containment leak rate tests are performed to assure that leakage through the primary containment and systems and components penetrating primary containment does not exceed allowable leakage limits specified in the Technical Specifications. Corrective actions are taken if leakage rates exceed established administrative limits for individual penetrations or the overall containment pressure boundary.

A1.30 MASONRY WALLS

The Masonry Walls program manages cracking of masonry walls. The Masonry Walls program, administered as part of the Structures Monitoring program (A1.31), is based on guidance provided in NRC Bulletin 80-11, *Masonry Wall Design* and NRC Information Notice 87-67, *Lessons Learned from Regional Inspections of Licensee Actions in Response to NRC IE Bulletin 80-11*. The Masonry Wall program contains inspection guidelines and lists attributes that cause aging of masonry walls, which are to be monitored during structural monitoring inspections, as well as establishes examination criteria, evaluation requirements, and acceptance criteria.

A1.31 STRUCTURES MONITORING

The Structures Monitoring program manages the following aging effects of structures and structural supports within the scope of license renewal:

- Concrete cracking and spalling
- Cracking
- Cracking and distortion
- Cracking, blistering, change in color
- Cracking, loss of material
- Cracking, loss of bond, and loss of material (spalling, scaling)
- Increase in porosity and permeability, cracking, loss of material (spalling, scaling)
- Increase in porosity and permeability, loss of strength
- Loss of material
- Loss of material (spalling, scaling) and cracking
- Loss of mechanical function
- Loss of preload
- Loss of sealing
- Reduction in concrete anchor capacity

The Structures Monitoring program implements the requirements of 10 CFR 50.65, *Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants*, consistent with guidance of NUMARC 93-01, *Industry Guidelines for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants*, Revision 2 and NRC Regulatory Guide 1.160, *Monitoring the Effectiveness of Maintenance at Nuclear Power Plants*, Revision 2.

The Structures Monitoring program provides inspection guidelines for concrete elements, structural steel, roof systems, masonry walls and metal siding, including all masonry walls and water control structures within the scope of license renewal. The Structures Monitoring program also monitors settlement for each major structure and inspects non ASME mechanical and electrical supports.

A1.32 RG 1.127, INSPECTION OF WATER-CONTROL STRUCTURES ASSOCIATED WITH NUCLEAR POWER PLANTS

The RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants program, which is implemented as part of the Structures Monitoring program (SMP), manages the following aging effects:

- Cracking; loss of bond; and loss of material (spalling, scaling)
- Increase in porosity and permeability; loss of strength
- Loss of material
- Loss of material (spalling, scaling) and cracking
- Loss of material; loss of form

The scope of this program also includes structural steel and structural bolting associated with water-control structures. SNUPPS-Callaway positions are compliant with that of the Regulatory Guide 1.127 with respect to the ultimate heat sink (UHS) retention pond. The Structures Monitoring program (A1.31) includes all water-control structures within the scope of Regulatory Guide 1.127. The UHS retention pond, the essential service water pumphouse, the ESW supply lines yard vault, the UHS cooling tower and the submerged discharge structures are the water-control structures within the scope for license renewal that are monitored by this program. The UHS retention pond and its associated structures receive periodic in-service inspections for assessment of their structural safety and operational adequacy every five years. Callaway performs algae treatment and riprap inspections along the UHS retention pond to ensure smooth operation of the essential service water pumps. Callaway maintains benchmarks for monitoring settlement in any of the Category 1 structures including the UHS cooling tower.

A1.33 PROTECTIVE COATING AND MONITORING AND MAINTENANCE PROGRAM

The Protective Coating Monitoring and Maintenance Program manages loss of coating integrity for Service Level 1 coatings inside containment so that the intended functions of post-accident safety systems that rely on water recycled through the containment sump/drain system are maintained consistent with the current licensing basis. The program includes a visual examination of all accessible Service Level 1 coatings inside containment, including those applied to the steel containment liner, structural steel, supports, penetrations, and concrete walls and floors. The program is consistent with the ASTM requirements, but Callaway is not committing to all the requirements noted in NRC Regulatory Guide 1.54, *Service Level I, II, and III Protective Coatings Applied to Nuclear Power Plants*, Revision 2.

A1.34 INSULATION MATERIAL FOR ELECTRICAL CABLES AND CONNECTIONS NOT SUBJECT TO 10 CFR 50.49 ENVIRONMENTAL QUALIFICATION REQUIREMENTS

The Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program manages reduced insulation resistance to ensure that accessible electrical cables, connections and terminal blocks not subject to the environmental qualification (EQ) requirements of 10 CFR 50.49 and within the scope of license renewal are capable of performing their intended functions.

Non-EQ cables, connections and terminal blocks within the scope of license renewal in accessible areas with an adverse localized environment are inspected for embrittlement, melting, cracking, swelling, surface contamination, or discoloration that could indicate incipient conductor insulation aging from temperature, radiation, or moisture at least once every ten years.

A1.35 INSULATION MATERIAL FOR ELECTRICAL CABLES AND CONNECTIONS NOT SUBJECT TO 10 CFR 50.49 ENVIRONMENTAL QUALIFICATION REQUIREMENTS USED IN INSTRUMENTATION CIRCUITS

The Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits program manages reduced insulation resistance to ensure that cables and connections used in sensitive instrumentation circuits with high voltage low-level current signals within the ex-core neutron monitoring system are capable of performing their intended functions. All high voltage cable to radiation monitors within the scope of license renewal are managed by the Environmental Qualification (EQ) of Electric Components program (A2.2).

This program provides reasonable assurance that the intended function of cables and connections used in instrumentation circuits with sensitive, low-level current signals that are not subject to the environmental qualification requirements of 10 CFR 50.49 and are exposed to adverse localized environments caused by temperature, radiation, or moisture are maintained consistent with the current licensing basis through the period of extended operation. In most areas, the actual ambient environments (e.g., temperature, radiation, or moisture) are less severe than the plant design environment for those areas.

Calibration or surveillance tests are used to manage the aging of the cable insulation and connections for ex-core neutron monitors so that instrumentation circuits perform their intended functions. When an instrumentation channel is found to be out of calibration during routine calibration or surveillance testing, troubleshooting is performed on the loop, including the instrumentation cable and connections. A review of calibration results will be completed prior to the period of extended operation and every 10 years thereafter.

A1.36 INACCESSIBLE POWER CABLES NOT SUBJECT TO 10 CFR 50.49 ENVIRONMENTAL QUALIFICATION REQUIREMENTS

The Inaccessible Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program manages reduced insulation resistance leading to electrical failure of in-scope non-EQ inaccessible power cables exposed to wetting or submergence caused by significant moisture. Significant moisture is defined as periodic exposures to moisture that last more than a few days.

Manholes, pits, and the ends of duct banks that contain in-scope non-EQ inaccessible power cables will be inspected for water collection and that cables/splices and cable support structures are intact. Collected water will be removed as required. This inspection and water removal will be performed based on actual plant experience with inspection frequency being at least annually. The first inspection for license renewal is to be completed prior to the period of extended operation.

All in-scope non-EQ inaccessible power cables routed through manholes are tested to provide an indication of the conductor insulation condition. Testing that is appropriate to the application at the time of the testing will be performed to detect deterioration of the insulation system due to wetting. Cable testing may be a mix of proven testing methods (such as dielectric loss, AC voltage withstand, partial discharge, low frequency dissipation factor, time domain reflectometry, insulation resistance and polarization index, or line resonance analysis) that are state-of-the-art at the time of testing. The first test for license renewal will be completed prior to the period of extended operation and every six years thereafter.

A1.37 ELECTRICAL CABLE CONNECTIONS NOT SUBJECT TO 10 CFR 50.49 ENVIRONMENTAL QUALIFICATION REQUIREMENTS

The Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program manages increased resistance of connections due to thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion, or oxidation. As part of the Callaway predictive maintenance program, infrared thermography testing is being performed on non-EQ electrical cable connections, associated with active and passive components within the scope of license renewal. A sample of connections will be tested at least once prior to the period of extended operation using infrared thermography to confirm that there are no aging effects requiring management during the period of extended operation. The selected sample is based upon voltage level (medium and low voltage), circuit loading (high loading), connection type, and location (high temperature, high humidity, vibration, etc.).

Industry and plant-specific operating experience will be evaluated in the development and implementation of this program.

A1.38 MONITORING OF NEUTRON-ABSORBING MATERIALS OTHER THAN BORAFLEX

The Monitoring of Neutron-Absorbing Materials Other than Boraflex program manages reduction of neutron-absorbing capacity; change in dimensions, and loss of material to assure that aging of the Boral® neutron-absorbing material used in the spent fuel storage racks does not invalidate the criticality analysis of the spent fuel pool.

The program is a monitoring program which performs inspections and in-situ testing of the Boral® panels in the spent fuel pool. Testing includes areal density measurements of the boron-10 in the Boral® panels, and visual inspections of the Boral® panel sheaths look for geometry changes caused by bulging or swelling. The results are evaluated against acceptance criteria and previous inspections to determine whether corrective actions are required. If required, appropriate actions are taken to ensure the required five percent sub-criticality margin is maintained. Monitoring of the Boral® panels in the spent fuel pool will be performed on a ten-year frequency.

The Monitoring of Neutron-Absorbing Materials Other than Boraflex program is a new program that will be implemented prior to the period of extended operation.

Industry and plant specific operating experience will be evaluated in the development and implementation of this program.

A1.39 METAL ENCLOSED BUS

The Metal Enclosed Bus program manages aging of in-scope non-segregated phase metal enclosed bus including bus and connections, enclosures, and insulation and insulators. The internal surfaces of bus enclosure assemblies are inspected for cracks, corrosion, foreign debris, excessive dust buildup, and evidence of water intrusion. Bus insulation is inspected for signs of reduced insulation resistance due to thermal/thermoxidative degradation of organics/thermoplastics, radiation-induced oxidation, moisture/debris intrusion, or ohmic heating, as indicated by embrittlement, cracking, chipping, melting, discoloration, or swelling, which may indicate overheating or aging degradation. The internal bus insulating supports are inspected for structural integrity and signs of cracks. The external portions of the MEB, including gaskets and sealants, are inspected for surface cracking, crazing, scuffing, dimensional change (e.g., “ballooning” and “necking”), shrinkage, discoloration, hardening and loss of strength due to elastomer degradation. The external surfaces are inspected for loss of material due to general, pitting, and crevice corrosion. A sample of the accessible bolted connections will be inspected for increased resistance of connection due to loosening of bolts using thermography or by measuring connection resistance. For accessible bolted connections that are covered with heat shrink tape, sleeving, insulating boots, etc., a visual inspection of insulating material will be conducted.

The first inspection of the metal enclosed bus, including a sample of bolted connections, will be completed prior to the period of extended operation and every 10 years thereafter. Where visual inspection of insulating material is conducted, the inspection interval of bolted connections will be every five years thereafter.

Industry and plant-specific operating experience will be evaluated in the development and implementation of this program.

A2 SUMMARY DESCRIPTIONS OF TIME-LIMITED AGING ANALYSIS AGING MANAGEMENT PROGRAMS

A2.1 FATIGUE MONITORING

The Fatigue Monitoring program manages fatigue cracking caused by anticipated cyclic strains in metal components of the reactor coolant pressure boundary. The program ensures that actual plant experience remains bounded by the transients analyzed in the design calculations and fatigue crack growth analyses, or that corrective actions maintain the design and licensing basis. The Fatigue Monitoring program tracks the number of transient cycles and will track cumulative fatigue usage at monitored locations. The program will also consider the effects of the reactor water environment for a set that includes the NUREG/CR-6260 sample locations for a newer-vintage Westinghouse Plant, and plant-specific bounding EAF locations. If a cycle count or cumulative usage factor value increases to a program action limit, corrective actions include fatigue reanalysis, repair, or replacement. Action limits permit completion of corrective actions before the design limit is exceeded.

A2.2 ENVIRONMENTAL QUALIFICATION (EQ) OF ELECTRICAL COMPONENTS

The Environmental Qualification (EQ) of Electrical Components program manages component thermal, radiation, and cyclical aging through the use of aging evaluations based on 10 CFR 50.49(f) qualification methods. As required by 10 CFR 50.49, EQ components not qualified for the current license term are to be refurbished or replaced, or have their qualification extended prior to reaching the aging limits established in the evaluation.

The Environmental Qualification (EQ) of Electrical Components program is consistent with the guidance of 10 CFR 50.49, NUREG-0588 Category I, and Regulatory Guide 1.89, *Qualification of Class IE Equipment for Nuclear Power Plants*, Revision 0 for maintaining qualifications of equipment.

Reanalysis of aging evaluations to extend the qualifications of components is performed on a routine basis as part of the EQ program. Important attributes for the reanalysis of aging evaluations include analytical methods, data collection and reduction methods, underlying assumptions, acceptance criteria and corrective actions (if acceptance criteria are not met).

A2.3 CONCRETE CONTAINMENT TENDON PRESTRESS

The Concrete Containment Tendon Prestress program, which is part of the ASME Section XI, Subsection IWL Inservice Inspection program, manages loss of tendon prestress consistent with the requirements of 10 CFR 50.55a(b)(2)(viii)(B). The Concrete Containment Tendon Prestress program includes inspection procedures and acceptance criteria and prescribes specific corrective actions, including increased inspection scope, if inspection criteria are not met.

A3 EVALUATION SUMMARIES OF TIME-LIMITED AGING ANALYSES

10 CFR 54.21(c) requires that an applicant for a renewed license identify time-limited aging analyses (TLAAs) and evaluate them for the period of extended operation. The following TLAAs have been identified and evaluated for Callaway.

A3.1 REACTOR VESSEL NEUTRON EMBRITTLEMENT

The following calculations of neutron fluence and of its embrittlement effects are TLAAs affected by the extended life of the plant:

- Neutron Fluence Values
- Charpy Upper-Shelf Energy (C_V USE)
- Pressurized Thermal Shock (PTS)
- Pressure-Temperature (P-T) Limits
- Low Temperature Overpressure Protection (LTOP)

The Reactor Vessel Surveillance program is described in Section A1.17.

A3.1.1 Neutron Fluence Values

The End of Life – Extended (EOLE) fluence projections were revised to quantify those materials with an expected fluence greater than 1 x 10^{17} n/cm^2 (E>1.0 MeV) at the end of the period of extended operation using methodologies that follow the guidance of Regulatory Guide 1.190. Therefore this TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(ii).

A3.1.2 Charpy Upper-Shelf Energy (USE)

The projections demonstrated that the C_V USE in the limiting material will remain above the 10 CFR 50 Appendix G acceptance criteria of 50 ft-lbf. The C_V USE values were projected to the end of the period of extended operation. Therefore, these TLAAs are dispositioned in accordance with 10 CFR 54.21(c)(1)(ii).

A3.1.3 Pressurized Thermal Shock

The revised projections of PTS reference temperature (RT_{PTS}) to the end of the 60-year licensed operating period meet the requirements of 10 CFR 50.61. Therefore, the evaluation of the pressurized thermal shock screening parameter is projected to the end of the period of extended operation. These TLAAs are dispositioned in accordance with 10 CFR 54.21(c)(1)(ii).

A3.1.4 Pressure-Temperature (P-T) Limits

Appendix G of 10 CFR 50 requires that reactor vessel boltup, hydrotest, pressure tests, normal operation, and anticipated operational occurrences be accomplished within established pressure-temperature (P-T) limits. These curves are required to be maintained and updated as necessary by Technical Specifications 3.4.3 and 5.6.6. Therefore the P-T limit curves will be managed, as required by its current license, through the period of extended operation. The TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(iii).

A3.1.5 Low Temperature Overpressure Protection

The cold overpressure mitigation system (COMS) setpoints are established in the Callaway Plant Pressure and Temperature Limits Report and managed consistent with the P-T curves, which will be managed through the period of extended operation. Therefore the COMS setpoints will be managed through the period of extended operation. The TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(iii).

A3.2 METAL FATIGUE

ASME III Class 1 design specifications define a set of static and transient load conditions for which components are to be designed. The Callaway operating licenses are for 40 years. The Callaway design specifications state that the transient conditions are for a 40-year design life. However, the fatigue analyses are based on a specified number of occurrences of each transient rather than on the design or licensed life. The design number of occurrences of each transient for use in the fatigue analyses was specified to be larger than the number of occurrences now expected during the 40-year design life of the plant.

Operating experience at Callaway and at other similar units has demonstrated that the assumed frequencies of design transients, and therefore the number and severity of transient cycles assumed for a 40-year life were conservative, and that with few exceptions the design numbers are not expected to be exceeded during a 60-year life.

A3.2.1 ASME Section III Class I Fatigue Analysis of Vessels, Piping and Components

The following lists all vessels, pumps, and components subject to Class 1 analyses.

- Reactor Pressure Vessel, Nozzles, Head, Head Adapter Plugs, and Studs
- Control Rod Drive Mechanisms and Core Exit Thermocouple Nozzle Assembly
- Reactor Coolant Pumps
- Pressurizer and Pressurizer Nozzles
- Steam Generators, and Feedwater Nozzles
- ASME III Class 1 Valves
- ASME III Class 1 Piping and Piping Nozzles

The Fatigue Monitoring program described in Section A2.1 will track the numbers of events and transient severities. Therefore the analyses will be managed for the period of extended operation, and the TLAAs are dispositioned in accordance with 10 CFR 54.21(c)(1)(iii).

Sections A3.2.1.1 through A3.2.1.4 include topics which required additional consideration when evaluating the ability of the Fatigue Monitoring program to manage fatigue and fatigue analyses which were not dispositioned in accordance with 10 CFR 54.21(c)(1)(iii).

A3.2.1.1 Reactor Coolant Pump Thermal Barrier Flange

Even though the fatigue waiver conditions are satisfied for the pump, a cumulative usage factor was calculated as part of simplified elastic-plastic analyses for the thermal barrier flange at component cooling water connection. The transients used in the fatigue analysis of the thermal barrier flange at the component cooling water connection will be tracked by the Fatigue Monitoring program, summarized in Section A2.1. Therefore the fatigue analysis will be managed for the period of extended operation, and the TLAAs are dispositioned in accordance with 10 CFR 54.21(c)(1)(iii).

A3.2.1.2 Pressurizer Insurge-Outsurge Transients

The thermal transients resulting from a reactor coolant insurge-outsurge during normal heatup and cooldown operations were not considered in the original design analyses of the pressurizer. The limiting cumulative usage factors (CUF) locations for Westinghouse NSSS plants are at the heater penetrations and pressurizer surge nozzle. The fatigue analyses will be revised to incorporate the effect of insurge-outsurge transients on the pressurizer lower head, surge nozzle, and heater well nozzles at plant specific conditions. Callaway has committed to monitor the CUF of the limiting location out of the pressurizer lower head, pressurizer surge line nozzle, and heater well nozzles using fatigue monitoring software consistent with RIS 2008-30. These TLAAs are dispositioned in accordance with 10 CFR 54.21(c)(1)(iii).

A3.2.1.3 Steam Generator ASME Section III Class 1, Class 2 Secondary Side, and Feedwater Nozzle Fatigue Analyses

Although the ASME classification for the secondary side of the replacement steam generators (RSGs) is specified to be Class 2, all pressure retaining parts of the steam generator, and thus both the primary and secondary pressure boundaries, are designed to satisfy the criteria specified in Section III of the ASME Code for Class 1 components.

The RSGs were installed during Refueling Outage 14 (Fall 2005). The Class 1 fatigue analyses of the RSG components used the design basis numbers of events assumed for a 40-year design life. The RSG design lives end in 2045 which extends beyond the period of extended operation. Therefore, the corresponding TLAAs are dispositioned in accordance with 10 CFR 54.21(c)(1)(i).

A3.2.1.4 NRC Bulletin 88-11 Revised Fatigue Analysis of the Pressurizer Surge Line for Thermal Cycling and Stratification

The analysis of thermal stratification effects at Callaway evaluated the hot-leg surge line nozzles and the pressurizer surge line. The Fatigue Monitoring program, summarized in Section A2.1, tracks events to ensure that a design basis number of events are not exceeded. The effects of fatigue on the pressurizer surge line will therefore be managed for the period of extended operation, and the TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(iii).

A3.2.2 ASME Section III Subsection NG Fatigue Analysis of Reactor Pressure Vessel Internals

The reactor vessel internals analyses of record for Callaway were verified to continue to satisfy the ASME Subsection NG requirements. The fatigue analyses were performed using the 40 year design transients in FSAR Table 3.9(N)-1 SP. The Fatigue Monitoring program, summarized in Section A2.1, will track the number of events to manage the fatigue analysis of the reactor internals. Therefore, fatigue in the reactor vessel internals will be adequately managed for the period of extended operation, in accordance with 10 CFR 54.21(c)(1)(iii).

A3.2.3 Effects of the Reactor Coolant System Environment on Fatigue Life of Piping and Components (Generic Safety Issue 190)

All of the locations specified in NUREG/CR-6260 for newer vintage Westinghouse plants will be monitored by the Fatigue Monitoring program, described in Section A2.1. If any of the analyzed CUF values for these locations exceeds the fatigue design limit, the analyses may be revised using actual plant transients experienced. Callaway will complete an evaluation for any additional plant-specific bounding EAF locations prior to the period of extended operation. The supporting environmental factors, F_{en}, calculations will be performed with NUREG/CR-6909 or NUREG/CR-6583 for carbon and low alloy steels, NUREG/CR-6909 or NUREG/CR-5704 for austenitic stainless steels, and NUREG/CR-6909 for nickel alloys. Therefore, the effects of the reactor coolant environment on fatigue usage factors in the remaining locations will be managed for the period of extended operation. These TLAAs are dispositioned in accordance with 10 CFR 54.21(c)(1)(iii).

A3.2.4 Assumed Thermal Cycle Count for Allowable Secondary Stress Range Reduction Factor in ANSI B31.1 and ASME Section III Class 2 and 3 Piping

The existing analyses of ANSI B31.1 or ASME Section III Class 2 and 3 piping for which the allowable range of secondary stresses depends on the number of assumed thermal cycles and that are within the scope of license renewal are valid for the period of extended operation. These TLAAs are dispositioned in accordance with 10 CFR 54.21(c)(1)(i).

A3.2.5 Fatigue Design of Spent Fuel Pool Liner and Racks for Seismic Events

The spent fuel pool racks and liner were replaced in 1999 and were analyzed for fatigue effects of 1 safe-shutdown earthquake (SSE) and 20 operating basis earthquakes (OBE) using methods similar to those for ASME Section III Class 1 analyses. No OBE events have occurred in the operating history of the plant to date, so that the design basis number of events remains sufficient for the remainder of the original licensed operating period, plus the 20-year licensed operating period extension, and the replacement racks are therefore presently qualified for the number of these events now expected for the remainder of a 60-

year life. Therefore the analyses are valid for the period of extended operation, and the TLAAs are dispositioned in accordance with 10 CFR 54.21(c)(1)(i).

A3.2.6 Fatigue Design and Analysis of Class 1E Electrical Raceway Support Angle Fittings for Seismic Events

The design of Class 1E electrical raceway included a fatigue evaluation of the effects of operating basis and safe shutdown earthquake loads (OBE and SSE loads). The analysis assumes a total of 750 cycles for the 5 OBE events plus 150 for the single SSE. No OBE events have occurred in the operating history of the plant to date. The design basis number of events therefore remains sufficient for the remainder of the original licensed operating period, plus the 20-year licensed operating period extension, and the Class 1E electrical raceway support angle fittings are therefore presently qualified for the number of these events now expected for the remainder of a 60-year life. Therefore, the analysis is valid for the period of extended operation, and the TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(i).

A3.2.7 Fatigue Analyses of Class 2 Heat Exchangers

Regenerative Heat Exchanger

Thermal fatigue analyses, in accordance with ASME III, NB-3222.4, were performed to qualify the regenerative heat exchanger to the Code design requirements. The fatigue analysis evaluated the tube side inlet and outlet tubesheets, the shell side nozzles, the tube side nozzles, and the cross shell juncture. The transients in the analysis will be counted by the Fatigue Monitoring program, described in Section A2.1. Therefore the fatigue analysis of the regenerative heat exchanger will be managed for the period of extended operation, and this TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(iii).

Letdown Heat Exchanger

The fatigue analysis of the letdown heat exchanger evaluated the flange, tubesheet, tube side nozzles, and studs. The transients significant to fatigue are monitored; or are not projected to be approached during a 60-year plant life; or will not challenge the Code allowable CUF. Therefore these CUFs are projected through the period of extended operation and the TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(ii).

Letdown Reheat Heat Exchanger

The fatigue analysis of the letdown reheat heat exchanger evaluated the shell and tube side nozzles, the tubesheet, and the studs. The transients significant to fatigue are monitored; or are not projected to be approached during a 60-year plant life; or will not challenge the Code allowable CUF. Therefore these CUFs are projected through the period of extended operation and the TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(ii).

Residual Heat Removal Heat Exchangers

The Callaway residual heat removal (RHR) heat exchangers satisfied the fatigue waiver criteria of NB-3222.4(d). The transients in the waiver will be counted by the Fatigue Monitoring program, described in Section A2.1. Therefore the fatigue analysis of the RHR heat exchanger will be managed for the period of extended operation, and this TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(iii).

Excess Letdown Heat Exchanger

The number of excess letdown initiation transient events anticipated for 60 years is less than the Code maximum allowable. Therefore the excess letdown heat exchanger CUF is projected through the period of extended operation and the TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(ii).

A3.3 ENVIRONMENTAL QUALIFICATION (EQ) OF ELECTRIC EQUIPMENT

10 CFR 50.49 requires that certain electrical and instrument and control equipment, important to safety, located in harsh environments, be qualified to perform their safety-related functions in those harsh environments after the effects of in-service aging.

The Callaway Environmental Qualification (EQ) of Electric Components program is consistent with the guidance of NUREG-0588, Category I, and the requirements of 10 CFR 50.49. The program outlines the methodology for performing activities required to establish, maintain, and document the environmental qualification of electrical equipment important to safety. The current list of equipment requiring environmental qualification is maintained in accordance with plant procedures and the Equipment Qualification Management System (EQMS). Safety-related electrical equipment and components located in a harsh environment are qualified by test or combination of test and analysis in accordance with the requirements of 10 CFR 50.49 and NUREG-0588 Revision 1. Detailed qualification results for electrical equipment located in a harsh environment are maintained in the Equipment Qualification Data Package (EQDP).

The Environmental Qualification (EQ) of Electric Components program, summarized in Section A2.2, ensures that the aging effects will be managed and that the EQ components will continue to perform their intended functions for the period of extended operation. This program also manages the aging of mechanical EQ components. Aging effects addressed by the EQ program will therefore be managed for the period of extended operation, and the TLAAs are dispositioned in accordance with 10 CFR 54.21(c)(1)(iii).

A3.4 CONCRETE CONTAINMENT TENDON PRESTRESS

Predicted Lower Limit

Predicted lower limit force lines are incorporated in the tendon surveillance program to identify any abnormal degradation in tendon prestressing force. The calculations of predicted lower limit lines are consistent with NRC Regulatory Guide 1.35.1. As part of the Tendon Surveillance program, described in Section A2.3, the PLL force lines will be extended to 60 years. This TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(ii).

Regression Analysis

The trend lines are calculated by regression of individual tendon lift off data and are consistent with NRC Information Notice 99-10, *Degradation of Prestressing Tendon Systems in Prestressed Concrete Containments*, Revision 1, Attachment 3. The regression analysis trend lines indicate lift-offs in excess of the MRV for at least 60 years ; therefore the analysis is valid for the period of extended operation. The TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(i).

A3.5 CONTAINMENT LINER PLATE, METAL CONTAINMENTS, AND PENETRATIONS FATIGUE ANALYSES

The Callaway prestressed concrete containment vessel is poured against a steel membrane liner. No credit is taken for the liner for the pressure design of the containment vessel, but the liner and penetrations ensure the vessel is leak-tight. These components are designed to ASME Section III requirements for metal containment components.

A3.5.1 Design Cycles for the Main Steam Line and Feedwater Penetrations

Loading Condition IV

The analysis of Loading Condition IV (normal thermal gradient plus pipe rupture) for the main steam line and feedwater penetrations assumed 10 cycles of line ruptures which will not be exceeded during the period of extended operation. Therefore the analysis will remain valid for the period of extended operation and the TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(i).

Loading Condition V

The analysis of Loading Condition V (normal thermal gradient plus operating cycle) for the main steam line penetrations accounts for 500 startup-shutdown cycles which exceeds the number projected for 60 years, therefore the TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(ii).

A3.5.2 Fatigue Waiver Evaluations for the Access Hatches and Leak Chase Channels

Access Hatches

The number of pressure tests and startup and cooldown cycles assumed in the access hatch fatigue waiver evaluations will not be exceeded during the period of extended operation; therefore the TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(i).

Leak Chase Channels

The numbers of pressure tests and thermal cycles assumed in the leak chase fatigue waiver evaluation will not be exceeded during the period of extended operation; therefore the TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(i).

A3.6 PLANT-SPECIFIC TIME-LIMITED AGING ANALYSES

A3.6.1 Containment Polar Crane, Fuel Building Cask Handling Crane, Spent Fuel Pool Bridge Crane, and Refueling Machine CMAA 70 Load Cycle Limits

The design standard number of full-capacity lifts, even with a significant number of unforeseen lifts, far exceeds the number expected of each machine for a 60-year life. The lifting machine designs therefore remain valid for the period of extended operation. These TLAAs are dispositioned in accordance with 10 CFR 54.21(c)(1)(i).

A3.6.2 In-Service Flaw Growth Analyses that Demonstrate Structural Stability for 40 Years

Cold Leg Elbow-to-Safe End Weld Flaw Indications

The fatigue crack growth analysis for the Cold Leg Elbow-to-Safe End Weld Flaw Indications assumes the design number of transients. The projected transient accumulations show that the numbers of transient cycles are expected to remain within the assumed numbers and therefore the analyses are valid through the period of extended operation. This TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(i).

Canopy Seal Weld Overlay

The fracture mechanics crack growth analysis for the CRDM canopy seal weld overlay repairs indicates that the design is adequate for 57 years of operation. Since the repairs were performed in 1992, the repairs are valid through the period of extended operation, until 2049. Therefore this TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(i).

Pressurizer SWOL Fatigue Crack Growth Analysis

The pressurizer nozzle structural weld overlays, performed in 2007, depend on 40-year fatigue crack growth analyses, which will remain valid until 2047. The projected transient accumulations are expected to remain within the assumed numbers and therefore the analyses are valid through the period of extended operation. These TLAAs are dispositioned in accordance with 10 CFR 54.21(c)(1)(i).

A3.6.3 Corrosion Analysis of the Reactor Vessel Cladding Indications

Two areas where identified during Refuel 13 (Spring 2004) and Refuel 15 (Spring 2007) where the reactor pressure vessel low-alloy steel has been left exposed to the reactor coolant. The evaluation considered a plant life of 40 years, which includes 20 years under the current license plus 20 years for the period of extended operation. The corrosion analysis includes the period of extended operation. Therefore the TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(i).

A3.6.4 Reactor Coolant Pump Flywheel Fatigue Crack Growth Analysis

Fatigue in the reactor coolant pump flywheels is supported by a fatigue crack growth analysis which demonstrates that 6,000 start-stop cycles (over an assumed 60 year life) will produce an acceptable extension of the crack. The evaluation is based on the 60-year operating period, therefore the TLAA extends to the end of the period of extended operation and the TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(i).

A3.6.5 High Energy Line Break Postulation Based on Fatigue Cumulative Usage Factors

The selection of ASME III, Class 1 piping HELB locations depends on usage factors, which will remain valid as long as the assumed numbers of cycles are not exceeded. The Fatigue Monitoring program, summarized in Appendix B, Section A2.1, ensures that the analytical bases of the HELB locations are maintained or that a HELB analysis for the new locations with a CUF greater than 0.1 is performed. These TLAAs are dispositioned in accordance with 10 CFR 54.21(c)(1)(iii).

A3.6.6 Fatigue Crack Growth Assessment in Support of a Fracture Mechanics Analysis for the Leak-Before-Break (LBB) Elimination of Dynamic Effects of Piping Failures

Reactor Coolant Loops

The fatigue crack growth analysis associated with the leak-before-break analyses depend on design transient cycle assumptions, and will remain valid as long as the assumed numbers of cycles are not exceeded. The projected transient accumulations show that the numbers of transient cycles are expected to remain within the assumed numbers and therefore the analyses will remain valid for the period of extended operation. Therefore, these TLAAs are dispositioned in accordance with 10 CFR 54.21(c)(1)(i).

Accumulator Injection and Residual Heat Removal Lines

These analyses are based on assumed 40 year design transients. The projected transient accumulations are expected to remain within the assumed numbers and therefore the analyses will remain valid for the period of extended operation. Therefore, these TLAAs are dispositioned in accordance with 10 CFR 54.21(c)(1)(i).

A3.6.7 Replacement Class 3 Buried Piping

The replacement of buried Essential Service Water (ESW) piping with high-density polyethylene (HDPE) material began in 2008 with a service life of 40 years, which extends beyond the period of extended operation. Therefore the design of buried HDPE ESW piping will remain valid for the period of extended operation, and the TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(i).

A3.6.8 Replacement Steam Generator Tube Wear

The replacement steam generator tube wear analysis determined the maximum wear for a 45-year design life. The 45-year design life of the replacement steam generator tubes extends beyond the period of extended operation. Therefore, the design of the replacement steam generator tubes is valid through the period of extended operation and the TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(i).

A4 LICENSE RENEWAL COMMITMENTS

Table A4-1 identifies proposed actions committed to by Ameren Missouri for the Callaway Plant Unit 1 in its License Renewal Application. These and other actions are proposed regulatory commitments. This list will be revised, as necessary, in subsequent amendments to reflect changes resulting from NRC questions and Ameren Missouri responses. Ameren Missouri will utilize the commitment tracking system to track regulatory commitments.

Table A4-1 License Renewal Commitments

Item #	Commitment	LRA Section	Implementation Schedule
1	Procedures will be enhanced to apply the elements of corrective actions, confirmation process, and administrative controls of the Callaway Plant Quality Assurance program to those nonsafety-related SSCs requiring aging management.	B1.3	Prior to the period of extended operation
2	Upon receipt of the renewed operating license, the station operating experience review process and Corrective Action Program will perform reviews of plant-specific and industry operating experience to confirm the effectiveness of the license renewal aging management programs, to determine the need for aging management programs to be enhanced, or indicate the need to develop a new aging management program. Industry and plant-specific operating experience will be evaluated during the development and implementation of new aging management programs.	B1.4	Upon receipt of the renewed operating license
3	Enhance the Boric Acid Corrosion program procedures: • to include steel, copper alloy greater than 15 percent zinc, and aluminum as materials that are susceptible to boric acid corrosion. • so that system engineers will observe for signs of boric acid residue when performing system walkdowns. • to specify that the corrective actions taken by the program will include a consideration to modify the present design or operating procedures to mitigate or prevent recurrence of aging effects caused by borated water leakage. Consideration will be given to modifications that (a) reduce the probability of primary coolant leaks at locations where they may cause corrosion damage, and (b) entail the use of suitable corrosion resistant materials or the application of protective coatings or claddings.	B2.1.4	Prior to the period of extended operation

Table A4-1 License Renewal Commitments

Item #	Commitment	LRA Section	Implementation Schedule
4	Implement the PWR Vessel Internals program as described in LRA Section B2.1.6	B2.1.6	Within 24 months after the issuance of MRP-227-A, *PWR Internals Inspection and Evaluation Guideline*
5	Enhance the Bolting Integrity program procedures to: • reference NUREG-1339 and EPRI NP-5769 to meet the NUREG-1801 recommendations • include bolting in the list of items to be inspected during walkdowns.	B2.1.8	Prior to the period of extended operation
6	Enhance the Open-Cycle Cooling Water System program procedures to: • include polymeric material inspection requirements, parameters monitored, and acceptance criteria. Examination of polymeric materials by OCCW System program will be consistent with examinations described in the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program.	B2.1.10	Prior to the period of extended operation
7	Enhance the Closed Treated Water Systems Program procedures to: • include visual inspections of the surfaces of components with a closed treated water systems water environment. Representative samples of each combination of material and water treatment program will be visually inspected at least every ten years or opportunistically when consistent with sample requirements. Inspections will be conducted and evaluated consistent with ASME Code inspections, industry standards, or a plant-specific inspection procedure by personnel qualified to detect aging. If adverse conditions are found, additional examinations will be performed. This periodic inspection will determine the extent of cracking, loss of material and fouling, and serves as a leading indicator of the condition of the interior of piping components otherwise inaccessible for visual inspection.	B2.1.11	Prior to the period of extended operation

Table A4-1 License Renewal Commitments

Item #	Commitment	LRA Section	Implementation Schedule
8	Enhance the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems program procedures to: • inspect crane structural members for loss of material due to corrosion and rail wear, and loss of preload due to loose or missing bolts and nuts. • include performance of periodic inspections as defined in the appropriate ASME B30 series standard for all cranes, hoists and equipment handling systems within the scope of license renewal. For handling systems that are infrequently in service, such as those only used during refueling outages, periodic inspections may be deferred until just prior to use. • require evaluation of loss of material due to wear or corrosion and loss of bolting preload per the appropriate ASME B30 series standard. • require repairs to cranes, hoists and equipment handling systems per the appropriate ASME B30 series standard	B2.1.12	Prior to the period of extended operation
9	Enhance the Fire Protection program procedures to: • include visual inspections of the external surfaces of Halon fire suppression system components for excessive loss of material due to corrosion. • include trending of the performance of the Halon system during testing.	B2.1.13	Prior to the period of extended operation
10	Enhance the Fire Water System program procedures to: • include pipe wall thickness examinations on fire water piping. As an alternative to wall thickness examinations, internal inspections will be performed on accessible exposed portions of fire water piping during plant maintenance activities. Pipe wall thickness examinations and/or internal inspections will be performed prior to the period of extended operation and at 10-year frequencies throughout the period of extended operation. • replace sprinkler heads prior to 50 years in service or test a representative sample and test every 10 years thereafter to ensure signs of degradation are detected in a timely manner. • review and evaluate trends in flow parameters recorded during the NFPA 25 fire water	B2.1.14	Prior to the period of extended operation

Table A4-1 License Renewal Commitments

Item #	Commitment	LRA Section	Implementation Schedule
	flow tests.		
11	Implement the Aboveground Metallic Tanks program as described in LRA Section B2.1.15	B2.1.15	Prior to the period of extended operation
12	Enhance the Fuel Oil Chemistry program procedures to: • include periodic draining of the water from the bottom of the emergency fuel oil system day tanks, diesel fire pump fuel oil day tanks, and security diesel generator fuel oil day tank. • include the addition of biocide to the diesel fire pump fuel oil day tank and security diesel generator fuel oil day tank if periodic testing indicates biological activity or evidence of corrosion. • include draining, cleaning, and inspection of the emergency fuel oil system day tanks within the 10-year period prior to the period of extended operation and at least once every ten years after entering the period of extended operation. • include a determination of water and sediment in the periodic sampling of the emergency fuel oil system day tanks and security diesel generator fuel oil day tank. • include a determination of particulate concentrations in the periodic sampling of the emergency fuel oil system day tanks, diesel fire pump fuel oil day tanks, and security diesel generator fuel oil day tank. • include a determination of microbial activity concentrations in the periodic sampling of the emergency fuel oil system storage tanks, emergency fuel oil system day tanks, diesel fire pump fuel oil day tanks, and security diesel generator fuel oil day tank. • include new fuel oil receipt sampling for water and sediment prior to introduction into the security diesel generator fuel oil day tank and diesel fire pump fuel oil day tank. • perform a volumetric examination of the emergency fuel oil system storage tanks and day tanks after evidence of tank degradation is observed during the visual inspection within the 10-year period prior to the period of extended operation and at least once every ten years after entering the period of extended operation. • perform a volumetric examination on the external surface of the diesel fire pump fuel oil	B2.1.16	Prior to the period of extended operation

Table A4-1 License Renewal Commitments

Item #	Commitment	LRA Section	Implementation Schedule
	day tanks and security diesel generator fuel oil day tank within the 10-year period prior to the period of extended operation and at least once every ten years after entering the period of extended operation. • include at least quarterly trending for water, biological activity, and particulate concentrations on the emergency fuel oil system day tanks, diesel fire pump fuel oil day tanks, and security diesel generator fuel oil day tank. • include immediate removal of accumulated water when discovered in the emergency fuel oil system day tank, diesel fire pump fuel oil day tank, and security diesel generator fuel oil day tank.		
13	Enhance the Reactor Vessel Surveillance program to: • determine the vessel fluence by ex-vessel dosimetry, following withdrawal of the final capsule. • require that pulled and tested surveillance capsules are placed in storage for future reconstitution or reinsertion unless given NRC approval to discard. • specifically require the design change process to evaluate the impact of plant operation changes on reactor vessel embrittlement.	B2.1.17 4.2	Prior to the period of extended operation
14	Implement the One-Time Inspection program as described in LRA Section B2.1.18	B2.1.18	Within the 10-year period prior to the period of extended operation
15	Implement the Selective Leaching program as described in LRA Section B2.1.19	B2.1.19	Within the five-year period prior to the period of extended operation

Table A4-1 License Renewal Commitments

Item #	Commitment	LRA Section	Implementation Schedule
16	Implement the One-Time Inspection of ASME Code Class 1 Small-Bore Piping program as described in LRA Section B2.1.20	B2.1.20	Within the six-year period prior to the period of extended operation
17	Implement the External Surfaces Monitoring of Mechanical Components program as described in LRA Section B2.1.21	B2.1.21	Prior to the period of extended operation
18	Implement the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program as described in LRA Section B2.1.23	B2.1.23	Prior to the period of extended operation
19	Enhance the Lubricating Oil program procedures to: • indicate that lubricating oil contaminants are maintained within acceptable limits, thereby preserving an environment that is not conducive to loss of material or reduction of heat transfer, • state the testing standards for water content and particle count, and • state that phase separated water in any amount is not acceptable.	B2.1.24	Prior to the period of extended operation
20	Implement the Buried and Underground Piping and Tanks program as described in LRA Section B2.1.25	B2.1.25	Within the 10-year period prior to the period of extended operation
21	Enhance the ASME Section XI, Subsection IWE program to: • specify that whenever replacement of bolting is required, bolting material, installation torque or tension, and use of lubricants and sealants are in accordance with the guidelines of EPRI NP 5769, EPRI TR 104213, and the additional recommendations of NUREG 1339, and • perform additional surface examinations of stainless steel penetration sleeves, dissimilar metal welds, bellows, and steel components that are subject to cyclic loading for cracking, unless Appendix J testing is adequate to identify cracking.	B2.1.26	Prior to the period of extended operation
22	Enhance the ASME Section XI, Subsection IWF program procedures to • specify that whenever replacement of bolting is required, bolting material, installation	B2.1.28	Prior to the period of extended operation

Table A4-1 License Renewal Commitments

Item #	Commitment	LRA Section	Implementation Schedule
	torque or tension, and use of lubricants and sealants are in accordance with the applicable EPRI guidelines, ASTM standards, AISC specifications, and NUREG-recommendations to prevent or mitigate degradation and failure of safety-related bolting due to stress corrosion cracking, and • specify that, in addition to VT-3 examination, high strength bolting (actual measured yield strength greater than or equal to 150 ksi) in sizes greater than 1 in. nominal diameter, shall receive a volumetric examination comparable to that of ASME Code Section XI, Table IWB-2500-1, Examination Category B-G-1 to detect cracking.		

Table A4-1 License Renewal Commitments

Item #	Commitment	LRA Section	Implementation Schedule
23	Enhance the Structures Monitoring program procedures to: • include the main access facility into the scope of Structures Monitoring program. • specify that whenever replacement of bolting is required, bolting material, installation torque or tension, and use of lubricants and sealants are in accordance with the guidelines of EPRI NP 5769, EPRI NP 5067, EPRI TR 104213, and the additional recommendations of NUREG-1339. • specify the preventive actions for storage, lubricants, and stress corrosion cracking potential discussed in Section 2 of Research Council for Structural Connections publication Specification for Structural Joints Using ASTM A325 or A490 Bolts for ASTM A325, ASTM F1852, and/or ASTM A490 structural bolts. • specify inspections of penetrations, transmission towers, electrical conduits, raceways, cable trays, electrical cabinets/enclosures, and associated anchorages. • specify that groundwater is monitored for pH, chlorides and sulfates, and every five years at least two samples are tested and the results are evaluated by engineering to assess the impact, if any, on below grade structures. • specify that structural bolts greater than one in. in diameter with actual measured yield strength greater than or equal to 150 ksi are evaluated for susceptibility to stress corrosion cracking, and, if necessary, visual inspections are supplemented with volumetric or surface examinations. • specify inspector qualifications in accordance with ACI349.3R-96. • quantify acceptance criteria and critical parameters for monitoring degradation, and to provide guidance for identifying unacceptable conditions requiring further technical evaluation or corrective action. • incorporate applicable industry codes, standards and guidelines for acceptance criteria.	B2.1.31	Prior to the period of extended operation
24	Enhance the Protective Coating Monitoring and Maintenance Program procedures to: • specify parameters monitored or inspected to include; any visible defects, such as blistering, cracking, flaking, peeling, rusting, and physical damage. • specify inspection frequencies, personnel qualifications, inspection plans, inspection	B2.1.33	Prior to the period of extended operation

Table A4-1 License Renewal Commitments

Item #	Commitment	LRA Section	Implementation Schedule
	methods, and inspection equipment that meet the requirements of ASTM D 5163-08. • specify a pre-inspection review of the previous two monitoring reports and, based on inspection report results, prioritize repair areas as either needing repair during the same outage or as postponed to future outages, but under surveillance in the interim period. • specify characterization, documentation, and testing consistent with ASTM D 5163-08 section 10.2 through 10.4 and to specify an evaluation of the inspection reports by the responsible coating evaluation specialist who prepares a summary of findings and recommendations for future surveillance or repair. • specify that the inspection reports prioritize repair areas as either needing repair during the same outage or as postponed to future outages, but under surveillance in the interim period.		
25	Enhance the Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program procedures to: • include all accessible in-scope cable in an adverse localized environment. • ensure there are no unacceptable visual indications of surface anomalies. All unacceptable visual indications of cable jacket and connection insulation surface anomalies will be subject to an engineering evaluation.	B2.1.34	Prior to the period of extended operation
26	Enhance the Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits program procedures to: • identify the scope of cables requiring aging management. • require engineering review of calibration results every 10 years.	B2.1.35	Prior to the period of extended operation

Table A4-1 License Renewal Commitments

Item #	Commitment	LRA Section	Implementation Schedule
27	Enhance the Inaccessible Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program procedures to: • identify the power cables, manholes, pits and duct banks that are within the scope of the Inaccessible Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program. • include periodic inspection of pits and duct banks, to ensure power cables/splices and support structures are not submerged or immersed in water, and to ensure that cable support structures are intact. Inspections will be performed at least annually based on water accumulation over time and after event driven occurrences. Power cables subject to significant moisture are tested periodically. • ensure in-scope power cables are tested at least once every six years. • ensure cables/splices and support structures are not submerged or immersed in standing water. • require an engineering evaluation when the test acceptance criteria are not met.	B2.1.36	Prior to the period of extended operation
28	Implement the Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program as described in LRA Section B2.1.37	B2.1.37	Prior to the period of extended operation
29	Implement the Monitoring of Neutron-Absorbing Materials Other than Boraflex program as described in LRA Section B2.1.38	B2.1.38	Prior to the period of extended operation
30	Implement the Metal Enclosed Bus program as described in LRA Section B2.1.39	B2.1.39	Prior to the period of extended operation

Table A4-1 License Renewal Commitments

Item #	Commitment	LRA Section	Implementation Schedule
31	Enhance the Fatigue Monitoring program procedures to: • include fatigue usage calculations that consider the effects of the reactor water environment for a set of sample reactor coolant system locations. The set includes the NUREG/CR-6260 sample locations for a newer-vintage Westinghouse Plant and plant-specific bounding EAF locations. • ensure the scope includes the fatigue crack growth analyses, which support the leak-before-break analyses, ASME Section XI evaluations, and the HELB break selection criterion remain valid by counting the transients used in the analyses. • require the review of the temperature and pressure transient data from the operator logs and plant instrumentation to ensure actual transient severity is bounded by the design and to include environmental effects where applicable. If a transient occurs which exceeds the design transient definition the event is documented in the Corrective Action Program and corrective actions are taken. • include additional transients that contribute significantly to fatigue usage identified by evaluation of ASME Section III fatigue and fatigue crack growth analyses. • include additional locations which receive more detailed monitoring. These locations are identified by evaluation of ASME Section III fatigue analyses and the locations evaluated for effects of the reactor coolant environment. The monitoring methods will be benchmarked consistent with the NRC RIS 2008-30. • project the transient count and fatigue accumulation of monitored components into the future. • include additional cycle count and fatigue usage action limits, which permit completion of corrective actions if the design limits are expected to be exceeded within the next 3 fuel cycles. The fatigue results associated with the NUREG/CR-6260 sample locations for a newer vintage Westinghouse plant and plant-specific bounding environmental-assisted fatigue locations will account for environmental effects on fatigue. The cycle count action limits for the hot leg surge nozzle will incorporate the 60-year cycle projections use in the hot leg surge nozzle EAF analysis.	B3.1	Prior to the period of extended operation

Table A4-1 License Renewal Commitments

Item #	Commitment	LRA Section	Implementation Schedule
	• include appropriate corrective actions to be invoked if a component approaches a cycle count or CUF action limit or if an experienced transient exceeds the design transient definition. If an action limit is reached, corrective actions include fatigue reanalysis, repair, or replacement. When a cycle counting action limit is reached, action will be taken to ensure that the analytical bases of the HELB locations are maintained. Re-analysis of a fatigue crack growth analysis must be consistent with or reconciled to the originally submitted analysis and receive the same level of regulatory review as the original analysis.		
32	Enhance the Concrete Containment Tendon Prestress program specification to: • include random samples for the 40, 45, 50, and 55 year surveillances. • extend the PLL lines for the vertical and hoop tendon groups to 60 years. • specifically require the final report for each surveillance interval to plot the measured results against time, and to include the Predicted Lower Limit, Minimum Required Value, and trend lines. • require a regression analysis consistent with the requirements of NRC Information Notice 99-10 Revision 1, Attachment 3.	B3.3 4.5	Prior to the period of extended operation
33	As additional industry and plant-specific applicable operating experience becomes available, it will be evaluated and incorporated into each new program.	B2.1.6 B2.1.15 B2.1.18 B2.1.19 B2.1.20 B2.1.21 B2.1.23 B2.1.25 B2.1.37 B2.1.38 B2.1.39	Prior to the period of the new program

Table A4-1 License Renewal Commitments

Item #	Commitment	LRA Section	Implementation Schedule
34	Callaway replacement steam generator divider plate assemblies are fabricated of Alloy 690. The divider plate to primary head and tubesheet junctions are welded with Alloy 152 weld materials. The tubesheet cladding is Alloy 182 and the primary head cladding is stainless steel. There is a concern regarding potential failure at the divider plate welds to primary head and tubesheet cladding and Callaway commits to perform one of the following three resolution options: (1) Perform an inspection of each steam generator to assess the condition of the divider plate welds. The examination technique(s) will be capable of detecting PWSCC in the divider plate welds. OR (2) Perform an analytical evaluation of the steam generator divider plate welds in order to establish a technical basis which concludes that the steam generator reactor coolant system pressure boundary is adequately maintained with the presence of steam generator divider plate weld cracking. OR (3) If results of industry and NRC studies and operating experience document that potential failure of the steam generator reactor coolant system pressure boundary due to PWSCC cracking of steam generator divider plate welds is not a credible concern, this commitment will be revised to reflect that conclusion.	Section 3.1.2.2.11.1, Table 3.1.2-4	Prior to the period of extended operation
35	The material of steam generator tubesheet cladding is Alloy 182. The tubes are made of Alloy 690 and are secured to the tubesheet by means of tube to tubesheet leaktight weld and tube expansion. There is a concern regarding potential failure of primary-to-secondary pressure boundary due to PWSCC cracking of tube-to-tubesheet welds. Callaway commits to perform one of the following two resolution options: (1) Perform a one-time inspection of a representative number of tube-to-tubesheet welds in each steam generator to determine if PWSCC cracking is present. If weld cracking is identified, the condition will be resolved through repair or engineering evaluation to justify continued service, as appropriate, and an ongoing monitoring program will be established to perform routine tube-to-tubesheet weld inspections for the remaining life of the steam generators.	Section 3.1.2.2.11.2, Table 3.1.2-4	Prior to the period of extended operation

Table A4-1 License Renewal Commitments

Item #	Commitment	LRA Section	Implementation Schedule
	OR (2) Perform an analytical evaluation of the steam generator tube-to-tubesheet welds in order to establish a technical basis which concludes that the structural integrity of the steam generator tube-to-tubesheet interface is adequately maintained with the presence of tube-to-tubesheet weld cracking. Establish a technical basis which concludes that the steam generator tube-to-tubesheet welds are not required to perform a reactor coolant pressure boundary function		
36	Implement SBF or CBF consistent with RIS 2008-30 to monitor the CUF of the limiting location out of the pressurizer lower head, surge nozzle and heater penetrations to accommodate the insurge-outsurge transient.	4.3.1 4.3.2.2 B3.1	Prior to the period of extended operation
37	Complete an evaluation to determine if there are any additional plant-specific bounding EAF locations. The supporting environmental factors, F(en), calculations will be performed with NUREG/CR-6909 or NUREG/CR-6583 for carbon and low alloy steels, NUREG/CR-6909 or NUREG/CR-5704 for austenitic stainless steels, and NUREG/CR-6909 for nickel alloys. In order to determine if the pressurizer contains a limiting EAF location, the fatigue analyses will be revised to incorporate the affect effect of insurge-outsurge transients on the pressurizer lower head, surge nozzle, and heater well nozzles at plant specific conditions.	4.3.2.2 4.3.4	Prior to the period of extended operation
38	The number of the most severe RCP component cooling water transient, elevated CCW inlet temperature transients, will be limited to 75 percent of its design value, i.e. limited to 150, in order to accommodate the seasonal temperature change transient in the RCP thermal barrier flange fatigue analysis.	4.3.2.1	Prior to the period of extended operation

APPENDIX B

AGING MANAGEMENT PROGRAMS

B1 APPENDIX B INTRODUCTION

B1.1 OVERVIEW

License renewal aging management program descriptions are provided in this appendix for each program credited for managing aging effects based upon the aging management review results provided in Sections 3.1 through 3.6 of this application. Each aging management program described in this section has 10 elements that are consistent with the definitions in Section A.1, *Aging Management Review - Generic*, Table A.1-1, *Elements of an Aging Management Program for License Renewal*, of NUREG-1800, *Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants*. The 10 element detail is only provided when the program is plant-specific.

B1.2 METHOD OF DISCUSSION

For those aging management programs that are consistent with the assumptions made in Sections X and XI of NUREG-1801, or are consistent with exceptions, each program discussion is presented in the following format:

- A program description abstract of the overall program form and function is provided.
- A NUREG-1801 consistency statement is made about the program.
- Exceptions to the NUREG-1801 program are outlined and a justification is provided.
- Enhancements to ensure consistency with NUREG-1801 or additions to the NUREG-1801 program to manage aging for additional components with aging effects not assumed in NUREG-1801 for the NUREG-1801 program. A proposed schedule for completion is discussed.
- Operating experience information specific to the program is provided.
- A conclusion section provides a bases statement of reasonable assurance that the program is effective, or will be effective, once enhanced.

B1.3 QUALITY ASSURANCE PROGRAM AND ADMINISTRATIVE CONTROLS

The Callaway Plant Quality Assurance (QA) Program implements the requirements of 10 CFR 50, Appendix B, *Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants* and with the guidance of Regulatory Guide 1.33, *Quality Assurance Program Requirement (Operation)*, as clarified by Appendix A of the Callaway Plant Operating Quality Assurance Manual (OQAM). This QA Program is consistent with the summary provided in Appendix A.2 of NUREG-1800 and the Appendix, *Quality Assurance for Aging Management Programs*, of NUREG-1801. The corrective action, confirmation process, and administrative controls of the Callaway (10 CFR 50 Appendix B) Quality Assurance Program are applicable to all systems, structures and components (SSCs) subject to aging management programs and activities required during the period of extended operation.

The program elements of Corrective Action, Confirmation Process, and Administrative Controls are applicable as follows:

Corrective Action

Callaway Plant applies its Corrective Action Program to safety-related and nonsafety-related SSCs that are subject to aging management. Corrective Action Program procedures, review and approval processes, and administrative controls are implemented in accordance with the requirements of 10 CFR 50, Appendix B, *Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants*.

The Corrective Action procedures specify the methods to promptly report, evaluate, and correct conditions adverse to quality and significant conditions adverse to quality commensurate with the significance of the SSC or activity. Consistent with the significance of the adverse condition, these methods include: (1) problem identification, (2) problem reporting, (3) immediate response, (4) investigative action to determine the cause, (5) evaluation of the extent of condition and extent of cause, (6) assessment of impact on operability and assessment for reportability, (7) determination of corrective action to prevent recurrence or minimize the consequences, and (8) the performance and verification of corrective actions.

In the case of significant conditions adverse to quality, measures are implemented to ensure that the cause is determined and that corrective action is taken to preclude recurrence. Significant conditions adverse to quality receive independent review and approval and are reported to appropriate levels of management.

Confirmation Process

The Callaway Corrective Action Program requires that measures be taken to preclude repetition of significant conditions adverse to quality. These measures include documented actions to verify effective implementation of corrective actions.

Plant procedures include provisions for timely evaluation of adverse conditions and implementation of corrective actions required, including root cause evaluations and prevention of recurrence where appropriate (e.g.; significant conditions adverse to quality). These procedures provide for tracking, coordinating, monitoring, reviewing, verifying, validating and approving corrective actions, and ensure that corrective actions have been effectively implemented.

The corrective action process is also monitored for potentially adverse trends. Identification of a potentially adverse trend due to recurring or repetitive unacceptable conditions will result in the initiation of a corrective action document.

Administrative Controls

Callaway Plant organizational structure, responsibilities and authorities and personnel qualification requirements conform to Appendix B of 10 CFR 50. Formal review and approval processes exist for procedures and other forms of written instruction utilized for the activities performed under the programs credited for aging management. These procedures contain objectives, program scope, responsibilities, methods for implementation, and acceptance criteria.

Enhancement

Procedures will be enhanced apply the elements of corrective actions, confirmation process, and administrative controls of the Callaway Plant Quality Assurance program to those nonsafety-related SSCs requiring aging management.

B1.4 OPERATING EXPERIENCE

Operating experience is used at Callaway to enhance plant programs, prevent repeat events, and prevent events that have occurred at other plants. External nuclear industry operating experience is screened, evaluated, and acted on to prevent or mitigate the consequences of similar events. External operating experience may include NRC generic communications (e.g., NRC Generic Letters, Bulletins, Information Notices), and other documents (e.g., 10 CFR 21 Reports, Licensee Event Reports, Nonconformance Reports). Internal operating experience may include event investigations, trending reports, lessons learned from in-house events, self-assessments, and the 10 CFR 50, Appendix B, corrective action process.

Each aging management program summary in this appendix contains a discussion of operating experience relevant to the program. This information was obtained through the review of in-house operating experience in the Corrective Action Program and the review of industry operating experience. Plant-specific operating experience was obtained by a review of the Callaway corrective action program records for the period January 1999 through June 2011 and applicable industry operating experience was reviewed based on plant responses to specific NRC Generic Letters, Generic Safety Issues, Information Circulars, IE Bulletins, Information Notices, and Regulatory Information Summaries. This population of industry experience was supported by plant documentation available since the beginning of the project and includes the operating experience associated to the NUREG-1801, Revision 2 (January 2004 to approximately April 2009). These reviews ensured that there was no unique, plant-specific operating experience in addition to that provided in NUREG-1801. This review was augmented with information from the Callaway staff.

The applicable operating experience for each aging management program was reviewed and summarized in the Appendix B program summaries. Detailed records on the performance and effectiveness of each program are maintained in the Callaway records management system (including the Corrective Action Program). The operating experience summary in each aging management program identifies past corrective actions and provides objective evidence that the effects of aging have been, and will continue to be, adequately managed so that the intended functions of the structures and components within the scope of each program will be maintained during the period of extended operation.

Upon receipt of the renewed operating license, the station operating experience review process and Corrective Action Program will perform reviews of plant-specific and industry operating experience to confirm the effectiveness of the license renewal aging management programs, to determine the need for aging management programs to be enhanced, or indicate the need to develop a new aging management program. Industry and plant-specific operating experience will be evaluated during the development and implementation of new aging management programs.

B1.5 AGING MANAGEMENT PROGRAMS

The following aging management programs are described in the sections listed in this appendix.

- ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (Section B2.1.1)
- Water Chemistry (Section B2.1.2)
- Reactor Head Closure Stud Bolting (Section B2.1.3)
- Boric Acid Corrosion (Section B2.1.4)

- Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components (Section B2.1.5)
- PWR Vessel Internals (Section B2.1.6)
- Flow-Accelerated Corrosion (Section B2.1.7)
- Bolting Integrity (Section B2.1.8)
- Steam Generators (Section B2.1.9)
- Open-Cycle Cooling Water System (Section B2.1.10)
- Closed Treated Water Systems (Section B2.1.11)
- Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (Section B2.1.12)
- Fire Protection (Section B2.1.13)
- Fire Water System (Section B2.1.14)
- Aboveground Metallic Tanks (B2.1.15)
- Fuel Oil Chemistry (Section B2.1.16)
- Reactor Vessel Surveillance (Section B2.1.17)
- One-Time Inspection (Section B2.1.18)
- Selective Leaching (Section B2.1.19)
- One-time Inspection of ASME Code Class 1 Small-Bore Piping (Section B2.1.20)
- External Surfaces Monitoring of Mechanical Components (Section B2.1.21)
- Flux Thimble Tube Inspection (Section B2.1.22)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (Section B2.1.23)
- Lubricating Oil Analysis (Section B2.1.24)
- Buried and Underground Piping and Tanks(Section B2.1.25)
- ASME Section XI, Subsection IWE (Section B2.1.26)

- ASME Section XI, Subsection IWL (Section B2.1.27)
- ASME Section XI, Subsection IWF (Section B2.1.28)
- 10 CFR 50, Appendix J (Section B2.1.29)
- Masonry Walls (Section B2.1.30)
- Structures Monitoring (Section B2.1.31)
- RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (Section B2.1.32)
- Protective Coating Monitoring and Maintenance Program (Section B2.1.33)
- Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (Section B2.1.34)
- Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits (Section B2.1.35)
- Inaccessible Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (Section B2.1.36)
- Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (Section B2.1.37)
- Monitoring of Neutron-Absorbing Materials Other than Boraflex (B2.1.38)
- Metal Enclosed Bus (B2.1.39)

B1.6 TIME-LIMITED AGING ANALYSIS PROGRAMS

The following time-limited aging analysis aging management programs are described in the sections listed in this appendix. These programs are discussed in NUREG-1801.

- Fatigue Monitoring (Section B3.1)
- Environmental Qualification (EQ) of Electric Components (Section B3.2)
- Concrete Containment Tendon Prestress (Section B3.3)

B2 AGING MANAGEMENT PROGRAMS

The correlation between NUREG-1801, Generic Aging Lessons Learned programs and Callaway Plant programs is shown below. For Callaway programs, links to appropriate sections of this appendix are provided.

NUREG-1801 NUMBER	NUREG-1801 PROGRAM	PLANT PROGRAM	EXISTING OR NEW	APPENDIX B REFERENCE
XI.M1	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	Existing	B2.1.1
XI.M2	Water Chemistry	Water Chemistry	Existing	B2.1.2
XI.M3	Reactor Head Closure Stud Bolting	Reactor Head Closure Stud Bolting	Existing	B2.1.3
XI.M4	BWR Vessel ID Attachment Welds	Not Applicable to a PWR	N/A	N/A
XI.M5	BWR Feedwater Nozzle	Not Applicable to a PWR	N/A	N/A
XI.M6	BWR Control Rod Drive Return Line Nozzle	Not Applicable to a PWR	N/A	N/A
XI.M7	BWR Stress Corrosion Cracking.	Not Applicable to a PWR	N/A	N/A
XI.M8	BWR Penetrations	Not Applicable to a PWR	N/A	N/A
XI.M9	BWR Vessel Internals	Not Applicable to a PWR	N/A	N/A
XI.M10	Boric Acid Corrosion	Boric Acid Corrosion	Existing	B2.1.4

NUREG-1801 NUMBER	NUREG-1801 PROGRAM	PLANT PROGRAM	EXISTING OR NEW	APPENDIX B REFERENCE
XI.M11B	Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components (PWRs only)	Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components (PWRs only)	Existing	B2.1.5
XI.M12	Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)	Not Credited	N/A	N/A
XI.M16A	PWR Vessel Internals	PWR Vessel Internals	New	B2.1.6
XI.M17	Flow-Accelerated Corrosion	Flow-Accelerated Corrosion	Existing	B2.1.7
XI.M18	Bolting Integrity	Bolting Integrity	Existing	B2.1.8
XI.M19	Steam Generators	Steam Generators	Existing	B2.1.9
XI.M20	Open-Cycle Cooling Water System	Open-Cycle Cooling Water System	Existing	B2.1.10
XI.M21A	Closed Treated Water Systems	Closed Treated Water Systems	Existing	B2.1.11
XI.M22	Boraflex Monitoring	Not Applicable	N/A	N/A
XI.M23	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems	Existing	B2.1.12
XI.M24	Compressed Air Monitoring	Not Credited	N/A	N/A
XI.M25	BWR Reactor Water Cleanup System	Not Applicable	N/A	N/A
XI.M26	Fire Protection	Fire Protection	Existing	B2.1.13
XI.M27	Fire Water System	Fire Water System	Existing	B2.1.14

NUREG-1801 NUMBER	NUREG-1801 PROGRAM	PLANT PROGRAM	EXISTING OR NEW	APPENDIX B REFERENCE
XI.M29	Aboveground Metallic Tanks	Aboveground Metallic Tanks	New	B2.1.15
XI.M30	Fuel Oil Chemistry	Fuel Oil Chemistry	Existing	B2.1.16
XI.M31	Reactor Vessel Surveillance	Reactor Vessel Surveillance	Existing	B2.1.17
XI.M32	One-Time Inspection	One-Time Inspection	New	B2.1.18
XI.M33	Selective Leaching	Selective Leaching	New	B2.1.19
XI.M35	One-Time Inspection of ASME Code Class 1 Small Bore-Piping	One-Time Inspection of ASME Code Class 1 Small-Bore Piping	New	B2.1.20
XI.M36	External Surfaces Monitoring of Mechanical Components	External Surfaces Monitoring of Mechanical Components	New	B2.1.21
XI.M37	Flux Thimble Tube Inspection	Flux Thimble Tube Inspection	Existing	B2.1.22
XI.M38	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	New	B2.1.23
XI.M39	Lubricating Oil Analysis	Lubricating Oil Analysis	Existing	B2.1.24
XI.M40	Monitoring of Neutron-Absorbing Materials Other than Boraflex	Monitoring of Neutron-Absorbing Materials Other than Boraflex	New	B2.1.38
XI.M41	Buried and Underground Piping and Tanks	Buried and Underground Piping and Tanks	New	B2.1.25

NUREG-1801 NUMBER	NUREG-1801 PROGRAM	PLANT PROGRAM	EXISTING OR NEW	APPENDIX B REFERENCE
XI.E1	Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	Existing	B2.1.34
XI.E2	Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits	Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits	Existing	B2.1.35
XI.E3	Inaccessible Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	Inaccessible Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	Existing	B2.1.36
XI.E4	Metal Enclosed Bus	Metal Enclosed Bus	New	B2.1.39
XI.E5	Fuse Holders	Not Credited	N/A	N/A
XI.E6	Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	New	B2.1.37
XI.S1	ASME Section XI, Subsection IWE	ASME Section XI, Subsection IWE	Existing	B2.1.26
XI.S2	ASME Section XI, Subsection IWL	ASME Section XI, Subsection IWL	Existing	B2.1.27

NUREG-1801 NUMBER	NUREG-1801 PROGRAM	PLANT PROGRAM	EXISTING OR NEW	APPENDIX B REFERENCE
XI.S3	ASME Section XI, Subsection IWF	ASME Section XI, Subsection IWF	Existing	B2.1.28
XI.S4	10 CFR Part 50, Appendix J	10 CFR Part 50, Appendix J	Existing	B2.1.29
XI.S5	Masonry Walls	Masonry Walls	Existing	B2.1.30
XI.S6	Structures Monitoring	Structures Monitoring	Existing	B2.1.31
XI.S7	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants	Existing	B2.1.32
XI.S.8	Protective Coating Monitoring and Maintenance Program	Protective Coating Monitoring and Maintenance Program	Existing	B2.1.33
X.M1	Fatigue Monitoring	Fatigue Monitoring	Existing	B3.1
X.E1	Environmental Qualification (EQ) of Electric Components	Environmental Qualification (EQ) of Electric Components	Existing	B3.2
X.S1	Concrete Containment Tendon Prestress	Concrete Containment Tendon Prestress	Existing	B3.3

B2.1 AGING MANAGEMENT PROGRAM DETAILS

B2.1.1 ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD

Program Description

The ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program manages cracking, loss of fracture toughness, and loss of material. The program consists of periodic volumetric, surface, and/or visual examination and leakage test of ASME Class 1, 2, and 3 pressure-retaining components, including welds, pump casings, valve bodies, integral attachments, and pressure-retaining bolting for assessment, signs of degradation, and corrective actions. These components are identified in ASME Section XI Tables IWB-2500-1, IWC-2500-1, and IWD-2500-1 for Class 1, 2, and 3 components, respectively. Repair and replacement activities are performed in accordance with ASME Section XI, IWA-4000.

The ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program has been proven within the industry to maintain component structural integrity and ensure that aging effects are discovered and repaired before the loss of component intended function.

The ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program is an existing program that is in accordance with ASME Section XI, 1998 edition with the 2000 addenda. As required by 10 CFR 50.55a(g)(4)(ii), the Callaway ISI Program is updated during each successive 120-month inspection interval to comply with the requirements of the latest edition of the Code specified twelve months before the start of the inspection interval. Callaway will use the ASME Code Section XI edition consistent with the provisions of 10 CFR 50.55a during the period of extended operation.

Callaway is in the third ISI interval which began December 19, 2004. Callaway is following Inspection Program B as allowed by the ASME Code. Requirements are included for scheduling of examinations and tests for Class 1, 2, and 3 components. The program requires periodic visual, surface, and volumetric examinations and leakage tests of Class 1, 2, and 3 pressure-retaining components. The ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program provides measures for monitoring to detect aging effects prior to loss of intended function. Subsection IWA provides measures for repair and replacement of components.

Inservice inspections of reactor vessel flange stud holes, closure studs, nuts, and washers are managed by the Reactor Head Closure Stud Bolting program (B2.1.3).

Inservice inspections of Class 1, 2, and 3 component supports are managed by the ASME Section XI, Subsection IWF program (B2.1.28).

NUREG-1801 Consistency

The ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program is an existing program that is consistent with NUREG-1801, Section XI.M1, *ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD*.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

The following discussion of operating experience provides objective evidence the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program will be effective in ensuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation.

1. Review of the Owner Activity Reports for the last 10 years indicates there were no conditions found through ISI inspections which required repair or replacement during this period. There was one indication which required an evaluation for continued operation. This indication was a weld flaw in the C reactor vessel inlet nozzle safe end-to-elbow weld. This indication was found during the reactor pressure vessel 10-year ISI examinations performed during Refuel 13 (Spring 2004). It was determined that the flaw had its origin in initial fabrication. Propagation to the inside surface had occurred, but growth toward the outside surface was minimal to non-existent. This flaw was found to be acceptable by analytical evaluation, as allowed by ASME Section XI, Section IWB-3600. Based on a technical evaluation of the indication, the course of action was to monitor the indication for change. The monitoring will use the same nondestructive evaluation (NDE) techniques as the current "state of the art" to assure accurate comparison. The monitoring interval coincides with the ASME Code’s requirement for reinspection within three years. A subsequent inspection was performed during Refuel 15 in 2007 and indicated that the flaw had not grown. The flaw will also be examined in Refuel 19 in 2013 and in Refuel 21 in 2016 or Refuel 22 in 2017.

2. ASME Section XI is revised every three years and addenda issued in the interim which allows the code to be updated to reflect industry experience. The ISI program at Callaway is updated at the end of each inspection interval to reference a newer edition of ASME Section XI. In this way, industry experience that has been incorporated into ASME Section XI gets incorporated into Callaway’s ISI program.

The operating experience of the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program did not show any adverse trend in performance. The above examples provide objective evidence that the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program inspection methods are capable of detecting aging effects. Occurrences that would be identified under the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program will be evaluated to assure there is no significant impact to safe operation of the plant and corrective actions will be taken to prevent recurrence. Guidance for re-evaluation, repair, or replacement is provided for locations where aging is found. There is confidence that the continued implementation of the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program will effectively identify aging prior to loss of intended function.

Conclusion

The continued implementation of the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program provides reasonable assurance that aging effects will be managed such that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B2.1.2 Water Chemistry

Program Description

The Water Chemistry program manages loss of material, cracking, reduction of heat transfer, and wall thinning in components exposed to a treated water environment. The program is a mitigation program that consists of a primary water chemistry program and a secondary water chemistry program. The scope of the primary water chemistry program includes monitoring and control of the chemical environment in the reactor coolant system and related auxiliary systems. The scope of the secondary water chemistry program includes monitoring and control of the chemical environment in the steam generator secondary side and the secondary cycle systems. The primary water chemistry program is consistent with EPRI 1014986, *PWR Primary Water Chemistry Guidelines*, Volumes 1 and 2, both Revision 6. The secondary water chemistry program is consistent with EPRI 1016555, *PWR Secondary Water Chemistry Guidelines*, Revision 7.

The Callaway primary and secondary water chemistry control strategies are set forth in strategic plans and implemented in plant procedures. The programmatic control of the chemical environment ensures that the aging effects due to contaminants are limited. The methods used to manage both the primary and secondary chemical environments rely on the principles of: (1) limiting the concentration of chemical species known to cause corrosion and (2) addition of chemical species known to inhibit material degradation by their influence on pH and dissolved oxygen levels.

Water chemistry control is effective in areas of intermediate and high flow where thorough mixing takes place and the monitoring samples are representative of actual conditions. For low-flow areas and stagnant portions of the systems, sampling may not be as effective in determining local chemical environment conditions, and a one-time inspection of a representative group of components will provide verification of the effectiveness of the Water Chemistry program in these low flow areas.

The One-Time Inspection program (B2.1.18) will be used to verify the effectiveness of the Water Chemistry program.

NUREG-1801 Consistency

The Water Chemistry Program is an existing program that is consistent with NUREG-1801, Section XI.M2, *Water Chemistry*.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

The following discussion of operating experience provides objective evidence that the Water Chemistry program will be effective in ensuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation:

1. In 2004, the main condenser tube bundles were replaced, during Refuel 13 (Spring 2004). The replacement condenser tube sheets are 316L stainless steel and the tubes are 1-1/8 in. OD stainless steel tubes. From plant startup to Refuel 13, the main condenser consisted mostly of 90/10 copper/nickel tubes along with a much smaller percentage of 304 stainless steel tubes. On the secondary (steam) side, the corrosion rates of the copper tubes are known to increase as the amount of ammonia and pH is increased. Replacement of ammonia with ethanol-amine (ETA) lowered the corrosion rate of the copper/nickel tubing, which was confirmed by the lower copper transport rate results from the system. A copper removal plan for the secondary side was completed in Cycle 14.
2. With the replacement of the steam generators in Refuel 14 (Fall 2005), an optimized methoxy-propyl-amine (MPA)/ETA chemistry plan was implemented. The carbon steel extraction steam and drain piping subjected to two-phase (steam-water) high-flow conditions is susceptible to flow-accelerated corrosion and local failure. Since implementing MPA/ETA chemistry, the pH of the water phase has increased significantly, resulting in a significant reduction of corrosion transport rates from these systems. By implementing MPA/ETA chemistry along with the replacement of key susceptible piping with more corrosion resistant material, the extraction steam and drain systems have a low susceptibility to chemistry-related corrosion attack.
3. Since Cycle 15, Callaway has run successfully on no condensate polisher operation, except for shutdowns, startups, and chemical and other transients, and with MPA/ETA chemistry and use of the blowdown demineralizers as the main secondary chemistry control. Callaway plans to continue to run in a no-polisher mode. ETA is the possible root cause of prior resin fouling experienced at Callaway. Copper removal allows complete polisher bypass operation, and use of blowdown demineralizers with MPA allows long demineralizer run times with more even distribution of the amine within the secondary system.
4. In 2005, the Callaway pressurizer liquid space was found to have a dissolved oxygen concentration of 500 ppb, just after an in-surge of RCS water was allowed to cool the pressurizer surge line. Pressurizer liquid-space oxygen concentration was monitored every six hours until oxygen concentration came back down to within specification (less than 100 ppb). Pressurizer liquid samples were taken to show that oxygen concentration continued to decrease during the next 24 hours. The pressurizer vapor space was already lined up to remove any non condensable gases. Approximately 39 hours following the in-surge of reactor coolant to the pressurizer, hydrazine was added

to the RCS to scavenge oxygen in the entire system. In 2010, the dissolved oxygen concentration in the pressurizer liquid space exceeded 100 ppb for approximately 16 hours due to premature initiation of pressurizer spray while in Mode 5. Small dissolved oxygen concentrations for an extended time can cause stress corrosion cracking in susceptible materials, however the presence of oxygen for a short period during these events is not concern for the Callaway pressurizer materials.

5. In 2005, the RCS samples taken during Mode 5 start-up indicated high sulfate concentration, just after replacement of the steam generators. The sulfate spike was later identified as oxalic acid, found in lubricants used in cutting, drilling, and hydrostatic expansion of the steam generator components. Oxalates degrade the performance of ion chromatographs, causing false sulfate measurements. The oxalates were removed by the letdown mixed beds.

6. In March of 2007, a major sodium, sulfate and chloride intrusion from a condenser circulating water tube rupture caused a plant shut down. A single tube rupture was located in the condenser. Subsequent analysis in Refuel 15 (Spring 2007) indicated that the rupture was the result of the failure of a 10 in. slope-drain angle iron. The support was repaired.

7. In 2007, per NRC Information Notice 2007-37, *Buildup of Deposits in Steam Generator*, extensive buildup of deposits at steam generator tube support holes was evaluated to determine if the buildup is likely to result in flow-induced vibration and tube cracking. Callaway's evaluation of IN 2007-37 determined that the Callaway steam generator program was not impacted because the contributing factors cited in the Information Notice are not present at Callaway. A secondary-side sludge loading analysis was performed during Refuel 15 (Spring 2007) using primary side eddy current data. This data was used to create graphical representations of the sludge accumulation in each steam generator. A secondary system mass balance estimate was completed using actual plant iron and copper transport data collected during Cycle 15. These results were correlated with the eddy current deposit mapping data and indicate a minimal amount of sludge accumulation in each steam generator. This minimal amount of sludge confirms the effectiveness of the actions that Callaway has taken to reduce the amount of corrosion products in the secondary systems.

The operating experience of the Water Chemistry program did not show any adverse trend in performance. Occurrences that would be identified under the Water Chemistry program will be evaluated to ensure there is no significant impact to safe operation of the plant and corrective actions will be taken to prevent recurrence. Guidance for re-evaluation, repair, or replacement is provided for locations where aging effects are found. There is confidence that the continued implementation of the Water Chemistry program will effectively identify aging prior to loss of intended function.

Conclusion

The continued implementation of the Water Chemistry program, supplemented by the One-Time Inspection program (B2.1.18), provides reasonable assurance that aging effects will be managed such that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B2.1.3 Reactor Head Closure Stud Bolting

Program Description

The Reactor Head Closure Stud Bolting program manages cracking and loss of material by conducting ASME Section XI inspections of reactor vessel flange stud hole threads, reactor head closure studs, nuts, and washers.

The program is consistent with the ASME Section XI Code, Subsection IWB, Table IWB-2500-1. The Callaway program implements ASME Section XI Code, Subsection IWB, 1998 Edition with 2000 Addenda. In conformance with 10 CFR 50.55a(g)(4)(ii), the Callaway ISI Program is updated during each successive 120-month inspection interval to comply with the requirements of the latest edition of the Code specified twelve months before the start of the inspection interval. Callaway will use the ASME Code Edition consistent with the provisions of 10 CFR 50.55a during the period of extended operation.

The program uses visual and volumetric examinations in accordance with the general requirements of Section XI IWA-2000. The flange threads and studs receive a volumetric examination and the surfaces of nuts and washers are inspected using a VT-1 examination. All pressure retaining boundary components in examination category B-P receive a VT-2 examination during system leakage tests and system hydrostatic tests.

Callaway follows the preventive measures in Regulatory Guide 1.65, *Materials and Inspections for Reactor Vessel Closure Studs*. Lubricant is applied to reactor head closure studs and stud bearing assemblies after reactor head closure stud cleaning and examinations are complete. The lubricants are compatible with the stud material and operating environment and do not contain molybdenum disulfide, which is a potential contributor to stress corrosion cracking. The Callaway reactor vessel head studs are fabricated from modified SA-540 Class 3 Grade B24. As recommended by NUREG-1339, *Resolution of Generic Safety Issue 29: Bolting Degradation or Failure in Nuclear Power Plants*, the actual measured yield strength for the bolting material is less than 150 kilo-pounds per square inch.

Reactor vessel studs are removed from the reactor vessel flange each refueling outage when possible. Studs, nuts, and washers are stored in protective racks after removal. Reactor vessel flange holes are plugged with water tight plugs during cavity flooding. If a stud is stuck, a stainless steel or fiberglass protective cover is installed prior to cavity flooding. These methods ensure the holes, studs, nuts, and washers are protected from borated water during cavity flooding.

The Callaway program has proven to be effective in preventing and detecting potential aging effects of reactor vessel flange stud hole threads, closure studs, nuts, and washers.

NUREG-1801 Consistency

The Reactor Head Closure Stud Bolting program is an existing program that is consistent with NUREG-1801, Section XI.M3, *Reactor Head Closure Stud Bolting*.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

The following discussion of operating experience provides objective evidence that the Reactor Head Closure Stud Bolting program will be effective in ensuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation.

1. Review of the Owner Activity Reports for refueling outages since 1996 indicates there were no repair/replacement items identified with reactor vessel closure studs, nuts washers, or flange stud hole threads. None of the repair/replacement items indicate any implementation issues with the Callaway ASME Section XI program for reactor closure studs, nuts, washers, or flange stud hole threads.

2. During Refuel 8 (Fall 1996), a stud became stuck during installation. During stud installation, extensive work was being done overhead, and it is believed that debris entered the stud holes and fouled the threads. The stud has not been removed since then. The stud has over six inches of thread engagement, which is sufficient to allow it to be tensioned for operation. During refuelings, a protective cover is installed to protect it from the water in the refueling pool. To prevent a recurrence of this problem, controls on the work performed in the vicinity of and above the reactor during stud removal and installation were improved.

3. Callaway had problems with stuck reactor head closure studs. During Refuel 2 (Fall 1987), 5 reactor head closure studs could not be removed from the reactor vessel flange. All but one of the studs was tensioned during the subsequent operating cycle, which was evaluated to be acceptable. The studs were cut out during Refuel 3 (Spring 1989). The following corrective actions were taken to address the suspected causes: 1) gauge use is required to determine the acceptability of threads prior to installation of a stud; 2) the only allowed lubricant is Fel Pro N-5000; and 3) a load cell and chain fall is used to assure excess weight is kept off the threads until the stud is fully engaged. Currently, the go gauge is used prior to stud installation only if difficulty was encountered during removal of the stud. Also, air weight compensated stud drive tools are now used for stud installation and to keep excess weight off the threads without a load cell and chain hoist. Tooling used to install the studs during Refuel 2 is still available for use as a

backup, in which case the excess weight would be kept off the threads as described in 3) above.

The operating experience of the Reactor Head Closure Stud Bolting program did not identify an adverse trend in performance or signs of aging. This has been demonstrated by past satisfactory test and inspection results. Occurrences that would be identified under the Reactor Head Closure Stud Bolting program will be evaluated to ensure there is no significant impact to safe operation of the plant and corrective actions will be taken to prevent recurrence. Guidance for re-evaluation, repair, or replacement is provided for locations where aging is found. There is confidence that the continued implementation of the Reactor Head Closure Stud Bolting program will effectively identify aging prior to loss of intended function.

Conclusion

The continued implementation of the Reactor Head Closure Stud Bolting program provides reasonable assurance that aging effects will be managed such that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B2.1.4 Boric Acid Corrosion

Program Description

The Boric Acid Corrosion program manages loss of material and increased resistance of connection due to borated water or reactor coolant leakage. The program monitors mechanical, electrical, and structural components that are within the scope of license renewal and susceptible to boric acid corrosion. The program relies in part on implementation of recommendations of NRC Generic Letter 88-05, *Boric Acid Corrosion of Carbon Steel Reactor Pressure Boundary Components in PWR Plants*. The principal industry guidance document used is WCAP-15988-NP, *Generic Guidance for an Effective Boric Acid Inspection Program for Pressurized Water Reactors*. Additionally, the program includes examinations conducted during ISI pressure tests performed in accordance with ASME Section XI requirements.

The program includes provisions to identify leakage through inspection and examination. When leakage is identified, an inspection is performed that includes identification of the leakage path, visual inspections of adjacent structures, components and supports, and cleaning of the leakage. If it is determined that an evaluation is necessary, it is performed in a timely manner. If the evaluation identifies aging effects, corrective action will be taken. Monitoring is provided by tracking and trending of existing and repaired leaks and establishment of a component-based visual history of boric acid leakage.

The scope of monitoring and inspections of this program includes all components that contain borated water reactor coolant in proximity to structures and components within the scope of license renewal. The scope of the inspections, evaluations, assessments and corrective actions include all observed leakage sources and the affected structures, components and supports.

The effects of boric acid corrosion on reactor coolant pressure boundary materials in the vicinity of nickel alloy components are managed by the Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components program (B2.1.5).

NUREG-1801 Consistency

The Boric Acid Corrosion program is an existing program that, following enhancement, will be consistent with NUREG-1801, Section XI.M10, *Boric Acid Corrosion*.

Exceptions to NUREG-1801

None

Enhancements

Prior to the period of extended operation, the following enhancements will be implemented in the following program elements:

Scope of the Program (Element 1)

Procedures will be enhanced to include steel, copper alloy greater than 15 percent zinc, and aluminum as materials that are susceptible to boric acid corrosion.

Detection of Aging Effects (Element 4)

Procedures will be enhanced so that system engineers will observe for signs of boric acid residue when performing system walkdowns.

Corrective Actions (Element 7)

Procedures will be enhanced to specify that the corrective actions taken by the program will include a consideration to modify the present design or operating procedures to mitigate or prevent recurrence of aging effects caused by borated water leakage. Consideration will be given to modifications that (a) reduce the probability of primary coolant leaks at locations where they may cause corrosion damage, and (b) entail the use of suitable corrosion resistant materials or the application of protective coatings or claddings.

Operating Experience

The following discussion of operating experience provides objective evidence that the Boric Acid Corrosion program will be effective in ensuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation:

1. In Fall 2008, pre-outage preparation walkdowns revealed a boric acid leak in the pressurizer auxiliary spray line. Corrosion was found near structural supports (hangers) that had boric acid dripping on them, requiring piping replacement. Destructive examinations found stress corrosion cracking (SCC) below the boron and rust deposits. Additional inspections found several additional cracks under the hangers. Additional destructive examinations revealed axially oriented through-wall cracking that was OD-initiated, transgranular, and confined to beneath the hangers in-service. The OD-initiated SCC was promoted by the presence of chlorides, operating stresses due to pressure/temperature changes, and was found at crevices under hanger locations. The source of chlorides was most likely introduced during original construction. As a corrective action, the pressurizer cubicle and the seal table were added to the quarterly Operations walkdown of containment. Additional inspections for ODSCC in the alternate charging, RCS excess letdown, and auxiliary pressurizer spray lines were carried out in Refuel 17 (Spring 2010). There were unacceptable indications at seven locations. One location required pipe replacement, and the other six locations were repaired.

2. Prior to Refuel 17 (Spring 2010), Callaway was tracking 108 borated water leaks and during the outage, another 40 leaks were identified. During the outage the Valve Team completed work on over 90 borated water leaks and, at the conclusion of the outage, 55 leaks remained. An evaluation of the 55 remaining leaks determined that they did not impact plant operation and there were no boric acid corrosion concerns.

3. At the end of Spring 2011, Callaway had an average age of open jobs on borated water leaks of approximately 10.5 months, down from an average age of two years and one month during 2008. The backlog for boric acid leak jobs was down 19 percent from fall of 2010. A low concern leak that was being tracked worsened into a steam leak. The leak was evaluated and corrective actions were taken to perform a letdown outage to immediately repair the leak.

4. Between Fall 2010 and Spring 2011, the Boric Acid Corrosion program was revised as follows. Screening criteria were revised to match the format and context of the fluid leakage management program. Requirements were added to assure that boric acid evaluations were performed in a timely manner, and a due date must be specified for the evaluation of susceptible material. Guidance was also provided on the use of trending indicators such as RCS leakage rate, containment cooler fouling, and containment air monitors. Along with the program modifications, Callaway provided training to personnel based on the recommended training points in WCAP-15988. The purpose of this training is so that plant personnel know they should be looking for signs of borated water leakage, and what they need to look for.

The Boric Acid Corrosion program includes provision to identify, inspect, examine, and evaluate leakage and corrosion of structures and components within the scope of license renewal, and to initiate corrective actions. Occurrences that would be identified under the Boric Acid Corrosion program will be evaluated to ensure there is no significant impact to the safe operation of the plant and corrective actions will be taken to prevent recurrence. Guidance for re-evaluation, repair or replacement is provided for locations where aging is found. There is confidence that the continued implementation of the Boric Acid Corrosion program will effectively identify aging prior to loss of intended function.

Conclusion

The continued implementation of the Boric Acid Corrosion program, following enhancement, provides reasonable assurance that aging effects will be managed such that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B2.1.5 Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components

Program Description

The Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components program manages cracking of nickel-alloy components and associated welds as well as loss of material due to boric acid-induced corrosion in susceptible components in the vicinity of nickel-alloy reactor coolant pressure boundary components.

Detection of aging is accomplished through examinations consistent with ASME Section XI Subsection IWB Code Case N-722-1, subject to the conditions listed in 10 CFR 50.55a(g)(6)(ii)(E), Code Case N-729-1, subject to the conditions specified in 10 CFR 50.55a(g)(6)(ii)(D), and Code Case N-770-1, subject to the conditions listed in 10 CFR 50.55a(g)(6)(ii)(F).

Code Case N-729-1 establishes the examination requirements and acceptance standards for the reactor pressure vessel (RPV) upper head and its penetration nozzles. Code Case N-722-1 establishes examination requirements and acceptance standards for nickel-alloy reactor coolant pressure boundary welds in RPV bottom-mounted instrument penetrations, RPV nozzles, pressurizer penetrations/nozzles, reactor coolant system instrument connections, and steam generator primary side components. Code Case N-770-1 establishes examination requirements and acceptance standards for Class 1 butt weld locations requiring inspections.

This program provides for bare-metal visual, surface, and volumetric examinations of nickel-alloy components, and components whose leakage may affect the reactor vessel head, for pressure boundary leakage and signs of boric acid leakage on adjacent ferritic steel components. Repair and replacement activities are performed to remove or overlay nickel-alloy material or as a corrective action in response to an unacceptable flaw.

The impacts of all boric acid leakage from non-nickel-alloy reactor coolant pressure boundary components, provisions for identifying and evaluating leakage, and initiating corrective actions for boric acid leakage are managed by the Boric Acid Corrosion program (B2.1.4).

The Water Chemistry program (B2.1.2) monitors and controls water environments in accordance with industry guidelines; thereby ensuring water environments are favorable for mitigation of primary water stress corrosion cracking (PWSCC) and related mechanisms in nickel-alloy components.

NUREG-1801 Consistency

The Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components program is an existing program that is consistent with NUREG-1801, Section XI.M11B, *Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components*.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

The following discussion of operating experience provides objective evidence that the Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components program will be effective in ensuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation:

1. During Refuel 14 (Fall 2005), the steam generators were replaced. The only location of alloy-600 type material in the replacement steam generators is the Alloy 182 tubesheet cladding, which is not under tensile loads, and therefore is not considered susceptible to PWSCC.

2. During Refuel 15 (Spring 2007), the RPV head penetrations were examined using volumetric and surface techniques. No evidence of cracking or leak path was identified with the volumetric and surface examinations. No evidence of leakage from the penetration nozzles or indications of wastage was identified during bare metal visual examinations. An indication was visually detected in the RPV lower head cladding in 2007, during the remote VT-3 examination of the vessel interior. The indication was evaluated and additional volumetric and surface examinations were performed for better characterization. The indication was determined to be acceptable as is. During Refuel 17 (Spring 2010), a VT-2 exam of the RPV head and penetration nozzles identified indications of leakage on the control rod drive mechanism housings. No indications of leakage were found on the carbon steel RPV head. An evaluation determined the stains are from a prior vent line valve leak from above the RPV head insulation. Leaking reactor coolant had dripped down on the stainless steel control rod drive mechanism housings and was determined not to be a significant issue.

3. During Refuel 15 (Spring 2007), the Callaway RPV hot leg and cold leg nozzles were volumetrically examined. No evidence of cracking or leak path was identified in the nozzle to pipe dissimilar metal welds. During Refuel 17 (Spring 2010), the Callaway

RPV hot-leg and cold-leg nozzle to pipe welds were examined visually. No evidence of leakage from any of the eight nozzle welds was identified.

4. During Refuel 15 (Spring 2007), a full structural weld overlay using Alloy 52M was performed on six pressurizer nozzles, including the surge nozzle, spray nozzle, and the four safety and relief nozzles. The overlays mitigate Alloy 82/182 safe-end welds with application of the PWSCC highly resistant Alloy 52M weld overlay. Before the overlays were applied, no crack-like indications were identified in the pressurizer nozzle dissimilar metal welds. During Refuel 16 (Fall 2008), UT examination of the pressurizer weld overlays were performed, the welds of each weld overlay were examined, and no recordable indications were identified

5. During Refuel 17(Spring 2010), the 12 hot-leg thermowells and the four cold-leg thermowells were visually examined. No evidence of leakage was indentified.

6. During Refuel 17 (Spring 2010), the 58 Callaway RPV bottom-mounted instrumentation nozzle penetrations and the dissimilar metal welds were visually examined. No evidence of leakage from the nozzle penetrations and dissimilar metal welds was identified.

Examination methods implemented by the Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components program have been effective in detection of cracking and loss of material. Occurrences that would be identified under the Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components program will be evaluated to assure there is no significant impact to safe operation of the plant and corrective actions will be taken to prevent recurrence. Guidance for re-evaluation, repair, or replacement is provided for locations where aging is found. There is confidence that the continued implementation of the Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components program will effectively identify aging prior to loss of intended function.

Conclusion

The continued implementation of the Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components program provides reasonable assurance that aging effects will be managed such that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B2.1.6 PWR Vessel Internals

Program Description

The PWR Vessel Internals program manages cracking, loss of material, loss of fracture toughness, change in dimension, and loss of preload for reactor vessel internal components intended to provide core structural support. The program implements the guidance of EPRI 1016596, *PWR Internals Inspection and Evaluation Guideline* (MRP-227, Revision 0) and EPRI 1016609, *Inspection Standard for PWR Internals* (MRP-228, Revision 0). Applicable aging management program plant-specific action items, conditions and limitations identified in NRC Safety Evaluation for MRP-227 have been addressed in this aging management program.

The program is designed to identify cracking, loss of material induced by wear, loss of fracture toughness due to either thermal aging or neutron irradiation embrittlement, change in dimension due to void swelling and irradiation growth, distortion, or deflection, and loss of preload due to thermal and irradiation-enhanced stress relaxation or creep. The cracking mechanisms managed by this program include stress corrosion cracking (SCC), primary water stress corrosion cracking (PWSCC), irradiation-assisted stress corrosion cracking (IASCC), and cracking due to fatigue/cyclical loading.

The reactor vessel internal components are chosen for one of four inspection sample groups based on the guidance of MRP-227. The primary group inspections manage aging consistent with the inspection guidance of Table 4-3 (Westinghouse components) of MRP-227 and are expected to show the leading indications of aging effects. The expansion group inspections manage aging consistent with Table 4-6 (Westinghouse components) of MRP-227 after inspections find aging effects to be more severe than anticipated in the primary group inspections. Components in the existing program group inspections are adequately managed by existing programs, such as ASME Code, Section XI, Examination Category B-N-3 examinations of core support structures. The fourth group consists of components for which aging effects were determined to be negligible, relative to other internals components, and no additional measures for aging management are specified.

Program examination methods include visual examination (VT-3), enhanced visual examination (EVT-1), volumetric examination, and physical measurements. Visual examinations are performed consistent with the guidance of MRP-227. The MRP-227 guidance is consistent with the ASME Code Section XI rules, and includes additional guidance and methods of detecting relevant conditions. Volumetric examinations of reactor vessel internals, such as bolting, pins, and fasteners, are performed in accordance with the guidance of MRP-228 and MRP-227. This guidance includes requirements for the ultrasonic testing techniques used to detect loss of integrity of reactor vessel internals bolts, pins and fasteners.

Integral attachments to the internal surface of the reactor vessel are managed by the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program (B2.1.1)

Examination Category B-N-2. Bottom mounted instrumentation flux thimble tubes are managed by the Flux Thimble Tube Inspection program (B2.1.22).

The PWR Vessel Internals program is a new program that will be implemented within 24 months after the issuance of MRP-227-A, PWR Internals Inspection and Evaluation Guideline. The program will include future industry operating experience, as it is incorporated into future revisions of MRP-227, to provide reasonable assurance for the long-term integrity of the reactor vessel internals.

NUREG-1801 Consistency

The PWR Vessel Internals program is a new program that, when implemented, will be consistent with NUREG-1801, Section XI.M16A, *PWR Vessel Internals*.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

The following discussion of operating experience provides objective evidence that the PWR Vessel Internals program will be effective in ensuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation:

1. Based on industry operating experience, Callaway replaced the Alloy-750 guide tube support pins (split pins) with strained hardened (cold worked) 316 stainless steel pins during Refuel 13 (Spring 2004) to reduce the susceptibility for stress corrosion cracking in the split pins. There were no cracked Alloy X-750 pins discovered during the replacement process.

2. The ASME Code, Section XI, Examination Category B-N-3 examinations of core support structures conducted during the Refuel 13 (Spring 2004), did not identify any conditions that required repair or replacement.

3. With exception of the existing program components managed by ASME Section XI ISI, the Callaway PWR Vessel Internals program will be a new program. A key element of the program defined in MRP-227 is the requirement to report aging effects of reactor vessel internal components. Callaway, through its participation in PWR Owners Group and EPRI-MRP activities, will continue to benefit from the industry-wide collaboration of results from internals inspections.

The operating experience of the ASME Code, Section XI, Examination Category B-N-3 examinations of core support structures did not identify any significant age-related deficiencies. Occurrences that would be identified under the PWR Vessel Internals program will be evaluated to ensure there is no significant impact to safe operation of the plant and corrective actions will be taken to prevent recurrence. Guidance for re-evaluation, repair, or replacement is provided for locations where aging is found. Therefore, there is confidence that implementation of the PWR Vessel Internals program will effectively identify aging prior to loss of intended function.

Industry and plant-specific operating experience will be evaluated in the development and implementation of this program.

Conclusion

The implementation of the PWR Vessel Internals program will provide reasonable assurance that aging effects will be managed such that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B2.1.7 Flow-Accelerated Corrosion

Program Description

The Flow-Accelerated Corrosion (FAC) program manages aging effects of wall thinning on the internal surfaces of carbon or low alloy steel piping, elbows, reducers, expanders, and valve bodies which contain high energy fluids (both single phase and two phases). The program implements the EPRI guidelines in NSAC-202L-R3 to detect, measure, monitor, predict, and mitigate component wall thinning.

Analytical evaluations and periodic examinations of locations that are most susceptible to wall thinning due to FAC are used to predict the amount of wall thinning. Program activities include analyses to determine critical locations, baseline inspections to determine the extent of thinning at these critical locations, and follow-up inspections to confirm the predictions. Inspections are performed using ultrasonic, visual or other approved testing techniques capable of detecting wall thinning. Repairs and replacements are performed as necessary.

Where applicable, analyses to determine critical locations in piping and other components susceptible to FAC are performed utilizing CHECWORKS™, a predictive code that uses the implementation guidance of NSAC-202L-R3. For each examined component, a verified and validated computer program, called FAC Manager Web Edition, is utilized in conjunction with CHECWORKS™ to calculate component wear, wear rate, and the next scheduled inspection. If a component's remaining life cannot be demonstrated to be more than one operating cycle, then corrective action is required, such as repair, replacement, or reevaluation.

No preventive attributes are directly associated with the FAC program. However, it is recognized that water chemistry monitoring to control pH and dissolved oxygen content, as well as the chromium content of the piping material, are effective in reducing FAC. The program considers water treatment changes that may affect the FAC rates.

NUREG-1801 Consistency

The Flow-Accelerated Corrosion program is an existing program that is consistent with NUREG-1801, Section XI.M17, *Flow-Accelerated Corrosion*.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

The following discussion of operating experience provides objective evidence that the FAC program will be effective in ensuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation:

1. A review of a 10 year period of corrective action reports showed that there has been one FAC-related leak or rupture at Callaway during that time.

   In August 1999, the six-inch normal drain line from the first stage moisture separator reheater drain tank to the 6B high pressure feedwater heater ruptured. The severe FAC damage was caused by unusual two-phase flow conditions set up by a combination of a long horizontal line followed by two elbows in close proximity combined with inside pipe discontinuities such as weld backing rings. The wear rate predicted by the then-current version of CHECWORKS™ was only 0.003 in./year, so that it wasn't scheduled to be inspected until Refuel 10, which started six weeks following the failure.

   As corrective action for the above event, over 40 locations with similar geometry and fluid conditions were inspected immediately. No similar problems were identified by these inspections. The carbon steel piping and fittings in this line were replaced with FAC-resistant materials. This pipe was added to Callaway's FAC program.

2. A review of refueling outage FAC inspection reports since 2001 showed that wall thinning was identified during the FAC program inspections. There were cases where the allowable thickness determined in accordance with the program guidelines was reached and more rigorous stress analyses were performed to justify continued service and to postpone the replacement. In other cases, the component was repaired or replaced. In Refuel 11 (Spring 2001), unexpected wall thinning was found in feedwater piping, requiring expansion of the scope of the inspections and extensive replacement of the piping. The locations had not been modeled in CHECWORKS™ due to personnel error. In Refuel 13 (Spring 2004), the scope of inspections was expanded due to inspection results.

Replacements for each outage are scheduled proactively, determined by the projected remaining service life based on FAC analyses, by programmatic strategy, and cost comparison to further inspections. Most replacements are of FAC-resistant materials such as stainless steel and chrome-moly alloy.

The operating experience of the Flow-Accelerated Corrosion program shows that the program effectively monitors and trends the aging effects of FAC on piping and components and takes appropriate corrective action prior to loss of intended function. Occurrences that would be identified under the Flow-Accelerated Corrosion program will be evaluated to ensure there is no significant impact to safe operation of the plant and corrective actions will be taken to prevent recurrence. Guidance for re-evaluation, repair, or replacement is provided for locations where aging is found. There is confidence that the continued implementation of the Flow-Accelerated Corrosion program will effectively identify aging prior to loss of intended function.

Conclusion

The continued implementation of the Flow-Accelerated Corrosion program provides reasonable assurance that aging effects will be managed such that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B2.1.8 Bolting Integrity

Program Description

The Bolting Integrity program manages cracking, loss of material and loss of preload for pressure retaining bolting. The program includes preload control, selection of bolting material, use of lubricants/sealants, and performance of periodic inspections for indication of aging effects.

The general practices that are established in this program are consistent with the recommendations, as delineated in NUREG-1339, *Resolution of Generic Safety Issue 29: Bolting Degradation or Failure in Nuclear Power Plants*, and EPRI NP-5769, *Degradation and Failure of Bolting in Nuclear Power Plants*, Volume 1 and 2 with the exception noted in NUREG-1339 for safety-related bolting. In addition to the inspection activities noted above, the Bolting Integrity program includes activities for preload control, material selection and control, and use of lubricants/sealants as delineated in EPRI TR-104213, *Bolted Joint Maintenance and Applications Guide*.

ASME Section XI Inservice Inspection, Subsections IWB, IWC and IWD program (B2.1.1) supplements the Bolting Integrity program to manage cracking, loss of preload, and loss of material by providing the requirements for inservice inspection of ASME Class 1, 2, and 3 safety-related pressure retaining bolting. Examinations are currently performed in accordance with the ASME Section XI, 1998 Edition with the 2000 Addenda, per the ISI program plan. As required by 10 CFR 50.55a(g)(4)(ii), the Callaway ISI Program is updated during each successive 120-month inspection interval to comply with the requirements of the latest edition of the Code specified twelve months before the start of the inspection interval. Callaway will use the ASME Code Edition consistent with the provisions of 10 CFR 50.55a during the period of extended operation. The extent and schedule of the inspections is in accordance with IWB-2500-1, IWC-2500-1 and IWD-2500-1 and assures that detection of leakage or fastener degradation occurs prior to loss of system or component intended functions. Bolting associated with Class 1 vessel, valve and pump flanged joints receive visual (VT-1) inspection. For other pressure retaining bolting, routine observations identify any leakage before the leakage becomes excessive.

Inspection activities for bolting in a submerged environment are performed in conjunction with associated component maintenance activities. Inspection activities for bolting in buried and underground applications is performed in conjunction with inspection activities for the Buried and Underground Piping and Tanks (B2.1.25) program due to the restricted accessibility to these locations.

The integrity of non-ASME Class 1, 2, 3 system and component bolted joints is evaluated by detection of visible leakage during maintenance or routine observation such as system walkdowns. Inspection activities for non-ASME Class 1, 2, or 3 bolting in a submerged environment are performed in conjunction with associated component maintenance activities.

The Corrective Action Program is used to document and manage those locations where leakage was identified during routine observations including engineering walkdowns and equipment maintenance activities. Based on the severity of the leak and the potential to impact plant operations, nuclear or industrial safety, a leak may be repaired immediately, scheduled for repair, or monitored for change. If the leak rate changes (increases, decreases or stops), the monitoring frequency is re-evaluated and may be revised.

High strength bolts (actual yield strength ≥150 ksi) are not used on pressure retaining bolted joints within the scope of the Bolting Integrity program.

Procurement controls and installation practices, defined in plant procedures, include preventive measures to ensure that only approved lubricants, sealants, and proper torque are applied.

Safety-related and nonsafety-related structural bolting is managed by the following programs:

(a) ASME Section XI, Subsection IWE program (B2.1.26) provides the requirements for inspection of structural bolting.

(b) ASME Section XI, Subsection IWF program (B2.1.28) provides the requirements for inservice inspection of safety-related component support bolting.

(c) Structures Monitoring program (B2.1.31) monitors the condition of structures and structural supports that are within the scope of license renewal.

(d) RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants program (B2.1.32) provides the requirements for inspection of water control structures associated with emergency cooling water systems.

(e) Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems program (B2.1.12) provides the requirements for inspection of handling systems within the scope of license renewal.

Reactor pressure vessel head closure studs are not included in the Bolting Integrity program. The Reactor Head Closure Stud Bolting program (B2.1.3) provides the requirements for inspection of the reactor vessel head closure studs.

NUREG-1801 Consistency

The Bolting Integrity program is an existing program that, following enhancement, will be consistent with NUREG-1801, Section XI.M18, *Bolting Integrity*.

Exceptions to NUREG-1801

None

Enhancements

Prior to the period of extended operation, the following enhancements will be implemented in the following program elements:

Scope of the Program (Element 1), Preventive Actions (Element 2,) Detection of Aging Effects (Element 4), and Corrective Action (Element 7)

Procedures will be enhanced to reference NUREG-1339 and EPRI NP-5769 to meet the NUREG-1801 recommendations.

Scope of the Program (Element 1), Parameters Monitored or Inspected (Element 3),and Detection of Aging Effects (Element 4)

Procedures will be enhanced to include bolting in the list of items to be inspected during walkdowns.

Operating Experience

The following discussion of operating experience provides objective evidence that the Bolting Integrity program will be effective in ensuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation.

1. The Bolting Integrity program incorporates the applicable industry experience on bolting issues into the program. Actions taken include confirmatory testing/analysis or inspections. Also included are the addition of procedures of inspection, material procurement and verification processes.

2. A review of plant operating experience identified issues with corrosion, missing or loose bolts, inadequate thread engagement, and improper bolt applications. Identified concerns were corrected or evaluated to be accepted as-is. No generic bolting failure issues or trends have been identified. There is no documented case of cracking of pressure containing bolting due to stress corrosion cracking. .

The operating experience of the Bolting Integrity program shows that the program effectively monitors and trends the aging effects of cracking, loss of material, and loss of preload on pressure retaining bolting and takes appropriate corrective action prior to loss of intended function. Occurrences that would be identified under the Bolting Integrity program will be evaluated to ensure there is no significant impact to safe operation of the plant and corrective actions will be taken to prevent recurrence. Guidance for re-evaluation, repair, or replacement is provided for locations where aging is found. There is confidence that the continued implementation of the Bolting Integrity program will effectively identify aging prior to loss of intended function.

Conclusion

The continued implementation of the Bolting Integrity program, following enhancement, provides reasonable assurance that aging effects will be managed such that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B2.1.9 Steam Generators

Program Description

The Steam Generators program manages cracking, loss of material, and wall thinning of the steam generators. This program is applicable to the steam generator tubes, plugs, sleeves, and secondary side steam generator internal components. Aging is managed through assessment of potential degradation mechanisms, inspections, tube integrity assessments, plugging and repairs, primary to secondary leakage monitoring, maintenance of secondary side component integrity, primary side and secondary side water chemistry, and foreign material exclusion. Callaway procedural guidance implements the performance criteria for tube integrity, condition monitoring requirements, inspection scope and frequency, acceptance criteria for the plugging or repair of flawed tubes, acceptable tube repair methods, leakage monitoring requirements, operational leakage and accident induced leakage requirements of Callaway technical specifications.

The program reporting criteria, inspection scope and frequency, assessments, plugging criteria, and primary to secondary leak rate monitoring, and monitoring/controlling primary and secondary side water chemistry are consistent with the requirements of Callaway technical specifications, the Maintenance Rule (10 CFR 50.65), EPRI 1019038, *Steam Generator Integrity Assessment Guidelines*, EPRI 1013706, *PWR Steam Generator Examination Guidelines*, EPRI 1008219, *PWR Primary-to-Secondary Leak Guidelines*, EPRI 1014983, *Steam Generator In-Situ Pressure Test Guidelines*, EPRI 1014986, *PWR Primary Water Chemistry Guidelines*, and EPRI 1016555, *PWR Secondary Water Chemistry Guidelines*. The EPRI guidelines provide a generic industry program to implement the NEI 97-06, *Steam Generator Program Guidelines*, Revision 3.

The Steam Generators program includes preventive measures to mitigate aging related to corrosion phenomena through foreign material exclusion as a means to inhibit wear degradation. The Callaway Water Chemistry program (B2.1.2) also monitors and controls reactor water chemistry and secondary water chemistry for the steam generators consistent with EPRI guidelines applicable to reactor water chemistry and secondary water chemistry as a preventive measure.

The Steam Generators program detects flaws in tubing, plugs, and tube supports needed to maintain tube integrity. Nondestructive examination (NDE) techniques are used to inspect all tubing materials to identify tubes that may need to be removed from service or repaired in accordance with plant technical specifications. The program provides criteria for the qualification of personnel, specific techniques, and the associated acquisition and analysis of data, including procedures, probe selection, analysis protocols, and reporting criteria. Assessment of tube integrity and plugging or repair criteria of flawed tubes is in accordance with plant technical specifications and the program implementing procedures. Tube structural integrity limits consistent with Regulatory Guide 1.121, *Bases for Plugging Degraded PWR Steam Generator Tubes*, are applied as detailed in Callaway Technical Specifications, Section 5.5.9. Plugs and tube supports with aging are evaluated for corrective actions in accordance with the Callaway Corrective Action Program and the Callaway Steam Generators program. Condition monitoring assessments are performed to determine whether structural and accident leakage criteria have been satisfied. Operational assessments are performed after inspections to verify that structural and leakage integrity will be maintained for the operating interval between inspections, which is selected in accordance with the technical specifications and NEI 97-06 guidelines. Comparison of the results of the condition monitoring assessment with the predictions of the previous operational assessment provides feedback for evaluation of the adequacy of the operational assessment and additional insights that can be incorporated into the next operational assessment.

The original Callaway steam generators were replaced in 2005. The replacement steam generators incorporate features designed to improve reliability and minimize aging. Industry experience and laboratory testing have shown the materials used in fabricating the new steam generators to be more resistant to aging effects than those in the original steam generators.

NUREG-1801 Consistency

The Steam Generators program is an existing program that is consistent with NUREG-1801, Section XI.M19, *Steam Generators*.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

The following discussion of operating experience provides objective evidence that the Steam Generators program will be effective in ensuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation.

1. During Refuel 14 (Fall 2005), steam generators were replaced with AREVA designed steam generators with alloy 690 thermally treated tubes. Pre-service eddy current inspections found 77 small dings, four tubes with signals similar to outside diameter axial cracking, and 33 tubes with a spiral signal pattern. After analyzing the signals and the tubes containing indications, the tubes were found to have no detectable degradation. Two tubes were plugged due to manufacturing defects. Visual inspections of the SG secondary side were performed to identify any foreign objects that may have been left behind after uprighting and installation of the steam generators. Several foreign objects were found during these inspections and removed prior to placing the steam generators in service.

2. During Refuel 15 (Spring 2007), the first in-service inspection of the new steam generators identified a total of 92 anti-vibration bar (AVB) wear indications, with the largest indication being a 14 percent through-wall flaw. As discussed in the Refuel 15 operational assessment, Callaway does not expect to exceed the structural integrity performance criteria for AVB wear prior to the next scheduled steam generator inspection in Refuel 18 (Fall 2011).

3. In the degradation assessment for Refuel 17 (Spring 2010), Callaway monitored other plants with AREVA RSGs, both domestically and internationally. Specifically, Doel 4, Tihange 3, Prairie Island 1, and Salem 2 have Westinghouse-style steam generators manufactured by AREVA in the same time period as the Callaway RSGs. All four plants are experiencing various amounts of AVB wear in the same general location as Callaway.

4. Plant chemistry has been good and corrosion transport has been significantly reduced since the replacement of the main condenser in Refuel 13 (Spring 2004). Sludge lancing for all four replacement steam generators was performed for the first time in Refuel 18 (Fall 2011).

The operating experience of the Steam Generators program did not show any adverse trend in inspection results. Occurrences that would be identified under the Steam Generator program will be evaluated to ensure there is no significant impact to the safe operation of the plant and adequate corrective actions will be taken to prevent recurrence. Appropriate guidance for re-evaluation, repair, or replacement will be provided for locations where aging is found. There is confidence that the continued implementation of the Steam Generators program will effectively identify aging prior to loss of intended function.

Conclusion

The continued implementation of the Steam Generators program provides reasonable assurance that aging effects will be managed such that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B2.1.10 Open-Cycle Cooling Water System

Program Description

The Open-Cycle Cooling Water (OCCW) System program manages loss of material, reduction of heat transfer, cracking, blistering, change in color, and hardening and loss of strength for those components that are exposed to the raw water environment of the essential service water (ESW) system and heat exchangers and other components in other systems serviced by the essential service water system.

The activities for this program are consistent with the Callaway commitments to the requirements of NRC Generic Letter 89-13, *Service Water System Problems Affecting Safety-Related Components* and provide for management of aging effects in raw water cooling systems through tests, inspections and component cleaning. System and component testing, visual inspections, nondestructive examination (i.e., ultrasonic testing and eddy current testing), and biocide and chemical treatment are conducted to ensure that aging effects are managed such that system and component intended functions and integrity are maintained.

Periodic heat transfer testing or inspection and cleaning of heat exchangers with a heat transfer intended function is performed in accordance with Callaway commitments to NRC Generic Letter 89-13 to verify heat transfer capabilities.

Routine inspections and maintenance of the OCCW System program ensure that corrosion, erosion, sediment deposition and biofouling cannot degrade the performance of safety-related systems serviced by the essential service water system.

The guidelines of NRC Generic Letter 89-13 are utilized for the surveillance and control of biofouling. Procedures provide instructions and controls for biocide injection. Periodic inspections are performed for the presence of mollusks and biocide treatments are applied as necessary.

System walkdowns are performed periodically to assess the material condition of OCCW system piping and components. Compliance with the licensing basis is ensured by review of system design basis documents as well as periodic performance of self assessments.

Callaway uses internal coatings only on the component cooling water heat exchanger end bells, channels, and tubesheets; the control room air conditioner tubesheets; the class 1E electrical equipment air conditioner tubesheets; and the essential service water system strainers. This amount of coating surface area is relatively small and its aging has not been a concern for essential service water system performance.

Examination of polymeric materials by OCCW System program will be consistent with examinations described in the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program (B2.1.23).

The external surfaces of the buried OCCW components are managed by the Buried and Underground Piping and Tanks program (B2.1.25). The aging management of closed-cycle cooling water systems is described in B2.1.11, Closed Treated Water Systems program, and is not included as part of this program.

NUREG-1801 Consistency

The Open-Cycle Cooling Water System program is an existing program that, following enhancement, will be consistent with NUREG-1801, Section XI.M20, *Open-Cycle Cooling Water System*.

Exceptions to NUREG-1801

None

Enhancements

Prior to the period of extended operation, the following enhancements will be implemented in the following program elements:

Parameters Monitored or Inspected (Element 3), Detection of Aging Effects (Element 4), and Acceptance Criteria (Element 6)

Procedures will be enhanced to include polymeric material inspection requirements, parameters monitored, and acceptance criteria. Examination of polymeric materials by OCCW System program will be consistent with examinations described in the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program (B2.1.23).

Operating Experience

The following discussion of operating experience provides objective evidence that the Open-Cycle Cooling Water System program will be effective in ensuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation:

1. In 2000, during routine maintenance, Asiatic clams were found in an RHR room cooler, blocking approximately 15 percent of the tubes. In subsequent inspections, clams were found in several service water and essential service water heat exchangers and room coolers. It was determined that the clams originated in the waste treatment clearwell, from which they were flushed into the suction of the service water pumps. The service water pumps distributed the clams to the heat exchangers and room coolers. As corrective action, procedures were strengthened to require more frequent inspections and provide for a more robust chemistry program to control the clams. Corrective action also included plant modifications, such as installing strainers on the discharge line of the service water pumps.

2. In 2001, through-wall corrosion had been observed in the RHR pump room cooler. The exact cause could not be determined but was believed to be from microbiologically influenced corrosion attack. The cooler was repaired.

3. Performance of the containment coolers degraded over time due to debris from the service water system, so that by 2001 there was very little margin available. The design of the original containment cooler coils did not allow them to be mechanically cleaned, and flushing was ineffective. The coils for containment coolers A and B were replaced in Refuel 11 (Spring 2001), and the coils for C and D were replaced in Refuel 12 (Fall 2002). The replacement coils have a removable cover plate which permits access to mechanically clean individual tubes.

4. In 2007, Callaway revised the program so that the component cooling water heat exchangers are the only heat exchangers that are performance tested. In order to maintain heat removal capability of the other NRC Generic Letter 89-13 heat exchangers, Callaway cleans and inspects heat exchangers at regular intervals, as well as performs flow and pressure measurements according to the essential service water flow balance procedure. The inspections check for micro-fouling, and include thermographies or ultrasonic examinations of internal surfaces. These maintenance activities supplement the commitment to thermal performance testing made in response to NRC Generic Letter 89-13. The primary and additional monitoring methods have been determined for each of the NRC Generic Letter 89-13 heat exchangers, in accordance with the guidance of EPRI Technical Report 1007248, *Alternative to Thermal Performance Testing and/or Tube-side Inspections of Air-to-Water Heat Exchangers*.

5. From 2008 to 2009, the buried portions of the ESW supply from the ESW pump house and return to the ultimate heat sink cooling tower were replaced with high-density polyethylene (HDPE) piping. In addition, sections of above ground or underground carbon steel piping that interfaces with the buried piping was replaced with stainless steel piping. These modifications were performed as a result of the material condition of the ESW system. These modifications were performed as a result of corrective action documents that have been written concerning pinhole leaks, pitting, and other localized degradation of the ESW piping system.

6. In 2009, the replacement of the emergency diesel generator jacket water heat exchangers was evaluated due to loss of material in the tubes. The evaluation determined that a better material of construction and a better design would minimize aging effects due to raw water environment in the emergency diesel generators. The replacement jacket water heat exchangers and the emergency diesel generator lube oil coolers had tubes made of AL6XN stainless steel and were replaced in Refuel 17 (Spring 2010). The emergency diesel generator intercoolers were replaced in Refuel 18 (Fall 2011), and also have tubes fabricated from AL6XN stainless steel.

7. In 2009, room cooler flow rates had been observed to be low in the RHR pump room cooler and the containment spray pump room cooler. The low flow rates were

determined to be from material that was dislodged during weld repairs from the outage prior to flow testing. The coolers were flushed to remove the debris, and flow rates were restored to their normal operating condition.

8. Prior to 2010, the coils for the following safety-related room coolers were replaced due to performance or aging issues: auxiliary building north penetration room cooler, auxiliary building south penetration room cooler, component cooling water pump room cooler train A, component cooling water pump room cooler train B, and spent fuel pool room cooler A. The material for the replacement coils is AL6XN stainless steel.

The above examples provide objective evidence that the existing Open-Cycle Cooling Water System program preventive, condition, and performance monitoring activities prevent or detect aging effects. Occurrences that would be identified under the Open-Cycle Cooling Water System program will be evaluated to ensure there is no significant impact to safe operation of the plant and corrective actions will be taken to prevent recurrence. Guidance for re-evaluation, repair, or replacement is provided for locations where aging is found. There is confidence that the continued implementation of the Open-Cycle Cooling Water System program will effectively identify aging prior to loss of intended function.

Conclusion

The continued implementation of the Open-Cycle Cooling Water System program, following enhancement, will provide reasonable assurance that aging effects will be managed such that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B2.1.11 Closed Treated Water Systems

Program Description

The Closed Treated Water Systems program manages loss of material, cracking, and reduction of heat transfer for components within the scope of license renewal in closed-cycle treated water cooling systems.

The Closed Treated Water Systems program is a preventive program that is consistent with the guidelines of EPRI 1007820, *Closed Cooling Water Chemistry Guideline*. The program relies on water treatment, including the use of corrosion inhibitors to modify the chemistry of the water and chemical testing to ensure that water chemistry is maintained within acceptable guidelines. The program uses four treatment programs for chemistry control: molybdate control with tolyltriazole (closed treated water systems), ethylene glycol (plant heating steam), nitrite control with tolyltriazole (emergency diesel generator jacket water), or Diesel Coolant Additive (DCA) and ethylene glycol (fire protection diesel jacket water). The adequacy of chemistry control is confirmed by routine sampling and monitoring, which is performed at least quarterly.

The program also conducts periodic inspections to determine the presence or extent of corrosion, fouling, and/or cracking. Representative samples of each combination of material and water treatment program are visually inspected at least every 10 years or opportunistically when consistent with sample requirements. Inspections are conducted and evaluated consistent with ASME Code inspections, industry standards, or a plant-specific inspection procedure by personnel qualified to detect aging. If adverse conditions are found, additional examinations will be performed and appropriate corrective action taken.

NUREG-1801 Consistency

The Closed Treated Water Systems program is an existing program that, following enhancement, will be consistent with NUREG-1801 Section XI.M21A, *Closed Treated Water Systems*.

Exceptions to NUREG-1801

None

Enhancements

Prior to the period of extended operation, the following enhancements will be implemented in the following program elements:

Parameters Monitored or Inspected (Element 3), Detection of Aging Effects (Element 4), Monitoring and Trending (Element 5), and Acceptance Criteria (Element 6)

Procedures will be enhanced to include visual inspections of the surfaces of components with a closed treated water systems water environment. Representative samples of each combination of material and water treatment program will be visually inspected at least every 10 years or opportunistically when consistent with sample requirements. Inspections will be conducted and evaluated consistent with ASME Code inspections, industry standards, or a plant-specific inspection procedure by personnel qualified to detect aging. If adverse conditions are found, additional examinations will be performed. This periodic inspection will determine the extent of cracking, loss of material and fouling, and serves as a leading indicator of the condition of the interior of piping components otherwise inaccessible for visual inspection.

Operating Experience

The following discussion of operating experience provides objective evidence that the Closed Treated Water Systems program will be effective in ensuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation.

1. Based on a review of 10 years of operating experience, no instances were identified where aging effects arising from closed-cycle cooling water have led to the loss of the intended function of any of the heat exchangers served by the systems within the scope of this program.

2. In 2002, cracks were found by ultrasonic examination conducted in the outlet nozzle area of the letdown heat exchanger. These cracks were approximately 50 percent through wall and ½ in. in length from under the weld. The cracks were in the base metal of the heat exchanger shell. These inspections were conducted as a result of cracks found by Wolf Creek during inspections of their letdown heat exchanger nozzle. The apparent cause was stress corrosion cracking. The Callaway extent of condition was two cracks in the shell material where the CCW outlet nozzle is connected. A section of the letdown heat exchanger shell and the CCW outlet nozzle was replaced with identical material (SA-106, Grade B) as a permanent repair. No additional cracking was found by follow-up inspections.

3. In 2008, pitting was discovered in the carbon steel piping of the emergency diesel generator jacket water closed cycle cooling system. This pitting was minor, and did not affect the gasket sealing surface. The pitting was reduced by polishing and it was determined that the pitting would not affect the intended function of the piping.

The operating experience of the Closed Treated Water Systems program did not show any adverse trend in performance. Occurrences that would be identified under the Closed Treated Water Systems program will be evaluated to ensure there is no significant impact to safe operation of the plant and corrective actions will be taken to prevent recurrence. Guidance for re-evaluation, repair, or replacement is provided for locations where aging is found. There is confidence that continued implementation of the Closed Treated Water Systems program will effectively identify aging prior to loss of intended function.

Conclusion

The continued implementation of the Closed Treated Water Systems program, following enhancement, provides reasonable assurance that aging effects will be managed such that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B2.1.12 Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems

Program Description

The Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems program manages loss of material and loss of preload for bolting for all cranes, trolley and hoist structural components, fuel handling equipment and applicable rails within the scope of license renewal. Visual inspections will manage loss of material due to corrosion of structural members and bolting, loss of materials due to wear of rails, and loss of preload for bolted connections.

Consistent with Callaway's NUREG-0612 commitment, overhead lifting equipment that operates over safety-related equipment or has safety-related equipment beneath the load path on the next lower building elevation are included within the scope of license renewal. Also within the scope of license renewal are those light load equipment handling systems related to refueling operations that are used to handle fuel or equipment within or above the spent fuel pool or the reactor cavity.

Crane inspections are performed in accordance with the ASME B30 standards. Inspections are performed at a frequency that meets the requirements of the ASME B30 series. For cranes that are infrequently in service, such as the containment polar crane, periodic inspections are performed once every refueling cycle just prior to use.

NUREG-1801 Consistency

The Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems program is an existing program that, following enhancement, will be consistent with NUREG-1801, Section XI.M23, *Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems*.

Exceptions to NUREG-1801

None

Enhancements

Prior to the period of extended operation, the following enhancements will be implemented in the following program elements:

Parameters Monitored or Inspected (Element 3) and Detection of Aging Effects (Element 4)

Procedures will be enhanced to inspect crane structural members for loss of material due to corrosion and rail wear, and loss of preload due to loose or missing bolts and nuts.

Detection of Aging Effects (Element 4)

The program will be enhanced to include performance of periodic inspections as defined in the appropriate ASME B30 series standard for all cranes, hoists and equipment handling systems within the scope of license renewal. For handling systems that are infrequently in service, such as those only used during refueling outages, periodic inspections may be deferred until just prior to use.

Acceptance Criteria (Element 6)

The program will be enhanced to require evaluation of loss of material due to wear or corrosion and loss of bolting preload per the appropriate ASME B30 series standard.

Corrective Actions (Element 7)

The program will be enhanced to require repairs to cranes, hoists and equipment handling systems per the appropriate ASME B30 series standard.

Operating Experience

The following discussion of operating experience provides objective evidence that the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems program will be effective in ensuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation.

1. In a review of Callaway corrective action documents over a 10-year period, none were found that identified corrosion or rail wear as a problem. There were no occurrences of unacceptable corrosion, rail wear, or loose or missing fasteners for components within the scope of the Inspection of Overhead Load and Light Load (Related to Fuel handling) Handling Systems program. Additionally, since Callaway cranes, hoists, trolleys and fuel handling equipment have not been operated outside their design limits without appropriate evaluations, no fatigue related structural failures have occurred.

The operating experience of the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems program did not identify an adverse trend in performance. Occurrences that would be identified under the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems program will be evaluated to ensure there is no significant impact to safe operation of the plant and corrective actions will be taken to prevent recurrence. Guidance for re-evaluation, repair, or replacement is provided for locations where aging is found. There is confidence that the continued implementation of the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems program will effectively identify aging prior to loss of intended function.

Conclusion

The continued implementation of the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems program, following enhancement, provides reasonable assurance that aging effects will be managed such that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B2.1.13 Fire Protection

Program Description

The Fire Protection program manages loss of material of fire rated doors, fire dampers, and the Halon system, concrete cracking, spalling, and loss of material of fire barrier walls, ceilings, and floors, and increased hardness, shrinkage, and loss of strength of fire barrier penetration seals. The Fire Protection program is a condition and performance monitoring program comprised of tests and inspections that follow the applicable National Fire Protection Association (NFPA) recommendations.

The program requires visual inspections of not less than 10 percent of each type of penetration seal at least once per refueling cycle (18 months). The program specifies visual inspections of the fire barrier walls, ceilings and floors in structures within the scope of license renewal at a frequency of at least once per 18 months. Inspections of fire barriers include coatings and wraps. Periodic visual and functional tests are used to manage the aging effects of fire doors. The visual inspection frequency for fire doors is at least once per 18 months, and functional tests of closing mechanisms and latches for required doors is at least once per 18 months. Not less than 10 percent of the fire dampers are visually inspected at least once per 18 months.

Visual inspections of the Halon system will be performed to identify conditions of corrosion. A functional test of the Halon system is performed every 18 months, which is in accordance with Callaway's NRC-approved fire protection program (FSAR Table 9.5.1-2, Item 4 SP).

NUREG-1801 Consistency

The Fire Protection program is an existing program that, following enhancement, will be consistent with NUREG-1801, Section XI.M26, *Fire Protection*.

Exceptions to NUREG-1801

None

Enhancements

Prior to the period of extended operation, the following enhancements will be implemented in the following program elements:

Parameters Monitored or Inspected (Element 3), Detection of Aging Effects (Element 4), Monitoring and Trending (Element 5), and Acceptance Criteria (Element 6)

Procedures will be enhanced to include visual inspections of the external surfaces of Halon fire suppression system components for excessive loss of material due to corrosion.

Monitoring and Trending (Element 5)

Procedures will be enhanced to include trending of the performance of the Halon system during testing.

Operating Experience

The following discussion of operating experience provides objective evidence that the Fire Protection program will be effective in ensuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation.

1. Fire Barrier Penetration Seals

   In 2004, Callaway was notified by Wolf Creek of a concern with the seismic gap isolation seal between the auxiliary building and containment. At Callaway, 11 of the 23 seals were found to be incorrectly installed such that they did not meet a three-hour rated fire barrier. The deficient seals were repaired and a plant procedure was revised to clearly state the requirements for a three-hour rated fire barrier.

   In 2009, a degraded fire barrier penetration seal was discovered, consisting of a void between the penetration seal and sleeve. The seal appeared to be loose from the sleeve, however, no leaks were identified and the seal was repaired.

2. Fire Doors

   Between 2002 and 2011, multiple fire door deficiencies were identified through regular inspections and preventive maintenance, including failure of door to fully close, sticky door latches and door locks, broken door latches, broken door, tight fit and rubbing between double doors, passive door unable to open, panic bar and latch not working, degraded bottom sweep, loose, missing and stripped hinge screws and doors dragging on the floor. The degraded fire doors were repaired and parts were replaced, as necessary to restore proper function of the fire doors.

3. Halon System

   A review of the most recent 10 years of Callaway operating experience was performed and confirmed that the operating experience discussed in NUREG-1801, Section XI.M26 for the halon system is bounding, i.e., that there is no unique plant specific operating experience in addition to that described in NUREG-1801.

4. Fireproofing

   In 2005, during a fire barrier inspection, a small section of structural steel fireproofing (approximately 1 ft long) was degraded at the ceiling level of Room 3404 (Switchboard Room 4 on 2016 ft elevation of the control building). The affected area was repaired.

The above examples provide objective evidence that the fire protection program is capable of detecting and correcting aging effects associated with fire rated doors, fire dampers, fire barrier penetration seals, structural fire barriers, and halon systems within the scope of license renewal. Occurrences that would be identified under the Fire Protection program will be evaluated to ensure there is no significant impact to safe operation of the plant and corrective actions will be taken to prevent recurrence. Guidance for re-evaluation, repair, or replacement is provided for locations where aging is found. There is confidence that the continued implementation of the Fire Protection program will effectively identify aging prior to loss of intended function.

Conclusion

The continued implementation of the Fire Protection program, following enhancement, provides reasonable assurance that aging effects will be managed such that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B2.1.14 Fire Water System

Program Description

The Fire Water System program manages loss of material for water-based fire protection systems consisting of aboveground, buried and underground piping, fittings, valves, fire pump casings, sprinklers, nozzles, hydrants, hose stations, standpipes and water storage tanks. Periodic fire main and hydrant inspections and flushing, sprinkler inspections, functional test, and flow tests in accordance with National Fire Protection Association (NFPA) codes and standards ensure that the water-based fire protection systems are capable of performing their intended function. The fire water system is maintained at the required normal operating pressure and monitored such that a loss of system pressure is immediately detected and corrective actions initiated.

The Fire Water System program performs a flow test of the system at least once every three years in accordance with plant procedures meeting the requirements of NFPA 25, including a yard fire loop flush and a flush of associated hydrants. A visual inspection of yard fire hydrants is performed annually.

The Fire Water System program conducts flow tests through each open head spray/sprinkler nozzle in accordance with NFPA 25, to verify water flow is unobstructed. The Fire Water System program requires replacement of sprinklers prior to 50 years in service, or the program tests a representative sample of the sprinklers and tests another representative sample every 10 years thereafter during the period of extended operation to ensure signs of aging are detected in a timely manner.

Pipe wall thickness examinations are performed on fire water piping. As an alternative to wall thickness examinations, internal inspections are performed on accessible exposed portions of fire water piping during plant maintenance activities. The inspections evaluate wall thickness measurements to ensure against catastrophic failure and the inner diameter of the piping as it applies to the design flow of the fire protection system. If a representative number of inspections have not been completed prior to the period of extended operation, Callaway will determine what additional inspections or examinations are required. The representative sample will be selected, based on system susceptibility to corrosion or fouling and evidence of performance degradation during system flow testing or periodic flushes. If material and environment conditions for above grade and below grade piping are similar, the results of the inspections of the internal surfaces of the above grade fire protection piping can be extrapolated to evaluate the condition of the internal surfaces of the below grade fire protection piping. If not, additional inspection activities will be performed to ensure that the intended function of below grade fire protection piping will be maintained consistent with the current licensing basis. Pipe wall thickness examinations and/or internal inspections will be performed prior to the period of extended operation and at 10-year frequencies throughout the period of extended operation.

Functional tests are periodically performed on fire detectors to ensure that they are operable.

The fire water storage tank external surfaces are inspected and volumetric examinations of the tank bottom are performed as described in the Aboveground Metallic Tanks program (B2.1.15). External surfaces of buried fire main piping are evaluated as described in the Buried and Underground Piping and Tanks program (B2.1.25).

NUREG-1801 Consistency

The Fire Water System program is an existing program that, following enhancement, will be consistent, with exception to NUREG-1801, Section XI.M27, *Fire Water System*.

Exceptions to NUREG-1801

Program Element Affected:

Detection of Aging Effects (Element 4)

NUREG-1801 requires inspection of fire protection systems in accordance with the guidance of NFPA-25. Callaway performs power block hose station gasket inspections at least once every 18 months. The inspection interval is in accordance with the approved fire protection program, as described in FSAR Table 9.5.1-2 - SP, Section 5.4, rather than annually as specified by NFPA-25.

NUREG-1801 requires annual testing of fire hydrant hose. Callaway hydrostatically tests fire hoses at fire hose stations that are older than five years at least every three years. The testing interval is in accordance with the approved fire protection program, as described in FSAR Table 9.5.1-2 - SP, Section 5.6.

NUREG-1801 requires fire hydrant flow tests to be performed annually. Callaway performs a yard loop and hydrant flush at least once every three years, and a flow test of the system at least once every three years. The testing interval is in accordance with the approved fire protection program, as described in FSAR Table 9.5.1-2 - SP, Sections 2.4 and 2.7.

Enhancements

Prior to the period of extended operation, the following enhancements will be implemented in the following program elements:

Parameters Monitored or Inspected (Element 3) and Detection of Aging Effects (Element 4)

The Fire Water System program will be enhanced to include pipe wall thickness examinations on fire water piping. As an alternative to wall thickness examinations, internal inspections will be performed on accessible exposed portions of fire water piping during plant maintenance activities. Pipe wall thickness examinations and/or internal inspections will be performed prior to the period of extended operation and at 10-year frequencies throughout the period of extended operation.

Detection of Aging Effects (Element 4)

The Fire Water System program will be enhanced to replace sprinkler heads prior to 50 years in service or test a representative sample and test every 10 years thereafter to ensure signs of degradation are detected in a timely manner.

Monitoring and Trending (Element 5)

The Fire Water System program will be enhanced to review and evaluate trends in flow parameters recorded during the NFPA 25 fire water flow tests.

Operating Experience

The following discussion of operating experience provides objective evidence that the Fire Water System program will be effective in ensuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation.

1. In 2005, during a surveillance test, 10 sprinkler heads had signs of corrosion or mechanical damage. Two of the sprinkler heads were replaced, and the other eight were cleaned. There have been no additional issues with the sprinkler heads since then.

2. In 2005 an alarm was triggered for fire protection loop jockey pump excessive run time and an investigation was initiated to identify the leak. The location of the leak was determined and promptly isolated from the main fire water loop. The isolation of the leak did not affect any required suppression systems. The leak was promptly repaired and the fire water piping was returned to service.

3. In 2006, a low C-factor lead to the fire water system being chemically cleaned, resulting in removal of approximately 8900 pounds of corrosion products. The cleaning was successful in keeping the system C-factor above 91.5 as required by plant procedure. During the chemical cleaning, five leaks developed, all of which were repaired. Since that time, two additional leaks have occurred. One was due to a cracked valve, and the cause of the other is still under investigation.

4. In 2008, during microbiological sampling of the fire water system, elevated levels of microbiologically influenced corrosion (MIC) were detected in stagnant portions of fire water pipe supplying fire water to hose stations. As a result, a new preventive maintenance task has been created to flush hose stations with a biocide.

The above examples provide objective evidence that the existing Fire Water System program includes activities that are capable of detecting aging effects, evaluating system leakage, and initiating corrective actions. Occurrences that would be identified under the Fire Water System program will be evaluated to ensure there is no significant impact to safe operation of the plant and corrective actions will be taken to prevent recurrence. Guidance for re-evaluation, repair, or replacement is provided for locations where aging is found. There is confidence that the continued implementation of the Fire Water System program will effectively identify aging prior to loss of intended function.

Conclusion

The continued implementation of the Fire Water System program, following enhancement, provides reasonable assurance that aging effects will be managed such that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B2.1.15 Aboveground Metallic Tanks

Program Description

The Aboveground Metallic Tanks program manages cracking and loss of material on the external surfaces of outdoor, aboveground metallic tanks within the scope of license renewal that are supported on concrete or soil. The program also manages cracking, blistering, and change in color of the acrylic/urethane insulation on the condensate storage tank (CST). The program applies to the CST, refueling water storage tank (RWST), and the two fire water storage tanks (FWSTs). Tanks inside plant structures and protected from the outdoor environment are managed by the External Surface Monitoring of Mechanical Components program (B2.1.21).

The Aboveground Metallic Tanks program is a condition monitoring program that performs periodic inspections to monitor for aging effects on the external surfaces of the tank. For the carbon steel FWSTs, the program relies on the application of paint, coatings, or tank bottom edge grout as corrosion preventive measures. For the stainless steel CST and RWST, jacketed insulation with overlapping seams that prevent moisture intrusion or spray-on polyurethane foam insulation that adheres to tank surfaces are used as a corrosion preventive measure. There are no sealants or caulkings applied at the external interfaces between the FWST, CST, and RWST and their concrete or soil foundations.

This program performs visual inspections to monitor for aging of the tank external surface paint or damage of the insulation covering. Removal of the tank insulation is on an opportunistic basis, to permit inspection of the tank external surface for aging. Insulation is removed for inspection of the tank surface if insulation damage is detected that would permit water ingress to the tank metallic surface. Painted exterior tank metallic surfaces are inspected for signs of degradation such as flaking, cracking, and peeling, to manage loss of material of the metallic surfaces.

Insulated tank exterior surfaces that have not been opportunistically inspected will be examined with ultrasonic test (UT) thickness measurements from the internal surface, to determine the tank wall thickness. Tank wall thickness measurements for insulated tank exterior surfaces that have not had an opportunistic inspection will be performed on a sampling basis when the tank is drained and within five years of entering the period of extended operation.

This program also performs UT thickness measurements of the bottom of the tank from the internal surface, to determine the thickness of the tank bottom. With exception of the FWSTs, tank bottom UT thickness measurements will be performed when the tank is drained and within five years of entering the period of extended operation. Tank bottom UT thickness measurements of each FWST will be performed at least once every 10 years.

The Aboveground Metallic Tanks program is a new program that will be implemented prior to the period of extended operation.

NUREG-1801 Consistency

The Aboveground Metallic Tanks program is new program that, when implemented, will be consistent with exception to NUREG-1801, Section XI.M29, *Aboveground Metallic Tanks*.

Exceptions to NUREG-1801

<u>Program Element Affected</u>

Detection of Aging Effects (Element 4)

NUREG-1801 requires UT thickness measurements of the tank bottoms whenever the tank is drained and at least once within five years of entering the period of extended operation. UT thickness measurements of the bottom of each FWST from the internal surface, to determine the thickness of the tank bottom will be performed at least once every ten years. Currently the internal surface of each FWST tank bottom will be visually inspected on an alternating refueling outage frequency. UT thickness measurements may be performed sooner if required by further evaluation of the tank bottom visual inspection results. Ten year periodic UT thickness measurements, supplemented when appropriate based on internal visual examinations, will be effective in managing loss of material of the tank bottoms.

Enhancements

None

Operating Experience

The following discussion of operating experience provides objective evidence that the Aboveground Metallic Tanks program will be effective in ensuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation:

1. In 2007, an inspection of the train B fire water storage tank, performed in accordance with the Callaway fire water storage tank inspection procedure, identified small amounts of corrosion and mineral deposits, generally at the weld seams. An evaluation determined another application of the tank coating would be planned. In 2009, an inspection of the train B fire water storage tank identified several areas of blistering in the coating, mainly near the welds, and calcium deposits. No major delaminations were identified, and the anodes were in good shape. Minor corrosion was identified on bare metal surfaces, with no pitting. An evaluation determined that the tank internal surfaces were satisfactory.

2. In 2008, an inspection of the train A fire water storage tank identified minor blistering and limestone deposits. No corrosion was found on the tank internal surface, and the tank cathodic protection was found in satisfactory condition. The internal surface of the tank was determined to be in satisfactory condition. In 2010, an inspection of the train A fire

water tank identified discontinuities and delaminations of the coating. The weld at the floor to wall interface had the most pitting, and weld locations contained heavy blistering. The adjustments on the rectifier of the cathodic protection system were found to be adequate. An evaluation determined that, since the cathodic protection system was determined to be effective, through voltage and current measurements, the substrate would not degrade excessively before the next planned inspection.

The above examples provide objective evidence that the new Aboveground Metallic Tanks program will be capable of detecting the aging effects associated with this program. Occurrences that would be identified under the Aboveground Metallic Tanks program will be evaluated to ensure there is no significant impact to the safe operation of the plant and corrective actions will be taken to prevent recurrence. Guidance for re-evaluation, repair, or replacement is provided for locations where aging is found. There is confidence that the implementation of the Aboveground Metallic Tanks program will effectively identify aging prior to loss of intended function.

Industry and plant-specific operating experience will be evaluated in the development and implementation of this program.

Conclusion

The implementation of the Aboveground Metallic Tanks program will provide reasonable assurance that aging effects will be managed such that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B2.1.16 Fuel Oil Chemistry

Program Description

The Fuel Oil Chemistry program manages loss of material on the internal surface of components in the emergency diesel engine fuel oil storage and transfer system, fire protection system, standby diesel generator engine system, and EOF and TSC diesels security building system. The program includes (a) surveillance and monitoring procedures for maintaining fuel oil quality by controlling contaminants in accordance with plant technical specifications and ASTM Standards D1796-83 and D2276-78, (b) periodic draining of the emergency fuel oil system storage tanks and day tanks, (c) cleaning and visual inspection of internal surfaces of the emergency fuel oil system storage tanks and day tanks during periodic draining, (d) ultrasonic measurements of the emergency fuel oil system storage tank and fuel oil day tank bottom thickness if there are indications of reduced cross sectional thickness found during the visual inspection, (e) periodic volumetric examination of tank bottom from the external surface of the diesel fire pump fuel oil day tank and security diesel generator fuel oil day tank where tank design prevents cleaning and inspection from the inside, and (f) inspection of new fuel oil before introduction to storage tanks.

The One-Time Inspection program (B2.1.18) will be used to verify the effectiveness of the Fuel Oil Chemistry program.

NUREG-1801 Consistency

The Fuel Oil Chemistry program is an existing program that, following enhancement, will be consistent, with NUREG-1801, Section XI.M30, *Fuel Oil Chemistry*.

Exceptions to NUREG-1801

None

Enhancements

Prior to the period of extended operation, the following enhancements will be implemented in the following program element:

Preventive Actions (Element 2)

Procedures will be enhanced to include periodic draining of the water from the bottom of the emergency fuel oil system day tanks, diesel fire pump fuel oil day tanks, and security diesel generator fuel oil day tank.

Procedures will be enhanced to add biocide to the diesel fire pump fuel oil day tank and security diesel generator fuel oil day tank if periodic testing indicates biological activity or evidence of corrosion.

Preventive Actions (Element 2) and Detection of Aging Effects (Element 4)

Procedures will be enhanced to include draining, cleaning, and inspection of the emergency fuel oil system day tanks within the 10-year period prior to the period of extended operation and at least once every ten years after entering the period of extended operation.

Parameters Monitored or Inspected (Element 3)

Procedures will be enhanced to include a determination of water and sediment in the periodic sampling of the emergency fuel oil system day tanks and security diesel generator fuel oil day tank.

Procedures will be enhanced to include a determination of particulate concentrations in the periodic sampling of the emergency fuel oil system day tanks, diesel fire pump fuel oil day tanks, and security diesel generator fuel oil day tank.

Procedures will be enhanced to include a determination of microbial activity concentrations in the periodic sampling of the emergency fuel oil system storage tanks, emergency fuel oil system day tanks, diesel fire pump fuel oil day tanks, and security diesel generator fuel oil day tank.

Procedures will be enhanced to include new fuel oil receipt sampling for water and sediment prior to introduction into the security diesel generator fuel oil day tank and diesel fire pump fuel oil day tank.

Detection of Aging Effects (Element 4)

Procedures will be enhanced to perform a volumetric examination of the emergency fuel oil system storage tanks and day tanks after evidence of tank degradation is observed during the visual inspection within the 10-year period prior to the period of extended operation and at least once every ten years after entering the period of extended operation.

Procedures will be enhanced to perform a volumetric examination on the external surface of the diesel fire pump fuel oil day tanks and security diesel generator fuel oil day tank within the 10-year period prior to the period of extended operation and at least once every ten years after entering the period of extended operation.

Monitoring and Trending (Element 5)

Procedures will be enhanced to include at least quarterly trending for water, biological activity, and particulate concentrations on the emergency fuel oil system day tanks, diesel fire pump fuel oil day tanks, and security diesel generator fuel oil day tank.

Corrective Actions (Element 7)

Procedures will be enhanced to include immediate removal of accumulated water when discovered in the emergency fuel oil system day tank, diesel fire pump fuel oil day tank, and security diesel generator fuel oil day tank.

Operating Experience

The following discussion of operating experience provides objective evidence that the Fuel Oil Chemistry program will be effective in ensuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation.

1. Historically, Callaway has met technical specification acceptance criteria for particulate concentration in the diesel fuel oil. Over the last ten years since 2001, particulate results averaged 0.181 ppm for the "A" tank and 0.190 ppm for the "B" tank. For the last five years since 2006 these values have been 0.104 ppm and 0.173 ppm, respectively. These results are below the Technical Specification requirement of 10 ppm. Callaway also filters both in-ground diesel fuel oil tanks every two years with a portable filter skid and adds biocide for microbiological control. This filtering provides additional assurance that particulate remains low in the diesel fuel oil storage tanks. A review of the maintenance history for the emergency fuel oil system diesel fuel oil filters for the past ten years indicates no examples of fuel oil system fouling.
2. During Refuel 16 (Fall 2008), as part of the 10-year cleaning and inspection of the emergency fuel oil system storage tank TJE01B, the condition of the internal protective coating was inspected. The coating was compared to plant specifications and vendor documents, which require two coats of bitumastic coal-tar epoxy. There were no concerns with the coating, and the tank was very clean without any sediment or organic matter.
3. In 2009, a diesel fuel oil program self-assessment was performed. The following changes were made as a result of the assessment findings. (a) The Certificate of Compliance for incoming diesel fuel oil truck loads was updated to include assurances that no biodiesel is present. (b) The diesel fuel oil testing program procedure was changed to include PMs for sampling of both underground storage tanks after each outage, including specific gravity, density, lubricity and microbial activity.
4. In 2010, in response to industry operating experience concerning contamination of diesel fuel oil with biodiesel, the following actions were taken to ensure that biodiesel is not used at Callaway: (a) a procedure which tests for biodiesel was created; (b) both diesel fuel oil storage tanks were sampled for biodiesel and verified to have less than minimum detectable; (c) testing for biodiesel was added to the required analyses for truck receipt sampling; (d) PMs were created to sample the fuel oil storage tanks after the 24 hour diesel runs at the end of each outage.
5. During Refuel 17 (Spring 2010), as part of the 10-year cleaning and inspection of the emergency fuel oil system storage tank TJE01A, the condition of the internal coating

was inspected and determined to be in acceptable condition. No debris, sludge, or bare metal areas were identified during the inspection. The coal tar epoxy coating was in good condition, however, coating blisters were identified in various places. An engineering evaluation determined the identified blistering was acceptable since all instances were less than nickel size. No issue with the coatings has been documented in any of the previous inspections. The procedure requiring the condition of each tank coating to be documented was enhanced to require inclusion of pictures of the internal coating condition and additional details regarding tank internal coating cleanliness, coating color, coating uniformity, and general tank condition.

The above examples provide objective evidence that the existing Fuel Oil Chemistry program is capable of both monitoring and detecting the aging effects associated with fuel oil environments. Occurrences that would be identified under the Fuel Oil Chemistry program will be evaluated to ensure there is no significant impact to safe operation of the plant and corrective actions will be taken to prevent recurrence. Guidance for re-evaluation, repair, or replacement is provided for locations where aging is found. There is confidence that the continued implementation of the Fuel Oil Chemistry program will effectively identify aging prior to loss of intended function.

Conclusion

The continued implementation of the Fuel Oil Chemistry program, following enhancement, supplemented by the One-Time Inspection program (B2.1.18), provides reasonable assurance that aging effects will be managed such that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B2.1.17 Reactor Vessel Surveillance

Program Description

The Reactor Vessel Surveillance program manages loss of fracture toughness in accordance with ASTM E 185-73, and the requirements of 10 CFR 50 Appendix H. The surveillance capsules contain reactor vessel steel specimens of the limiting beltline material; and associated weld metal and weld heat affected zone metal. Current examination methods and report requirements are also controlled by commitment to ASTM E 185-82.

The last-tested surveillance capsule removed from the reactor vessel was exposed to fluences equivalent to about 54 effective full power years (EFPY), which exceeds the 60-year peak reactor vessel wall neutron fluence. Capsule results are used to demonstrate compliance with Charpy upper-shelf energy requirements in 10 CFR 50 Appendix G and pressurized thermal shock screening criteria in 10 CFR 50.61, using the methodologies in Regulatory Guide 1.99, *Radiation Embrittlement of Reactor Vessel Materials,* Revision 2. Capsule results are also used to revise pressure-temperature curves and project the end-of-life fluence.

Two standby capsules will be removed at exposures greater than those expected at the beltline wall at 60 years. One capsule was removed at 71 EFPY of equivalent exposure and is stored in the spent fuel pool for reinsertion or testing as deemed appropriate. The other capsule will be removed at approximately 108 EFPY of equivalent exposure. This withdrawal schedule meets the ASTM E 185-82 criterion which states that capsules may be removed when the capsule neutron fluence is between one and two times the limiting fluence calculated for the vessel at the end of expected life. Changes to the capsule withdrawal schedule will be communicated and approved by the NRC as appropriate.

Following withdrawal of the final capsule, vessel fluence will be determined by ex-vessel dosimetry.

NUREG-1801 Consistency

The Reactor Vessel Surveillance program is an existing program that, following enhancement, will be consistent to NUREG-1801, Section XI.M31, *Reactor Vessel Surveillance*.

Exceptions to NUREG-1801

None

Enhancements

Prior to the period of extended operation, the following enhancements will be implemented in the following program elements:

Detection of Aging Effects - Element 4

Following withdrawal of the final capsule, vessel fluence will be determined by ex-vessel dosimetry.

Testing specification will be enhanced to require that pulled and tested surveillance capsules are placed in storage for future reconstitution or reinsertion unless given NRC approval to discard.

Monitoring and Trending - Element 5

Procedures will be enhanced to specifically require the evaluation of the impact of plant operation changes on the extent of reactor vessel embrittlement (i.e., Charpy upper-shelf energy and pressurized thermal shock screening criteria, and the P-T limit curves, including the effect of lower cold leg temperature or higher fluence).

Operating Experience

The following discussion of operating experience provides objective evidence that the Reactor Vessel Surveillance program will be effective in ensuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation.

1. The last-tested capsule specimens were exposed to fluences equivalent to approximately 54 EFPY, and satisfy the upper-shelf energy criterion and the pressurized thermal shock reference temperature screening criteria. The adjusted reference temperatures have been shown to be less than that used in the P-T limit curves, thereby demonstrating margin in the operating limits.

The operating experience of the Reactor Vessel Surveillance program did not identify an adverse trend in performance. Occurrences that would be identified under the Reactor Vessel Surveillance program will be evaluated to ensure there is no significant impact to safe operation of the plant and corrective actions will be taken to prevent recurrence. Guidance for re-evaluation, repair, or replacement is provided for locations where aging is found. There is confidence that the continued implementation of the Reactor Vessel Surveillance program will effectively identify aging prior to loss of intended function.

Conclusion

The continued implementation of the Reactor Vessel Surveillance program, following enhancement, provides reasonable assurance that aging effects will be managed such that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B2.1.18 One-Time Inspection

Program Description

The One-Time Inspection (OTI) program manages loss of material, cracking, and reduction of heat transfer. The OTI program provides one-time inspections of selected components in susceptible locations, to verify the system-wide effectiveness of the Water Chemistry program (B2.1.2), Fuel Oil Chemistry program (B2.1.16), and Lubricating Oil Analysis program (B2.1.24) in managing these components.

The OTI program inspections verify unacceptable aging effects are either not occurring or are progressing so slowly as to have a negligible effect on the intended function of each component. If the OTI program determines that aging effects are occurring then additional actions will be established to ensure adequate management of the component intended functions. Any aging effects identified during the OTI program will be documented and resolved through the corrective action program.

The program includes (a) determination of the inspection sample size, (b) identification of inspection locations, (c) determination of the examination technique, (d) evaluation of aging effects found during OTI and the need for follow-up examinations using the corrective action program.

Inspection sample sizes are based on the number of components in a group sharing the same material, environment and aging effects. The One-Time Inspection program determines nondestructive examination (NDE) sample sizes as 20 percent of the components in each material-environment group up to a maximum of 25 components. Components making up the sample are those determined to be most susceptible to aging effects based on a review of environment, flow conditions, materials, and operating experience. Inspections performed by other activities may be used if they satisfy the requirements of the OTI program.

The one-time inspections are conducted to identify the aging effects of loss of material (localized or general), cracking (partial wall or through wall), and reduction of heat transfer. The results of OTI inspections will be documented. ASME Section V examination techniques are used to detect aging effects. Any aging effects identified during the activities of this program will be documented and resolved through the corrective action program.

The One-Time Inspection program is not used for structures or components with known age-related degradation mechanisms or when a component is in a different environment in the period of extended operation than it experienced in the previous 40 years.

Class 1 piping less than 4 inch nominal pipe size is managed by the One-Time Inspection of ASME Code Class 1 Small Bore-Piping program (B2.1.20).

The One-Time Inspection program is a new program that will be implemented and completed within the 10-year period prior to the period of extended operation.

NUREG-1801 Consistency

The One-Time Inspection program is a new program that, when implemented, will be consistent with NUREG-1801, Section XI.M32, *One-Time Inspection*.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

The following discussion of operating experience provides objective evidence that the One-Time Inspection program will be effective in ensuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation.

1. A review of 10 years of Callaway operating experience associated with the Water Chemistry program (B2.1.2), Fuel Oil Chemistry program (B2.1.16), and Lubricating Oil Analysis program (B2.1.24) confirmed that aging effects are either not occurring or are progressing so slowly as to have a negligible effect on the intended function of each component and that these programs are adequately managing potential component aging effects.

2. During reactor pressure vessel 10-year ISI examinations performed during Refuel 13 (Spring 2004), a weld flaw indication was identified in the "C" inlet nozzle (cold leg) safe end-to-elbow weld (weld 2-BB-01-F302). These materials are all stainless steel. Based on comparison of ISI exams in 1995 and 2004 and based on the principles of crack development and growth, the flaw indication was concluded to be an initial fabrication defect. Based on a technical evaluation of the indication, the optimum course of action was to monitor the indication for change. The monitoring will use the same NDE techniques as the current "state of the art" to ensure accurate comparison. The monitoring interval coincides with the ASME Code's requirement for reinspection within three years. The origin of the indication was the combination of initial weld process failures due to one or more of the following: 1) small lack of fusion occurrences at the weld interface, 2) the presence of multiple repairs in the indication region, or 3) liquation cracking at the weld interface. In addition, NDE limitations with the radiography (RT) performed during the weld fabrication were cited as a root cause.

The OTI program will utilize various NDE techniques performed consistent with ASME Section V inspection techniques to identify potential aging effects. ASME Code inspections have proven to be effective within the industry for identifying defects (aging effects). The above examples provide objective evidence that ASME Code inspections will be capable of detecting aging effects associated with this program. Occurrences that would be identified under the OTI program will be evaluated to ensure there is no significant impact to safe operation of the plant and corrective actions will be taken to prevent recurrence. Guidance for re-evaluation, repair, or replacement is provided for locations where aging is found. There is confidence that the implementation of the OTI program will effectively identify aging prior to loss of intended function.

Industry and plant-specific operating experience will be evaluated in the development and implementation of this program.

Conclusion

The implementation of the One-Time Inspection program will provide reasonable assurance that aging effects will be managed such that the systems and components within the scope of the Water Chemistry program (B2.1.2), Fuel Oil Chemistry program (B2.1.16), and Lubricating Oil Analysis program (B2.1.24) will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B2.1.19 Selective Leaching

Program Description

The Selective Leaching program manages loss of material due to selective leaching for gray cast iron and copper alloy with greater than 15 percent zinc components exposed to treated water, raw water, waste water, or groundwater that are within the scope of license renewal. There are no copper alloy components with greater than eight percent aluminum within the scope of license renewal at Callaway. Components susceptible to selective leaching are in the fire protection system, chemical and volume control system, service water system, essential service water system, plant heating system, fuel building HVAC system, auxiliary building HVAC, containment purge system or oily waste system.

A one-time inspection of a selected representative sample of components that are most susceptible to selective leaching will be performed. A sample of 20 percent of the population, up to a maximum of 25 component inspections, is established for each material and environment combination.

Visual and mechanical methods are used to determine whether loss of material due to selective leaching is occurring. Identification of selective leaching may be accomplished by attempting to scrape or chip through the surface being inspected. If these inspections detect dezincification or graphitization, which are the types of selective leaching expected to occur in copper alloy and gray cast iron, a follow-up evaluation will be performed. The evaluation may require confirmation of selective leaching through a metallurgical evaluation (which may include microstructure examination). The sample size for each material and environment combination may be expanded, based upon the results of the evaluation and confirmatory testing. If indications of selective leaching are confirmed, follow-up examinations will be performed. Deficiencies are corrected through replacement, to ensure that systems will continue to perform their intended function for the period of extended operation.

The Selective Leaching program is a new program and visual inspections and associated evaluations will be implemented within the 5-year period prior to the period of extended operation.

NUREG-1801 Consistency

The Selective Leaching program is a new program that, when implemented, will be consistent, with exception to NUREG-1801, Section XI.M33, *Selective Leaching*.

Exceptions to NUREG-1801

Program Elements Affected:

Parameters Monitored or Inspected (Element 3), and Monitoring and Trending (Element 5)

NUREG-1801, Section XI.M33 requires inspection of buried gray cast iron components exposed to raw water or ground water. Selective leaching inspections do not need to be provided if the components are within the scope of the fire protection system, have been installed in accordance with NFPA Standard 24, and the activity of the fire protection system jockey pump is required to be monitored on an interval not to exceed one month. At a minimum, a flow test is conducted by the end of the following refueling outage, when unexplained changes in fire protection system jockey pump activity are observed. This exception is consistent with the fire protection aging management requirements of NUREG-1801, Section XI.M41, *Buried and Underground Piping and Tanks*.

Enhancements

None

Operating Experience

The following discussion of operating experience provides objective evidence that the Selective Leaching program will be effective in ensuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation:

1. The Selective Leaching program is a new program for Callaway. Industry operating experience that forms the basis for this program is included in the operating experience element of the corresponding NUREG-1801 aging management program. Plant-specific operating experience was reviewed to ensure that the operating experience discussed in the corresponding NUREG-1801 aging management program is bounding, i.e., that there is no unique plant-specific operating experience in addition to that described in NUREG-1801. The Callaway Corrective Action Program was searched to determine if selective leaching has been identified for components with the applicable material and environment combinations. In addition, there are no copper alloy components with greater than eight percent aluminum within the scope of license renewal at Callaway.

No occurrences of selective leaching were found in a search of Callaway historical information. Occurrences that would be identified under the Selective Leaching program will be evaluated to ensure there is no significant impact to safe operation of the plant and corrective actions will be taken to prevent recurrence. Guidance for re-evaluation, repair, or replacement is provided for locations where aging is found. There is confidence that the implementation of the Selective Leaching program will effectively identify aging prior to loss of intended function.

Industry and plant-specific operating experience will be evaluated in the development and implementation of this program.

Conclusion

The implementation of the Selective Leaching program will provide reasonable assurance that aging effects will be managed such that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B2.1.20 One-Time Inspection of ASME Code Class 1 Small-Bore Piping

Program Description

The One-Time Inspection of ASME Code Class 1 Small-Bore Piping program manages cracking of ASME Code Class 1 piping less than four inches nominal pipe size (NPS) and greater than or equal to NPS 1.

For ASME Code Class 1 small-bore piping, the Risk-informed (RI-ISI) ISI program requires volumetric examinations (by ultrasonic testing) on selected butt weld locations to detect cracking. Weld locations are selected based on the guidelines provided in EPRI TR-112657, *Revised Risk-Informed Inservice Inspection Evaluation Procedure.* There are 340 Class 1 small-bore butt welds less than NPS 4 and greater than or equal to NPS 1 at Callaway. At least 25 butt welds will be included in the examination population. Ultrasonic examinations are conducted in accordance with ASME Section XI with acceptance criteria from paragraph IWB-3000 for butt welds.

The program will include a volumetric or opportunistic destructive examination of socket welds to identify potential cracking. Callaway has experienced one case of cracking, in 1995, of an ASME Code Class 1 small-bore piping butt weld resulting from cyclical loading which was mitigated with a design change to prevent recurrence. Two small-bore Class 1 socket welds will be selected for examination, which represents 10 percent of the population. There are 19 Class 1 small-bore socket welds in the population of ASME Code Class 1 piping less than NPS 4 and greater than or equal to NPS 1 at Callaway. Alternatively, opportunistic destructive examinations may be used in lieu of a volumetric examination. An opportunistic destructive examination may be performed when a weld is removed from service for reasons other than inspection. When selecting socket welds for examination, consideration will be given to selecting welds which are susceptible to cracking resulting from stress corrosion, cyclical (including thermal, mechanical, and vibration fatigue) loading, or thermal stratification and thermal turbulence. At least one socket weld selected for examination will have a risk ranking of "high", as determined by the RI-ISI program.

Socket welds that fall within the weld examination sample will be examined following ASME Section XI Code requirements. If a qualified volumetric examination procedure for socket welds endorsed by the industry or the NRC is available and incorporated into the ASME Section XI Code at the time of the small-bore inspections, then this will be used for the volumetric examinations. If no volumetric examination procedure for ASME Code Class 1 small-bore socket welds has been endorsed by the industry or the NRC and incorporated into ASME Section XI at the time Callaway performs inspections of small-bore piping, a plant procedure for volumetric examination of ASME Code Class 1 small-bore piping with socket welds will be used.

The program includes controls to implement an alternate plant-specific periodic inspection aging management program should evidence of ASME Class 1 small bore piping cracking caused by intergranular stress corrosion cracking or fatigue be confirmed by review of

Callaway operating experience prior to the period of extended operation or by the examinations performed as part of this program.

The One-Time Inspection of ASME Code Class 1 Small-Bore Piping program inspections will be completed and evaluated within the six-year period prior to the period of extended operation.

In conformance with 10 CFR 50.55a(g)(4)(ii), the ISI program is updated during each successive 120-month inspection interval to comply with the requirements of the latest edition of the ASME Code specified twelve months before the start of the inspection interval. Callaway will use the ASME Code Edition consistent with the provisions of 10 CFR 50.55a during the 10 year period prior to the period of extended operation (fourth interval).

NUREG-1801 Consistency

The One-Time Inspection of ASME Code Class 1 Small-Bore Piping program is a new program that, when implemented, will be consistent with NUREG-1801, Section XI.M35, *One-Time Inspection of ASME Code Class 1 Small-Bore Piping.*

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

The following discussion of operating experience provides objective evidence that the One-Time Inspection of ASME Code Class 1 Small-Bore Piping program will be effective in ensuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation:

1 A review of plant-specific operating experience indicates that one event of cracking has been observed for an ASME Code Class 1 small-bore pipe butt weld less than NPS 4. In 1995, an ASME Class 1 butt weld on a two inch RCS Loop D crossover leg to chemical and volume control system excess letdown line developed a crack. The most probable cause was the combined effects of 1) high stresses resulting from interference with a flange/plate and 2) normal system vibration. The flange/plate was removed to prevent recurrence of this weld failure. A volumetric examination (UT) of the weld performed during Refuel 17 (Spring 2010) using the techniques described in MRP-146 identified no indications. There have been no additional failures since 1995.

Occurrences that would be identified under the One Time Inspection of ASME Code Class 1 Small Bore Piping program will be evaluated to ensure there is no significant impact to safe operation of the plant and corrective actions will be taken to prevent recurrence. Guidance for re-evaluation, repair, or replacement is provided for locations where aging is found. There is confidence that the implementation of the One Time Inspection of ASME Code Class 1 Small Bore Piping program will effectively identify aging prior to loss of intended function.

Industry and plant specific operating experience will be evaluated in the development and implementation of this program.

Conclusion

The implementation of the One-Time Inspection of ASME Code Class 1 Small-Bore Piping program will provide reasonable assurance that aging effects will be managed such that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B2.1.21 External Surfaces Monitoring of Mechanical Components

Program Description

The External Surfaces Monitoring of Mechanical Components program manages loss of material and cracking for metallic components and cracking and changes in material properties for cement board (splash panel) components. The program also manages loss of material, cracking, hardening and loss of strength for polymeric components.

Visual inspections of external surfaces will be conducted with system inspections and walkdowns of metallic components for evidence of loss of material and leakage. The inspection parameters for metallic components include material condition, which consists of evidence of corrosion, corrosion stains, material wastage, evidence of insulation damage or wetting; wear, flaking or oxide-coated surfaces; and leakage onto external surfaces. Coating degradation (e.g. cracking, flaking, and blistering) is used as an indicator of possible underlying degradation of the component. Polymer visual inspections will inspect for surface cracking, crazing, discoloration, wear, scuffing, dimensional change, exposure of internal reinforcement, and hardening/loss of strength as evidenced by loss of suppleness during manual or physical manipulation. Stainless steel monitoring will also include visual inspection for cracking when exposed to an aggressive air environment containing halides. Cement board visual inspections will inspect for loss of material or cracking that results in a loss of the component's intended function.

Visual inspections of components in normally accessible locations are conducted at least every refueling outage. This frequency accommodates inspections of components that may be in locations that are normally only accessible during outages. Surfaces that are not readily visible during plant operations and refueling outages are inspected when they are made accessible and at intervals that would ensure the components intended functions are maintained. Inspection intervals for inaccessible components will be determined based on an evaluation of aging effects and their impact on intended functions observed during external surface inspections on accessible components with the same material and environment combination.

Visible evidence of degradation will be evaluated to ensure the component's intended functions are maintained. Visual inspection activities will be performed by qualified personnel in accordance with site controlled procedures and processes. Deficiencies are documented and evaluated under the corrective action process.

The following aging management programs manage external surface aging of metallic or polymeric mechanical components outside the scope of the External Surfaces Monitoring program:

1. Boric Acid Corrosion program (B2.1.4) for components in systems near treated borated water or reactor coolant environments where boric acid corrosion may occur.

2. Buried and Underground Piping and Tanks program (B2.1.25) for buried components in buried and underground environments.

3. Aboveground Metallic Tanks program (B2.1.15) for external surfaces of outdoor, above-ground metallic tanks.

4. ASME Section XI ISI, Subsections IWB, IWC, and IWD program (B2.1.1) for Class 1, 2, and 3 pressure-retaining components and their integral attachments.

The External Surfaces Monitoring of Mechanical Components program is a new program that will be implemented prior to the period of extended operation.

NUREG-1801 Consistency

The External Surfaces Monitoring of Mechanical Components program is a new program that, when implemented, will be consistent with NUREG-1801, Section XI.M36, *External Surfaces Monitoring of Mechanical Components*.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

The following discussion of operating experience provides objective evidence that the External Surfaces Monitoring of Mechanical Components program will be effective in ensuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation.

1. The External Surfaces Monitoring of Mechanical Components program is a new program, however, external surface monitoring via system walkdown inspections are already in effect at Callaway. Routine system walkdowns are performed as part of the Plant Health and Performance Monitoring Program. The results of the walkdowns provide data for performance monitoring and trending, are an input to work planning and prioritization process, and are communicated in the System Health Reports and System Performance Monitoring Indicators. The walkdown inspections have been used to effectively maintain the condition of component external surfaces. The scope of these inspections and the inspection techniques are in accordance with industry practice. A review of the plant-specific operating experience for the past 10 years showed that the Plant Health and Performance Monitoring Program has been effective in maintaining the condition of component external surfaces.

2. In 2006, cracking was found on a rubber expansion joint located between the essential service water piping and the diesel generator intercooler heat exchanger. An extent of condition review revealed cracking on the expansion joint of the opposite train. Both expansion joints were replaced. The apparent cause of the cracking was pipe misalignment. The PMs to inspect the heat exchanger tubes were revised to include an inspection of the expansion joints. During the repair, it was discovered that the spare expansion joint in the warehouse was also cracked. As a result, the shelf life of the expansion joints was decreased from 372 months to 60 months. Expansion joint storage methods were changed to require bagging to mitigate their aging effects.

3. In 2006, loss of material due pitting and general corrosion was identified on essential service water supply line piping. A piping ultrasonic test confirmed the piping met minimum wall thickness. The pipe coating was completely restored on all bare metal surfaces of this piping, up to the floor seal. Inspection of safety-related carbon steel cooling piping exposed to aggressive environments and in the vicinity of penetrations through floors, walls, and ceilings was performed to determine extent of condition. No indications of significant corrosion were found as a result of these inspections.

4. In 2006, loss of material due pitting and general corrosion was identified on piping in the pipe chase between the condensate storage tank and the auxiliary building. The piping was ultrasonically examined to determine loss of wall thickness. Piping was replaced or recoated consistent with the results of the ultrasonic examinations. The apparent cause of the corrosion was intrusion of rainwater through the equipment access hatch at ground level outside of the condensate storage tank valve house. The access panel was resealed to prevent rain water intrusion.

5. In 2008, during a mechanical maintenance pre-job walkdown, expansion joint surface cracking was found on the emergency diesel generator intercooler heat exchanger shell side inlet and outlet. The shallow surface cracking was determined to not affect the structural integrity of the joint. The expansion joints are regularly inspected and trended per established preventive maintenance activities, so no further actions were required. During inspection of additional expansion joints on the essential service water system, additional expansion joints with cracks and visible cords were found. Expansion joints containing cracks deep enough to affect the second layer of nylon cording were replaced, since cracking of this layer questions the structural stability of the expansion joint.

The operating experience for the system walkdown inspections that will be incorporated into the External Surfaces Monitoring of Mechanical Components program did not show any adverse trend in performance. Occurrences that would be identified by the system walkdowns will be evaluated to ensure there is no significant impact to the safe operation of the plant and adequate corrective actions will be taken to prevent recurrence. Appropriate guidance for re-evaluation, repair, or replacement will be provided for locations where aging is found. There is confidence that the implementation of the External Surfaces Monitoring of Mechanical Components program will effectively identify aging prior to loss of intended function.

Industry and plant-specific operating experience will be evaluated in the development and implementation of this program.

Conclusion

The implementation of the External Surfaces Monitoring of Mechanical Components program will provide reasonable assurance that aging effects will be managed such that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B2.1.22 Flux Thimble Tube Inspection

Program Description

The Flux Thimble Tube Inspection program manages loss of material by performing wall thickness eddy current inspection of all flux thimble tubes that form part of the reactor coolant system pressure boundary. The pressure boundary includes the length of the tube inside the reactor vessel out to the seal fittings outside the reactor vessel. Eddy current testing is performed on the portion of the tubes inside the reactor vessel. The Flux Thimble Tube Inspection program does not prevent loss of material but provides measures for inspection and evaluation to detect the loss of material prior to loss of intended function.

All flux thimble tubes are periodically inspected during refueling outages. Wall thickness measurements are trended and wear rates are calculated. The refueling outage for the next inspection is determined from the wear rate calculations. If the current measured wear exceeds the acceptance criteria or if the predicted wear (as a measure of percent through wall) for a given flux thimble tube is projected to exceed the established acceptance criteria prior to the next refueling outage, corrective actions are taken to reposition, cap, or replace the tube. Program documentation maintains details regarding the core location and if a tube has been capped, repositioned or replaced.

The Flux Thimble Tube Inspection program implements the recommendations of NRC Bulletin 88-09, *Thimble Tube Thinning in Westinghouse Reactors*.

NUREG-1801 Consistency

The Flux Thimble Tube Inspection program is an existing program that is consistent with NUREG-1801, Section XI.M37, *Flux Thimble Tube Inspection*.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

The following discussion of operating experience provides objective evidence that the Flux Thimble Tube Inspection program will be effective in ensuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation:

1. The Callaway reactor vessel lower internals have instrumentation column sleeves installed which reduce the instrument column inside diameter. The flux thimble tubes have an outer diameter of 0.313 in. The combination of reduced inside diameter of the

instrument columns and large outer diameter of the flux thimble tubes results in a small annular gap, which was shown in WCAP-12866 to reduce the wear rates. As a result, the wear rates of the flux thimble tubes at Callaway have been relatively low, such that after 25 years of operation, no flux thimble tubes have had to be removed from service or repositioned due to wear.

2. Two thimbles have been repositioned for reasons other than wear. One thimble was repositioned because detectors could not be inserted into it past the seal table. Repositioning allowed a few inches of the thimble tube to be removed at the seal table end, so that detectors could once again be inserted into it. A second thimble was repositioned because of galled fittings. Installation of new fittings required the thimble to be repositioned.

Occurrences that would be identified under the Flux Thimble Tube Inspection program will be evaluated to ensure there is no significant impact to safe operation of the plant and corrective actions will be taken to prevent recurrence. Guidance for re-evaluation, repair, or replacement is provided for locations where aging effects are found. There is confidence that the implementation of the Flux Thimble Tube Inspection program will effectively identify aging prior to loss of intended function.

Conclusion

The continued implementation of the Flux Thimble Tube Inspection program provides reasonable assurance that aging effects will be managed such that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B2.1.23 Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components

Program Description

The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program manages cracking, loss of material, hardening and loss of strength. The program inspects internal surfaces exposed to plant indoor air, ventilation atmosphere, atmosphere/weather, condensation, borated water leakage, diesel exhaust, lubricating oil, and any water system environment not managed by Open-Cycle Cooling Water System (B2.1.10), Closed Treated Water System (B2.1.11), Fire Water System (B2.1.14), and Water Chemistry (B2.1.2) programs.

Internal inspections are performed opportunistically whenever the internal surfaces are made accessible, such as periodic system and component surveillance activities or maintenance activities. Visual inspections of internal surfaces of plant components are performed by qualified personnel. For certain materials, such as polymers, visual inspections will be augmented by physical manipulation of at least 10 percent of the accessible surface area or pressurization to detect hardening, loss of strength, and cracking. Volumetric evaluations are performed when appropriate for the component environment and material. Volumetric evaluations such as ultrasonic examinations are used to detect stress corrosion cracking of internal surfaces such as stainless steel components exposed to diesel exhaust.

Identified aging deficiencies are documented and evaluated by the Corrective Action Program. Acceptance criteria are established in the maintenance and surveillance procedures or are established during engineering evaluation of the degraded condition. If the inspection results are not acceptable, the condition is evaluated to determine whether the component intended function is affected, and a corrective action is implemented.

Components with repetitive failures due to loss of material from corrosion, and all similar component-material-environment combinations, require a plant-specific program, unless the component material has been replaced by a material of more corrosion resistance for the environment of interest.

The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program is a new program that will be implemented prior to entering the period of extended operation.

NUREG-1801 Consistency

The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program is a new program that, when implemented, will be consistent with exception to NUREG-1801, Section XI.M38, *Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components*.

Exceptions to NUREG-1801

Program Elements Affected:

Scope of Program (Element 1), Parameters Monitored or Inspected (Element 3), Detection of Aging Effects (Element 4), and Monitoring and Trending (Element 5)

NUREG-1801 requires a visual examination of the internal surface of components within the scope of this program. The diesel exhaust is not available for internal surface inspection, so a volumetric examination will be performed for this component. The volumetric examination is adequate for detecting loss of material (wall thinning) and cracking of piping and tubing.

Enhancements

None

Operating Experience

The following discussion of operating experience provides objective evidence that the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program will be effective in ensuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation.

1. The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program will be a new program at Callaway. Internal surface monitoring through visual inspections conducted during maintenance activities and surveillance testing are already in effect in Callaway. The results of the inspections provide data for performance trending, are an input to work planning and prioritization process, and are communicated in the System Health Reports and System Performance Monitoring Indicators. Plant-specific operating experience since 2000 was reviewed to ensure that the operating experience discussed in the corresponding NUREG-1801 aging management program is bounding, i.e., that there is no unique plant-specific operating experience in addition to that described in NUREG-1801. The review also showed that the Plant Health and Performance Monitoring Program had been effective in maintaining the condition of component internal surfaces.

2. In 2007, during maintenance activities, the threaded tube end plugs on the component cooling water pump room cooler were found to have a loss of material due to corrosion. None of the plugs were leaking. An evaluation determined that 125 plugs would be replaced, future inspections of the room cooler coils would include inspection of tube plugs for loss of material due to corrosion, and results of future plug inspections would be documented on a specified form by engineering. Later in 2007, the other cooler was inspected and the results were used to create a recommended replacement frequency of 15 years for the plugs. An additional corrective action was to ensure a continuous on-site availability of enough plugs to replace all the plugs in each room cooler.

Internal inspections conducted during maintenance activities and surveillance testing and the Plant Health and Performance Monitoring Program have been effective in maintaining the condition of component internal surfaces. Occurrences that would be identified under the Internal Surfaces in Miscellaneous Piping and Ducting Components program will be evaluated to ensure there is no significant impact to safe operation of the plant and corrective actions will be taken to prevent recurrence. Guidance for re-evaluation, repair, or replacement is provided for locations where aging is found. There is confidence that the implementation of the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program will effectively identify aging prior to loss of intended function.

Industry and plant-specific operating experience will be evaluated in the development and implementation of this program.

Conclusion

The implementation of the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program will provide reasonable assurance that aging effects will be managed such that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B2.1.24 Lubricating Oil Analysis

Program Description

The Lubricating Oil Analysis program manages oil environments in order to prevent loss of material and reduction of heat transfer. The program does not manage component surfaces directly, but maintains lubricating oil contaminants (primarily water and particulates) within acceptable limits, thereby preserving an environment that is not conducive to loss of material or reduction of heat transfer.

The Lubricating Oil Analysis program provides sampling, analysis, and condition monitoring activities in order to identify detrimental contaminants, such as water, particulates, and specific wear elements. Water and particulate contaminant levels are trended, and recommendations are made when adverse trends are observed, including in-leakage and corrosion product build-up. Sampling frequencies and acceptance criteria for water and particulate concentrations are consistent with vendor and industry guidelines. Corrective actions are initiated when the component’s oil sample has phase separated water in any amount or water content exceeds an establish target value.

The One-Time Inspection program (B2.1.18) will be used to verify the effectiveness of the Lubricating Oil Analysis program.

NUREG-1801 Consistency

The Lubricating Oil Analysis program is an existing program that, following enhancement, will be consistent with NUREG-1801, Section XI.M39, *Lubricating Oil Analysis*.

Exceptions to NUREG-1801

None

Enhancements

Prior to the period of extended operation, the following enhancements will be implemented in the following program elements:

Scope of Program (Element 1)

Procedures will be enhanced to indicate that lubricating oil contaminants are maintained within acceptable limits, thereby preserving an environment that is not conducive to loss of material or reduction of heat transfer.

Detection of Aging Effects (Element 4) and Acceptance Criteria (Element 6)

Procedures will be enhanced to state the testing standards for water content and particle count.

Acceptance Criteria (Element 6)

Procedures will be enhanced to state that phase separated water in any amount is not acceptable.

Operating Experience

The following discussion of operating experience provides objective evidence that the Lubricating Oil Analysis program will be effective in ensuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation:

1. In 2004, during an analysis of the auxiliary feedwater pump turbine lubricating oil, the oil sample from the reservoir was found to contain elevated water content (over 5000 ppm). The cause was a turbine steam leak from the outboard gland casing that migrated into the lube oil system. The steam leak was repaired, and the oil quality was restored through an oil change.

2. In 2005, during a routine oil analysis on the turbine driven auxiliary feedwater pump, the particle count and silicon levels were found to be above the acceptable ranges. An evaluation could not determine the origin of the dust or dirt contaminant ingression. One potential cause was the vented filler cap allowing dust stirred up by nearby work. The oil was determined to be able to continue to provide acceptable lubrication, as demonstrated by the viscosity, lack of water, and lack of other contaminants. Vibration test results were reviewed, and no bearing degradation was evident. The pump was determined to be qualified for continued use after bearing reservoir draining and flushing. There has not been a reoccurrence of dust or dirt contamination in the turbine driven auxiliary feedwater pump lubricating oil.

3. In 2009, during a routine analysis of the turbine driven auxiliary feedwater pump lubricating oil, the oil sample on the outboard bearing reservoir was observed to be dark due to an elevated iron content. The cause was determined to be an improperly installed bearing retainer ring. The ring was subsequently installed correctly.

4. In 2009, routine oil samples indicated viscosity of the safety injection pump was increasing. The condition was documented and the oil was replaced.

The Lubricating Oil Analysis program operating experience provides objective evidence that the program is capable of monitoring lubricating oils to preserve an environment that is not conducive to aging effects. Occurrences that would be identified under the Lubricating Oil Analysis program will be evaluated to ensure there is no significant impact to safe operation of the plant and corrective actions will be taken to prevent recurrence. Guidance for re-evaluation, repair, or replacement is provided for locations where aging is found. There is confidence that the continued implementation of the Lubricating Oil Analysis program will effectively identify aging prior to loss of intended function.

Conclusion

The continued implementation of the Lubricating Oil Analysis program, following enhancement, supplemented by the One-Time Inspection program (B2.1.18), provides reasonable assurance that aging effects will be managed such that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B2.1.25 Buried and Underground Piping and Tanks

Program Description

The Buried and Underground Piping and Tanks program manages loss of material, cracking, blistering, and changes in color of external surfaces of buried and underground piping and tanks. The program augments other programs that manage the aging of internal surfaces of buried and underground piping and tanks. The materials managed by this program include steel, stainless steel and high-density polyethylene. The program manages aging through preventive, mitigative, and inspection activities.

Preventive and mitigative actions include the selection of component materials, external coatings for corrosion control, backfill quality control, and the application of cathodic protection. Inspection activities may include electrochemical verification of the effectiveness of cathodic protection, nondestructive evaluation of pipe and tank wall thicknesses, and visual inspections of pipe and tank exterior surfaces, as permitted by opportunistic or directed excavations. The fire protection system jockey pump is monitored to identify changes in jockey pump activity.

Direct visual inspections will be performed on buried steel, stainless steel, and high density polyethylene piping and carbon steel tanks. Inspection locations will be selected based on susceptibility to degradation and consequences of failure. A minimum of 10 feet of pipe of each material type must be inspected. The inspection will consist of a 100 percent visual inspection of the exposed pipe. If adverse indications are detected, inspection sample sizes within the affected piping categories are doubled. If adverse indications are found in the expanded sample, further increases in inspection sample size would be based on an analysis of extent of cause and extent of condition. Visual inspections will be supplemented with surface or volumetric nondestructive testing (NDT) if significant indications are observed, to determine local area wall thickness.

Direct visual inspections will be performed on underground stainless steel and high density polyethylene piping and valves to detect external corrosion. Inspection locations will be selected based on susceptibility to degradation and consequences of failure.

Inspections will begin during the 10-year period prior to entering the period of extended operation. Upon entering the period of extended operation, inspections will occur every 10 years.

The internal surfaces of buried and underground piping and tanks are managed through other programs. Internal surfaces may be managed by the Open-Cycle Cooling Water System (B2.1.10), Closed Treated Water Systems (B2.1.11), Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.23), Fuel Oil Chemistry (B2.1.16), Fire Water System (B2.1.14) or Water Chemistry (B2.1.2) programs. The Selective Leaching program (B2.1.19) works in conjunction with this program to manage buried or underground components subject to selective leaching.

NUREG-1801 Consistency

The Buried and Underground Piping and Tanks program is a new program that, when implemented, will be consistent with exception to NUREG-1801, Section XI.M41, *Buried and Underground Piping and Tanks*.

Exceptions to NUREG-1801

<u>Program Elements Affected:</u>

Preventive Actions (Element 2)

NUREG-1801, Section XI.M41, Table 2a, Note 6 states that for polymeric piping, backfill is acceptable if the inspections conducted by this program do not reveal evidence of mechanical damage to buried pipe coatings due to backfill. However the high-density polyethylene (HDPE) piping at Callaway is not coated, nor does NUREG-1801 Section XI.M41 Table 2a require HDPE piping to be coated. The HDPE piping at Callaway is backfilled with controlled low strength materials (flowable fill) that uses fine aggregate consistent with ASTM C33. NUREG-1801, Section XI.M41, Table 2a, Note 6 states that the use of flowable fill meets the backfill objectives of SP0169-2007.

Detection of Aging Effects (Element 4)

NUREG-1801, Section XI.M41.4.c.iv states that underground pipe shall be inspected by a volumetric technique such as UT to detect internal corrosion. As mentioned in the NUREG-1801 program description, other aging management programs are used to manage the internal surface of buried components. Therefore, ultrasonic testing of underground piping to detect internal corrosion is not included in this program.

NUREG-1801, Section XI.M41.4.f.iv states that if adverse indications are found in the expanded sample, the inspection sample size is again doubled. This doubling of the inspection sample size continues as necessary. If adverse indications are found in the expanded sample at Callaway, further increases in inspection sample size would be based on an analysis of extent of cause and extent of condition.

Enhancements

None

Operating Experience

The following discussion of operating experience provides objective evidence that the Buried and Underground Piping and Tanks program will be effective in ensuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation:

1. In the winter of 2005, an alarm was triggered for fire protection loop jockey pump excessive run time and an investigation was initiated. The location of the leak was determined and promptly isolated from the main fire water loop. The isolation of the leak did not affect any required suppression systems. The leak was promptly repaired and the fire water piping was returned to service.

2. Prior to Refuel 15 (Spring 2007), Close Interval Surveys (CIS) were performed on various tanks and associated piping systems to identify cathodic protection effectiveness. The CIS testing measures cathodic protection levels along the pipeline at approximately 2.5 foot intervals. These surveys were performed on the following structures and components within the scope of license renewal: emergency fuel oil storage tanks, fire water storage tank bottoms, ESW system piping, and condensate storage tank piping. The results indicated that emergency fuel oil storage tanks, condensate storage tank piping, and one quadrant of the fire water storage tank, were not meeting the 850mV polarization potential criterion of the National Association of Corrosion Engineers (NACE). Corrective actions were taken to correct these deficiencies by adjusting the cathodic protection where possible. In some instances the cathodic protection system could not be adjusted to correct a condition. Cathodic protection system refurbishment and modifications are planned in areas where the system does not meet the NACE criteria.

3. From 2008 to 2009, the underground portions of the ESW supply from the ESW pump house and return to the ultimate heat sink cooling tower were replaced with HDPE piping. In addition, sections of above ground or underground carbon steel piping that interfaces with the buried piping was replaced with stainless steel piping. These modifications were performed as a result of the material condition of the ESW system. These modifications were performed as a result of corrective action documents that have been written concerning pinhole leaks, pitting, and other localized degradation of the ESW piping system.

4. In the summer of 2011, the annual cathodic protection survey was performed. Several locations in the fire water system had a negative potential below the NACE criteria of 850 mV. Modification and refurbishment of the cathodic protection system will address areas of low negative potential identified during the annual survey and the CIS described above.

5. Due to industry operating experience with buried condensate system piping, Callaway reviewed cathodic protection records related to the buried carbon steel piping for the condensate storage tank to determine if the external corrosion control provided for this piping was adequate. The review of the cathodic protection for this line found that the negative potential was below the NACE criteria. The cathodic protection system will be refurbished/modified in areas where it does not meet the NACE criteria. The buried portion of the condensate storage tank suction line will be inspected prior to the period of extended operation.

Inspection and preventive measures that will be implemented by the Buried and Underground Piping and Tanks program will be effective in managing aging of underground and buried components. Occurrences that would be identified under the Buried and Underground Piping and Tanks program will be evaluated to ensure there is no significant impact to safe operation of the plant and corrective actions will be taken to prevent recurrence. Guidance for re-evaluation, repair, or replacement is provided for locations where aging is found. There is confidence that the implementation of the Buried and Underground Piping and Tanks program will effectively identify aging prior to loss of intended function.

Industry and plant-specific operating experience will be evaluated in the development and implementation of this program.

Conclusion

The implementation of the Buried and Underground Piping and Tanks program will provide reasonable assurance that aging effects will be managed such that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B2.1.26 ASME Section XI, Subsection IWE

Program Description

The ASME Section XI, Subsection IWE program manages cracking, loss of material, loss of sealing, loss of preload, and loss of leak tightness by providing aging management of the steel liner of the concrete containment building. IWE inspections are performed in order to identify and manage containment liner aging effects that could result in loss of intended function. Included in this inspection program are the containment liner plate and its integral attachments, containment hatches and airlocks, and pressure retaining bolting. Acceptance criteria for components subject to IWE examination requirements are specified in Article IWE 3000.

Surface and volumetric examinations are performed to identify indications of degradation. The primary inspection method is a general visual examination (VT-3 and VT-1). Ultrasonic thickness measurements are performed, as required. All areas requiring augmented examination per criteria IWE 1240 and IWE 2420 receive a detailed visual inspection.

For the second containment inspection interval commencing December 1, 2008, Callaway performs IWE containment inservice inspections in accordance with the 2001 Edition of ASME Section XI, Subsection IWE (through the 2003 addenda), supplemented with the applicable requirements of 10 CFR 50.55a(b)(2)(ix). This program is consistent with provisions in 10 CFR 50.55a that specify use of the ASME Code edition in effect 12 months prior to the start of the inspection interval. Callaway will use the ASME Code edition consistent with the provisions of 10 CFR 50.55a during the period of extended operation.

Containment seals and gaskets are included in the scope of the 10 CFR Part 50, Appendix J program (B.2.1.29). Service Level 1 coatings are included in the scope of the Protective Coating Monitoring and Maintenance Program (B.2.1.33).

NUREG-1801 Consistency

The ASME Section XI, Subsection IWE program is an existing program that, following enhancement, will be consistent with NUREG-1801, *Section XI.S1, ASME Section XI, Subsection IWE*.

Exceptions to NUREG-1801

None

Enhancements

Prior to the period of extended operation, the following enhancements will be implemented in the following program elements:

Preventive Actions (Element 2)

Procedures will be enhanced to specify that whenever replacement of bolting is required, bolting material, installation torque or tension, and use of lubricants and sealants are in accordance with the guidelines of EPRI NP 5769, EPRI TR 104213, and the additional recommendations of NUREG-1339.

Detection of Aging Effects (Element 4)

Procedures will be enhanced to perform additional surface examinations of stainless steel penetration sleeves, dissimilar metal welds, bellows, and steel components that are subject to cyclic loading for cracking, unless Appendix J testing is adequate to identify cracking.

Operating Experience

The following discussion of operating experience provides objective evidence that the ASME Section XI, Subsection IWE program will be effective in ensuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation:

1. Exams are conducted every other refueling outage to meet the frequency requirements of once per period of 3-1/3 years. Recent examination results for the containment liner identified a weld defect in normal sump B that required an augmented examination during the next inspection period. The weld defect resulted in a pin-hole leak in the stainless steel sump liner plate. Engineering evaluation determined that the liner plate is not considered a strength element of the containment structure and further evaluation determined that the leak did not prevent the sump from performing its intended function. The results of this evaluation were documented in the plant corrective action program. The augmented examinations were completed in the first period of the second interval and the weld defect has been repaired.

2. Based on a review of 10 years of Callaway operating experience, no significant degradation or corrosion of the components of the containment liner have been identified. In 2002, five areas were identified that did not meet the acceptance criteria. Areas of minor surface corrosion were identified on the containment building liner plate, randomly spaced along the circumference of the building. No pitting of the liner plate was identified. Repairs of these areas have been completed. The Callaway operating experience findings are consistent with those identified in NUREG-1801.

The above examples provide objective evidence that the ASME Section XI, Subsection IWE program is capable of both monitoring and detecting the aging effects associated with the program. Occurrences that would be identified under the ASME Section XI, Subsection IWE program will be evaluated to ensure there is no significant impact to safe operation of the plant and corrective actions will be taken to prevent recurrence. Guidance for re-evaluation, repair, or replacement is provided for locations where aging is found. There is confidence that the continued implementation of the ASME Section XI, Subsection IWE program will effectively identify aging prior to loss of intended function.

Conclusion

The continued implementation of the ASME Section XI, Subsection IWE program, following enhancement, provides reasonable assurance that aging effects will be managed such that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B2.1.27 ASME Section XI, Subsection IWL

Program Description

The ASME Section XI, Subsection IWL program manages the following aging effects of the concrete containment building and post-tensioned system:

- Cracking
- Cracking, loss of bond, and loss of material (spalling, scaling)
- Increase in porosity and permeability, cracking, loss of material (spalling, scaling)
- Increase in porosity and permeability, loss of strength
- Loss of material
- Loss of material (spalling, scaling) and cracking

For the current inspection interval, Callaway performs IWL Containment Inservice Inspections (CISIs) in accordance with the 2001 Edition of ASME Section XI, Subsection IWL (including 2002 and 2003 addenda), supplemented with the applicable requirements of 10 CFR 50.55a(b)(2). This program is consistent with provisions in 10 CFR 50.55a that specify use of the ASME Code edition in effect 12 months prior to the start of the inspection interval. Callaway will use the ASME Code edition consistent with the provisions of 10 CFR 50.55a during the period of extended operation.

The ASME Section XI, Subsection IWL inspections are performed in order to identify and manage containment concrete aging effects that could result in loss of intended function. Included in this inspection program are the concrete containment structure (includes all accessible areas of the concrete dome, cylinder walls, and buttresses) and the post-tensioning system (includes tendons, end anchorages, and concrete surfaces around the end anchorages). A summary of the containment concrete components at Callaway, the examinations required, and a detailed schedule of examinations for items subject to IWL inspections are provided in plant procedures. The primary inspection method is a visual examination, supplemented by testing. Tendon wires are tested for yield strength, ultimate tensile strength, and elongation. Tendon corrosion protection medium is analyzed for alkalinity, water content, and soluble ion concentrations. Any free water contained in the anchorage end cap and free water which drains from tendons during the examination is documented. Samples of the free water are also analyzed for pH. Prestressing forces are measured in selected sample tendons. Evaluation of prestressing forces is addressed in Concrete Containment Tendon Prestress program (B3.3). Acceptance criteria, corrective actions, and expansion of the inspection scope when degradation exceeding the acceptance criteria is found, are in accordance with ASME Section XI, Subsection IWL.

Post-tensioning system repair/replacement activities and the augmented examination requirements following post-tensioning system repair/replacement activities are in accordance with ASME Section XI, Subsection IWL.

In conformance with 10 CFR 50.55a(g)(4)(ii), the Callaway CISI program will be updated during each successive 120-month inspection interval to comply with the requirements of the latest edition and addenda of the Code specified 12 months before the start of the inspection interval.

NUREG-1801 Consistency

The ASME Section XI, Subsection IWL program is an existing program that is consistent with NUREG-1801, Section XI.S2, *ASME Section XI, Subsection IWL*.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

The following discussion of operating experience provides objective evidence that the ASME Section XI, Subsection IWL program will be effective in ensuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation:

1. The 15th year tendon surveillance began in May 1999 and was completed in June 1999. Based on the data gathered during the 1999 physical surveillance and visual inspection, the conclusion was reached that no abnormal degradation of the post tensioning system had occurred at the Callaway containment building.

2. The 20th year tendon surveillance began in July 2004 and was completed in September 2004. All tendons were resealed and regreased. One tendon accepted less grease than was removed, and one tendon accepted more than 10 percent of the tendon duct volume. Nonconformance reports were written to record these findings and these conditions were found to be acceptable by engineering evaluation, as allowed by ASME Section XI, Subsection IWL-3310. Based on these evaluations and the other data gathered during the 2004 physical surveillance and visual inspection, the conclusion was reached that no abnormal degradation of the post tensioning system had occurred at the Callaway containment building.

3. The 25th year tendon surveillance began in March 2010 and was completed in April 2010. Sample wires were removed from one tendon in each group for physical testing. The test results on one of the wire samples indicated elongation values under the minimum prescribed in Callaway specifications. A nonconformance report was written to

record this finding, and this condition was found to be acceptable by engineering evaluation, as allowed by ASME Section XI, Subsection IWL-3310. Based on this evaluation and the other data gathered during the 2010 physical surveillance and visual inspection, the conclusion was reached that no abnormal degradation of the post tensioning system had occurred at the Callaway containment building.

The above examples provide objective evidence that the ASME Section XI, Subsection IWL program is capable of both monitoring and detecting the aging effects associated with the program. Occurrences that would be identified under the ASME Section XI, Subsection IWL program will be evaluated to ensure there is no significant impact to safe operation of the plant and corrective actions will be taken to prevent recurrence. Guidance for re-evaluation, repair, or replacement is provided for locations where aging is found. There is confidence that the continued implementation of the ASME Section XI, Subsection IWL program will effectively identify aging prior to loss of intended function.

Conclusion

The continued implementation of the ASME Section XI, Subsection IWL program provides reasonable assurance that aging effects will be managed such that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B2.1.28 ASME Section XI, Subsection IWF

Program Description

The ASME Section XI, Subsection IWF program manages loss of material, cracking, fatigue, loss of preload, and loss of mechanical function for supports of Classes 1, 2, and 3 piping and components. There are no Class MC supports at Callaway. The program conforms to Inspection Program B of ASME Section XI.

During the third inservice inspection interval (December 2004 to December 2014), Callaway is performing inspections of supports for Class 1, 2, and 3 piping and components in accordance with 1998 Edition with 2000 addenda of ASME Section XI. In conformance with 10 CFR 50.55a(g)(4)(ii), the Callaway ISI program is updated during each successive 120 month inspection interval to comply with the requirements of the latest edition and addenda of the Code specified 12 months before the start of the inspection interval. Callaway will use the ASME Code edition consistent with the provisions of 10 CFR 50.55a during the period of extended operation.

Supports for Class 1, 2, and 3 piping and components are selected for examination per the requirements of ASME Section XI, Subsection IWF.

Acceptance standards are specified in Article IWF 3400. Scope of the inspection for supports is based on class and total population as defined in Table IWF 2500-1. When a component support requires corrective measures in accordance with the provisions of IWF 3000, that support is reexamined during the next inspection period. When the reexaminations do not require additional corrective measures during the next inspection period, the inspection schedule reverts to the requirements of the original inspection program. Component support examinations that detect flaws or relevant conditions exceeding the acceptance criteria of IWF 3400 are extended to include additional examinations in accordance with IWF 2430. Callaway also implements, as needed, Code Case N-586 which prescribes alternative additional examination requirements of Class 1, 2, and 3 Piping, Components and Supports.

The ASME Section XI, Subsection IWF program provides a systematic method for periodic examination of supports for Class 1, 2, and 3 piping and components. The primary inspection method is visual examination. The instructions and acceptance criteria for the visual examinations are included in Callaway plant procedures.

NUREG-1801 Consistency

The ASME Section XI, Subsection IWF program is an existing program that, following enhancement, will be consistent with NUREG-1801, Section XI.S3, *ASME Section XI Subsection IWF*.

Exceptions to NUREG-1801

None

Enhancements

Prior to the period of extended operation, the following enhancements will be implemented in the following program element:

Preventive Actions (Element 2)

Procedures will be enhanced to specify that whenever replacement of bolting is required, bolting material, installation torque or tension, and use of lubricants and sealants are in accordance with the applicable EPRI guidelines, ASTM standards, AISC specifications, and NUREG recommendations to prevent or mitigate degradation and failure of safety-related bolting due to stress corrosion cracking.

Parameters Monitored or Inspected (Element 3) and Detection of Aging Effects (Element 4)

Procedures will be enhanced to specify that, in addition to VT-3 examination, high strength bolting (actual measured yield strength greater than or equal to 150 ksi) in sizes greater than 1 in. nominal diameter, shall receive a volumetric examination comparable to that of ASME Code Section XI, Table IWB-2500-1, Examination Category B-G-1 to detect cracking.

Operating Experience

The following discussion of operating experience provides objective evidence that the ASME Section XI, Subsection IWF program will be effective in ensuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation:

1. Review of the Owner Activity Reports since 2000 indicates there have been no conditions found through IWF inspections which required repair, replacement, or engineering evaluation during this period. Callaway inspected 100% of the supports required per examination category F-A for the past inspection interval and found no signs of aging.

The above review provides objective evidence that the ASME Section XI, Subsection IWF program is capable of both monitoring and detecting the aging effects associated with the program. Occurrences that would be identified under the ASME Section XI, Subsection IWF program will be evaluated to ensure there is no significant impact to safe operation of the plant and corrective actions will be taken to prevent recurrence. Guidance for re-evaluation, repair, or replacement is provided for locations where aging is found. There is confidence the continued implementation of the ASME Section XI, Subsection IWF program will effectively identify aging prior to loss of intended function.

Conclusion

The continued implementation of the ASME Section XI, Subsection IWF program, following enhancement, provides reasonable assurance that aging effects will be managed such that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B2.1.29 10 CFR Part 50, Appendix J

Program Description

The 10 CFR Part 50 Appendix J program manages cracking, loss of material, loss of leak tightness, loss of sealing, and loss of preload to ensure leakage through the primary containment, and systems and components penetrating the primary containment, does not exceed allowable leakage rate limits specified in the Technical Specifications. The 10 CFR Part 50 Appendix J program does not prevent degradation due to aging effects but provides measures for monitoring to detect the degradation prior to the loss of intended function. Periodic monitoring of leakage from the containment, containment isolation valves, and containment penetrations ensures proper maintenance and repairs can be performed prior to the loss of intended function. The 10 CFR Part 50 Appendix J program establishes compliance with the regulations and guidance provided in 10 CFR Part 50 Appendix J, *Primary Reactor Containment Leakage Testing for Water Cooled Power Reactors (Option B)*; NRC Regulatory Guide 1.163, *Performance-Based Containment Leak-Test Program*; NEI 94-01, *Industry Guideline for Implementing Performance Based Option of 10 CFR Part 50 Appendix J*; and ANSI/ANS 56.8, *Containment System Leakage Testing Requirements*.

As part of the Integrated Leak Rate Test (ILRT) pretest requirements, general inspection of the accessible interior and exterior surfaces of the containment structures and components for evidence of structural deterioration which may affect either the containment structural integrity or leaktightness is made. These examinations are conducted prior to initiating a Type A test, and during two other refueling outages before the next Type A test, if the interval for the Type A test has been extended to 10 years. Any evidence of structural deterioration is corrected before the Type A test is performed.

NUREG-1801 Consistency

The 10 CFR Part 50 Appendix J program is an existing program that is consistent with NUREG-1801, Section XI.S4, *10 CFR Part 50 Appendix J*.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

The following discussion of operating experience provides objective evidence that the 10 CFR Part 50, Appendix J program will be effective in ensuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation:

1. The primary containment Type A leak rate test results measured the as-left leakage in 1999 to be 0.0577 wt%/day which is approximately 29 percent of the technical specification limit of 0.2 wt%/day. This shows that equipment is being adequately maintained and that equipment maintenance has been capable of creating a significant safety margin between the technical specifications allowable limits and the as-tested values. The test results show the effects of aging are effectively being managed for the primary containment boundary.

2. The total maximum path leakage results for Types B and C tests, in terms of standard cubic centimeters per minute (SCCM), was 107,308.6 SCCM in 2008 and 79,208.5 in 2010. The total maximum path leakage results for 2008 were approximately 43 percent of the technical specification limit of 252,028 SCCM. The 2010 results were approximately 31 percent of the technical specification limit. This shows that equipment is being adequately maintained and that equipment maintenance has been capable of creating a significant safety margin between the technical specifications allowable limits and the as-tested values. The test results show the effects of aging are being managed for the primary containment boundary.

The above examples provide objective evidence that the 10 CFR Part 50, Appendix J program is capable of both monitoring and detecting the aging effects associated with the program. Occurrences that would be identified under the 10 CFR Part 50, Appendix J program will be evaluated to ensure there is no significant impact to safe operation of the plant and corrective actions will be taken to prevent recurrence . Guidance for re-evaluation, repair, or replacement is provided for locations where aging is found. There is confidence that the continued implementation of the 10 CFR Part 50, Appendix J program will effectively identify aging prior to loss of intended function. Guidance for re-evaluation, repair, or replacement is provided for locations where aging is found. There is confidence the continued implementation of the 10 CFR Part 50, Appendix J program will effectively identify aging prior to loss of intended function.

Conclusion

The continued implementation of the 10 CFR Part 50, Appendix J program provides reasonable assurance that aging effects will be managed such that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B2.1.30 Masonry Walls

Program Description

The Masonry Walls program manages cracking of masonry walls. The Masonry Walls program, is integrated and administered as part of the Structures Monitoring program (B2.1.31) that implements structures monitoring requirements as specified by 10 CFR 50.65 (Maintenance Rule). In Seismic Category I structures, masonry walls are within scope of license renewal based on guidance provided in NRC Bulletin 80-11, *Masonry Wall Design* and NRC Information Notice 87-67, *Lessons Learned from Regional Inspections of Licensee Actions in Response to NRC IE Bulletin 80-11*. Some masonry walls in Non-Category I structures are within the scope of license renewal based on FSAR commitments to satisfy fire protection requirements. The guidance of NRC Bulletin 80-11 does not apply to these walls. Refer to the Fire Protection program (B2.1.13) for aging management of the masonry wall fire barriers intended function.

The Masonry Walls program contains inspection guidelines and lists attributes that cause aging of masonry walls, which are to be monitored during structural monitoring inspections, as well as establishes examination criteria, evaluation requirements, and acceptance criteria. The provisions of the program are consistent with the guidance provided in NRC Information Notice 87-67 for inspections and evaluation of masonry wall cracking in Category I structures not addressed in the evaluation basis in response to NRC Bulletin 80-11.

Concrete masonry unit (CMU) walls in proximity to safety-related systems and equipment such that wall failure could adversely affect the safety-related systems or equipment are designed as reinforced CMU walls, and/or restrained with steel framing provided on both faces of the walls to prevent collapse of the units. Removable CMU walls, which are built with masonry or concrete units stacked without any grouting or reinforcing, are also restrained with steel framing on both faces of the wall.

NUREG-1801 Consistency

The Masonry Walls program is an existing program that is consistent with NUREG-1801, Section XI.S5, *Masonry Walls*.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

The following discussion of operating experience provides objective evidence that the Masonry Walls program, which is included in the Structures Monitoring program, will be effective in ensuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation:

1. At Callaway, aging effects identified during the structures monitoring inspections are documented in Callaway Action Requests and corrective actions are taken prior to any loss of intended functions. A review of the structures monitoring inspection reports from the last 10 years has indicated that in-scope concrete masonry unit walls are in good condition. Isolated instances of cracking masonry walls such as in the lube oil storage tank room of the turbine building have been noticed, but none severe enough to warrant corrective action at the time of the inspection. Such minor degradations are evaluated, recorded for trending purposes, and tagged for future inspections in the area.

The above example provides objective evidence that the Masonry Walls program is capable of both monitoring and detecting the aging effects associated with the program. Occurrences that would be identified under the Masonry Walls program will be evaluated to ensure there is no significant impact to safe operation of the plant and corrective actions will be taken to prevent recurrence. Guidance for re-evaluation, repair, or replacement is provided for locations where aging is found. There is confidence that the continued implementation of the Masonry Walls program will effectively identify aging prior to loss of intended function. Guidance for re-evaluation, repair, or replacement is provided for locations where aging is found. There is confidence the continued implementation of the Masonry Walls program will effectively identify aging prior to loss of intended function.

Conclusion

The continued implementation of the Masonry Walls program provides reasonable assurance that aging effects will be managed such that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B2.1.31 Structures Monitoring

Program Description

The Structures Monitoring program (SMP) monitors the condition of structures and structural supports that are within the scope of license renewal to manage the following aging effects:

- Concrete cracking and spalling
- Cracking
- Cracking and distortion
- Cracking, blistering, change in color
- Cracking, loss of material
- Cracking, loss of bond, and loss of material (spalling, scaling)
- Increase in porosity and permeability, cracking, loss of material (spalling, scaling)
- Increase in porosity and permeability, loss of strength
- Loss of material
- Loss of material (spalling, scaling) and cracking
- Loss of mechanical function
- Loss of preload
- Loss of sealing
- Reduction in concrete anchor capacity

Structural bolts greater than one inch in diameter with actual measured yield strength greater than or equal to 150 ksi are evaluated for susceptibility to stress corrosion cracking, and, if necessary, visual inspections are supplemented with volumetric or surface examinations. Plant procedures, following enhancements, will specify that whenever replacement of bolting is required, bolting material, installation torque or tension, and use of lubricants and sealants are in accordance with the guidelines of EPRI NP-5769, *Degradation and Failure of Bolting in Nuclear Power Plants*, EPRI NP-5067, *Good Bolting Practices, A Reference Manual for Nuclear Power Plant Maintenance Personnel*, EPRI TR-104213, *Bolted Joint Maintenance & Application Guide*, and the additional recommendations of NUREG-1339, *Resolution of Generic Safety Issue 29: Bolting Degradation or Failure in Nuclear Power Plants*.

The SMP implements the requirements of 10 CFR 50.65, *Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants*, consistent with guidance of NUMARC 93-01, *Industry Guidelines for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants*, Revision 2 and Regulatory Guide 1.160, *Monitoring the Effectiveness of Maintenance at Nuclear Power Plants*, Revision 2.

The SMP provides inspection guidelines and walk-down checklists for structural steel, roof systems, reinforced concrete, masonry walls and metal siding. Electrical duct banks and manholes, valve pits, access vaults, and structural supports are inspected as part of the SMP. Callaway is committed to NRC Regulatory Guide 1.127, *Inspection of Water-Control Structures Associated with Nuclear Power Plants* and the scope of the SMP includes water-control structures. The scope of SMP also includes masonry walls. Callaway has a settlement monitoring program that monitors settlement for each major structure utilizing geotechnical monitoring techniques.

Groundwater is monitored for pH, chlorides and sulfates every five years, and the results are evaluated by engineering to assess the impact, if any, on below grade structures.

Callaway does not take credit for any coatings to manage the aging of structural components and coating degradation is used only as an indicator of the condition of underlying material.

NUREG-1801 Consistency

The Structures Monitoring program is an existing program that, following enhancement, will be consistent with NUREG-1801, Section XI.S6, *Structures Monitoring*.

Exceptions to NUREG-1801

None

Enhancements

Prior to the period of extended operation, the following enhancements will be implemented in the following program elements:

Scope of the Program (Element 1)

Procedures will be enhanced to include the main access facility into the scope of Structures Monitoring program.

Preventive Actions (Element 2)

Plant procedures will be enhanced to specify that whenever replacement of bolting is required, bolting material, installation torque or tension, and use of lubricants and sealants are in accordance with the guidelines of EPRI NP-5769, EPRI NP-5067, EPRI TR-104213, and the additional recommendations of NUREG-1339.

Plant procedures will be enhanced to specify the preventive actions for storage, lubricants, and stress corrosion cracking potential discussed in Section 2 of Research Council for Structural Connections publication Specification for Structural Joints Using ASTM A325 or A490 Bolts for ASTM A325, ASTM F1852, and/or ASTM A490 structural bolts.

Scope of the Program (Element 1) and Parameters Monitored or Inspected (Element 3)

Procedures will be enhanced to specify inspections of penetrations, transmission towers, electrical conduits, raceways, cable trays, electrical cabinets/enclosures, and associated anchorages.

Procedures will be enhanced to specify that groundwater is monitored for pH, chlorides and sulfates, and every five years at least two samples are tested and the results are evaluated by engineering to assess the impact, if any, on below grade structures.

Parameters Monitored or Inspected (Element 3)

Procedures will be enhanced to specify that structural bolts greater than one inch in diameter with actual measured yield strength greater than or equal to 150 ksi are evaluated for susceptibility to stress corrosion cracking, and, if necessary, visual inspections are supplemented with volumetric or surface examinations.

Detection of Aging Effects (Element 4)

Procedures will be enhanced to specify inspector qualifications in accordance with ACI349.3R-96.

Acceptance Criteria (Element 6)

Procedures will be enhanced to quantify acceptance criteria and critical parameters for monitoring degradation, and to provide guidance for identifying unacceptable conditions requiring further technical evaluation or corrective action.

Procedures will be enhanced to incorporate applicable industry codes, standards and guidelines for acceptance criteria.

Operating Experience

The following discussion of operating experience provides objective evidence that the Structures Monitoring program will be effective in ensuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation:

1. A review of the most recent structure inspection reports show minor instances of cracking in concrete, corrosion in structural steel, and elastomeric degradation in various building structures which have been evaluated per acceptance criteria and with corrective action taken as needed. The northeast corner of the ‘A' emergency diesel generator fuel vault exterior exhibited some cracking in 2010, which is not severe enough to warrant corrective action at this time but is tracked for trending purposes. The most recent reactor building inspection report (2010) cites instances of corrosion of structural steel, supports, and cable trays due to condensation.

2. Fuel building structural inspection report (2002) identified an instance of cracking on the interior face of the exterior wall, with leachate observed coming through the crack. Engineering evaluation determined this leaking was not severe enough to warrant corrective action. Inspections performed in 2010 did not identify any further cracking or leaking of leachate in this area. Minor cracking on the exterior of fuel building plant south and west wall was identified and no water leakage, either active or inactive, was observed.

   Callaway performs continuous monitoring of the spent fuel pool liner leak chase channels. A standpipe with automatic drain controls is used to measure the fuel pool leak rate and periodic updates of the leak rate are provided by the plant computer. The observed leakage has been small and remained steady. The leakage rate is small at approximately 0.119 gal/day, and does not challenge makeup capability. The exterior spent fuel pool walls show no evidence of external leakage, thus indicating that the leakage is contained within the leak chase channels and that there is no effect upon the structural integrity of the spent fuel pool.

3. Groundwater has been sampled monthly since November, 2009. With exception of two monitoring wells, pH, chlorides and sulfate concentrations have been within the prescribed limits for non-aggressive ground water/soil. These two wells are located north of the turbine building and adjacent to plant roads. The wells' high chloride levels can be attributed to the use of winter road salts. These two well locations have shown seasonal increases in chloride levels of up to 680 mg/L while the pH and sulfate concentrations have remained non-aggressive. Callaway will continue to monitor the results from the groundwater samples and will perform an engineering evaluation to determine if any adverse aging effects have occurred in any inaccessible concrete structural elements.

The above examples provide objective evidence that the Structures Monitoring program is capable of both monitoring and detecting the aging effects associated with the program. Occurrences that would be identified under the Structures Monitoring program will be evaluated to ensure there is no significant impact to safe operation of the plant and corrective actions will be taken to prevent recurrence. Guidance for re-evaluation, repair, or replacement is provided for locations where aging is found. There is confidence that the continued implementation of the Structures Monitoring program will effectively identify aging prior to loss of intended function.

Conclusion

The continued implementation of the Structures Monitoring program, following enhancement, provides reasonable assurance that aging effects will be managed such that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B2.1.32 RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants

Program Description

The RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants program, which is implemented as part of the Structures Monitoring program (SMP), manages the following aging effects:

- Cracking; loss of bond; and loss of material (spalling, scaling)
- Increase in porosity and permeability; loss of strength
- Loss of material
- Loss of material (spalling, scaling) and cracking
- Loss of material; loss of form

The scope of this program also includes structural steel and structural bolting associated with water-control structures. SNUPPS-Callaway positions are compliant with that of Regulatory Guide 1.127 with respect to the ultimate heat sink (UHS) retention pond. The Structures Monitoring program (B2.1.31), which is in compliance with 10 CFR 50.65, *Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants*, includes all water-control structures within the scope of RG 1.127. The UHS retention pond, the essential service water pumphouse, the ESW supply lines yard vault, the UHS cooling tower and the submerged discharge structures are the water-control structures within the scope for license renewal that are monitored by this program. The UHS retention pond and its associated structures receive periodic inservice inspections for assessment of their structural safety and operational adequacy every five years. Callaway performs algae treatment and riprap inspections along the UHS retention pond. Callaway maintains benchmarks for monitoring settlement in any of the Category 1 structures including the UHS cooling tower.

NUREG-1801 Consistency

The RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants program is an existing program that is consistent with NUREG-1801, Section XI.S7, RG 1.127, *Inspection of Water-Control Structures Associated with Nuclear Power Plants*.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

The following discussion of operating experience provides objective evidence that the RG 1.127 Inspection of Water-Control Structures Associated with Nuclear Power Plants program will be effective in ensuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation:

1. An instance of concrete delamination occurred in 2005. Open electrical boxes that were part of the abandoned lighting system in the 'A' UHS fan deck room allowed water to enter the embedded conduits located in the concrete wall. This water contributed to the corrosion growth on the conduit which eventually deteriorated enough to cause spalling on the plant north face of the wall separating 'A' and 'B' UHS fan deck rooms. The spalled area was patched with cement grout in 2006.

2. Similar spalling was noted on the south wall in the 'D' UHS cooling tower fan room which had an area approximately 1 ft by 1 ft where the concrete had popped out. The degradation appeared to be about two to three inches deep. The apparent cause was rainwater seeping through an abandoned electrical conduit. A job was initiated to repair both spalled areas in the "D" cooling tower fan room. To prevent recurrence of the concrete spalling, prior to installing the grout patch, a hole was drilled in the exposed part of the conduit to drain any water remaining in the abandoned conduits.

The above examples provide objective evidence that the RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants program is capable of both monitoring and detecting the aging effects associated with the program. Occurrences that would be identified under the RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants program will be evaluated to ensure there is no significant impact to safe operation of the plant and corrective actions will be taken to prevent recurrence. Guidance for re-evaluation, repair, or replacement is provided for locations where aging is found. There is confidence that the continued implementation of the RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants program will effectively identify aging prior to loss of intended function.

Conclusion

The continued implementation of the RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants program provides reasonable assurance that aging effects will be managed such that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B2.1.33 Protective Coating Monitoring and Maintenance Program

Program Description

The Protective Coating Monitoring and Maintenance Program manages loss of coating integrity for Service Level 1 coatings inside containment so that the intended functions of post-accident safety systems that rely on water recycled through the containment sump/drain system are maintained consistent with the current licensing basis. The program includes a visual examination of accessible Service Level 1 coatings inside containment, including those applied to the steel containment liner, structural steel, supports, penetrations, and concrete walls and floors. The program is consistent with the ASTM requirements, but Callaway is not committing to all the requirements noted in NRC Regulatory Guide 1.54, *Service Level I, II, and III Protective Coatings Applied to Nuclear Power Plants*, Revision 2.

General visual inspections of the containment building Service Level 1 coatings are conducted once each fuel cycle. Thorough visual inspections are performed on previously designated areas and on areas as noted as deficient during the inspection. Characterization of deficient areas is performed to allow evaluation of the deficiency for future surveillance or repair, and prioritization of repairs. Characterization of blistering, cracking, flaking, peeling, delamination, and rusting is consistent with ASTM D 5163-08, Section 10.2. Physical testing may be performed when directed by the evaluator. Examinations are conducted by qualified personnel as recommended by ASTM D 5163-08, Paragraph 9.

Service Level I coatings are not credited for managing loss of material of the steel containment liner.

NUREG-1801 Consistency

The Protective Coating Monitoring and Maintenance Program is an existing program that, following enhancement, will be consistent, with exception to NUREG-1801, Section XI.S8, *Protective Coating Monitoring and Maintenance Program*.

Exceptions to NUREG-1801

Scope of the Program - Element 1

The program, following enhancement, will be consistent with the ASTM requirements noted in each of the 10 elements of NUREG-1801, Section XI.S8, but Callaway will not be committing to all the requirements noted in Regulatory Guide 1.54, Revision 2.

Enhancements

Prior to the period of extended operation, the following enhancements will be implemented in the following program elements:

Parameters Monitored or Inspected - Element 3

Procedures will be enhanced to specify parameters monitored or inspected to include; any visible defects, such as blistering, cracking, flaking, peeling, rusting, and physical damage.

Detection of Aging Effects - Element 4

Procedures will be enhanced to specify inspection frequencies, personnel qualifications, inspection plans, inspection methods, and inspection equipment that meet the requirements of ASTM D 5163-08.

Monitoring and Trending - Element 5

Procedures will be enhanced to specify a pre-inspection review of the previous two monitoring reports and, based on inspection report results, prioritize repair areas as either needing repair during the same outage or as postponed to future outages, but under surveillance in the interim period.

Acceptance Criteria - Element 6

Procedures will be enhanced to specify characterization, documentation, and testing consistent with ASTM D 5163-08 section 10.2 through 10.4 and to specify an evaluation of the inspection reports by the responsible coating evaluation specialist who prepares a summary of findings and recommendations for future surveillance or repair.

Corrective Actions - Element 7

Procedures will be enhanced to specify that the inspection reports prioritize repair areas as either needing repair during the same outage or as postponed to future outages, but under surveillance in the interim period.

Operating Experience

The following discussion of operating experience provides objective evidence that the Protective Coating Monitoring and Maintenance Program will be effective in ensuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation:

1. In response to industry experience pertaining to loss of coatings integrity inside containment and the potential for clogging of sump strainers, Callaway implemented a Protective Coating Monitoring and Maintenance Program. General visual examinations of containment building Service Level 1 coatings are conducted once each fuel cycle.

2. During the coating condition assessment for Refuel 16 (Fall 2008), several areas of damaged coatings were observed. The total surface area of the degraded coatings identified was conservatively estimated at seven square feet, which does not constitute significant degradation. Engineering evaluation determined the damaged coatings had a

negligible impact on the sump strainer assemblies and could not have prevented fulfillment of a safety function. The damaged coatings were removed prior to exiting the refueling outage.

3. During the coating condition assessment for Refuel 17 (Spring 2010), several areas of damaged coatings were observed. The total surface area of the degraded coatings identified was conservatively estimated at 10 square feet, which does not constitute significant degradation. The damaged coatings were removed.

4. During the coating condition assessment for Refuel 18 (Fall 2011), several areas of damaged coatings were observed. The total surface area of the degraded coatings identified was conservatively estimated at 10 square feet, which does not constitute significant degradation. The damaged coatings were removed. The containment recirculation sump strainer indeterminate coatings calculation was reviewed for impact. The amount of coatings found degraded did not impact the results of the calculation.

The above examples provide objective evidence that the Protective Coating Monitoring and Maintenance Program is capable of both monitoring and detecting the aging effects associated with the program. Occurrences that would be identified under the Protective Coating Monitoring and Maintenance Program will be evaluated to ensure there is no significant impact to safe operation of the plant and corrective actions will be taken to prevent recurrence. Guidance for re-evaluation, repair, or replacement is provided for locations where aging is found. There is confidence that the continued implementation of the Protective Coating Monitoring and Maintenance Program will effectively identify aging prior to loss of intended function.

Conclusion

The continued implementation of the Protective Coating Monitoring and Maintenance Program, following enhancement, provides reasonable assurance that aging effects will be managed such that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B2.1.34 Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements

Program Description

The Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program manages reduced insulation resistance to ensure that electrical cables, connections and terminal blocks not subject to the environmental qualification (EQ) requirements of 10 CFR 50.49 and within the scope of license renewal are capable of performing their intended functions. Technical information contained within SAND 96-0344 and EPRI TR-1013475 was used to determine the service limitations of the cable, connection and terminal block insulating materials. SAND 96-0344 and EPRI TR-109619 provided guidance on techniques for visually inspecting cables, connections and terminal blocks for aging.

Non-EQ cables, connections and terminal blocks within the scope of license renewal in accessible areas with an adverse localized environment are inspected. Connection insulation material includes termination kits and tape used to insulate splices that are normally located within junction boxes and terminal blocks located within terminal boxes. At least once every 10 years, the non-EQ cables, connections and terminal blocks within the scope of license renewal in accessible areas are visually inspected for embrittlement, discoloration, cracking, melting, swelling or surface contamination. The first inspection for license renewal is to be completed prior to the period of extended operation.

The acceptance criterion for visual inspection of accessible non-EQ cable jacket, connection, and terminal block insulating material is the absence of anomalous indications that are signs of reduced insulation resistance. Corrective actions for conditions that are adverse to quality are performed in accordance with the corrective action program. The corrective action process provides reasonable assurance that deficiencies are either promptly corrected or are evaluated to be acceptable.

NUREG-1801 Consistency

The Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program is an existing program that, following enhancement, will be consistent with NUREG-1801, Section XI.E1, *Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements*.

Exceptions to NUREG-1801

None

Enhancements

Prior to the period of extended operation, the following enhancements will be implemented in the following program elements:

Scope of the Program (Element 1)

Procedures will be enhanced to include all accessible in-scope cable in an adverse localized environment.

Parameters Monitored or Inspected (Element 3), Detection of Aging Effects (Element 4), Acceptance Criteria (Element 6), and Corrective Actions (Element 7)

Procedures will be enhanced to ensure there are no unacceptable visual indications of surface anomalies. All unacceptable visual indications of cable jacket and connection insulation surface anomalies will be subject to an engineering evaluation.

Operating Experience

The following discussion of operating experience provides objective evidence that the Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program will be effective in ensuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation.

1. The Callaway Corrective Action Program was reviewed over a 10 year period to determine if reduced insulation resistance has been identified to date for components in the applicable material and environment combinations. In 2007, while testing a 13.8kV cable to a nonsafety-related 4160V transformer, an anomaly in high potential test results on phase B was noted. The cable had not failed and has been identified for trending. No instances of reduced insulation resistance in an adverse localized environment have been identified.

Operating experience with Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program has not identified any instances of reduced insulation resistance in an adverse localized environment. Occurrences that would be identified under the Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program will be evaluated to ensure there is no significant impact to safe operation of the plant and corrective actions will be taken to prevent recurrence. Appropriate guidance for re-evaluation, repair, or replacement is provided for locations where aging is found. There is confidence that the continued implementation of the Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program will effectively identify aging prior to loss of intended function.

Conclusion

The continued implementation of the Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program, following enhancement, provides reasonable assurance that aging effects will be managed such that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B2.1.35 Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits

Program Description

The Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits program manages reduced insulation resistance to ensure that cables and connections used in sensitive instrumentation circuits with high voltage low-level current signals within the ex-core neutron monitoring system are capable of performing their intended functions. All high voltage cables to radiation monitors within the scope of license renewal are managed by the Environmental Qualification (EQ) of Electric Components program (B3.2).

The purpose of this program is to provide reasonable assurance that the intended function of cables and connections used in instrumentation circuits with sensitive, low-level current signals that are not subject to the environmental qualification requirements of 10 CFR 50.49 and are exposed to adverse localized environments caused by temperature, radiation, or moisture are maintained consistent with the current licensing basis through the period of extended operation. In most areas, the actual ambient environments (e.g., temperature, radiation, or moisture) are less severe than the plant design environment for those areas.

Calibration or surveillance tests are used to manage the aging of the cable insulation and connections for non-EQ ex-core monitors so that the instrumentation circuits perform their intended functions. When an instrumentation channel is found to be out of calibration during routine surveillance testing, troubleshooting is performed on the loop, including the instrumentation cable and connections. A review of the calibration results will be completed before the period of extended operation and every 10 years thereafter.

NUREG-1801 Consistency

The Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits program is an existing program that, following enhancement, will be consistent with NUREG-1801, Section XI.E2, *Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits*.

Exceptions to NUREG-1801

None

Enhancements

Prior to the period of extended operation, the following enhancement will be implemented in the following program elements:

Scope of the Program (Element 1) and Acceptance Criteria (Element 6)

Procedures will be enhanced to identify the scope of cables requiring aging management.

Parameters Monitored or Inspected (Element 3), Detection of Aging Effects (Element 4), and Corrective Actions (Element 7).

Procedures will be enhanced to require engineering review of calibration test results every 10 years.

Operating Experience

The following discussion of operating experience provides objective evidence that the Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits program will be effective in ensuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation.

1. Callaway has had no plant-specific operating experience indicating age-related failures of cables and connections used in sensitive instrumentation circuits with high voltage low-level current signals.

Operating experience with the Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits program have shown Callaway is effective in correcting conditions identified in industry operating experience. Occurrences that would be identified under the Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits program will be evaluated to ensure there is no significant impact to safe operation of the plant and corrective actions will be taken to prevent recurrence. Guidance for re-evaluation, repair, or replacement is provided for locations where aging is found. Therefore, there is confidence that the continued implementation of the Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits program will effectively identify aging prior to loss of intended function.

Conclusion

The continued implementation of the Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits program, following enhancement, provides reasonable assurance that aging effects will be managed such that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B2.1.36 Inaccessible Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements

Program Description

The Inaccessible Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program manages reduced insulation resistance of power cables (greater than or equal to 400 V) to minimize aging effects which could potentially lead to failure of the cable's insulation system. The program provides reasonable assurance that the intended functions of inaccessible or underground power cables (greater than or equal to 400 V) that are not subject to the environmental qualification requirements of 10 CFR 50.49 and are exposed to wetting or submergence are maintained consistent with the current licensing basis through the period of extended operation.

Manholes, pits and the ends of duct banks that contain in-scope non-EQ inaccessible power cables will be inspected for water collection to identify significant moisture. Significant moisture is defined as periodic exposures to moisture that last more than a few days (e.g., cable wetting or submergence in water). Any collected water is removed. The inspection includes direct observation that cables/splices and cable support structures are intact. This inspection and water removal is performed based on actual plant experience with the inspection frequency being at least annually. The first inspection for license renewal is to be completed prior to the period of extended operation.

All in-scope non-EQ inaccessible power cables (greater than or equal to 400V) routed through manholes, pits, or duct banks are tested to provide an indication of the conductor insulation condition. Testing that is a proven test and appropriate to the application at the time of the testing will be performed to detect deterioration of the insulation system due to wetting. Cable testing may be a mix of dielectric loss (dissipation factor/power factor), AC voltage withstand, partial discharge, step voltage, time domain reflectometry, insulation resistance and polarization index, line resonance analysis, or other testing that is state-of-the-art at the time the tests are performed. The first test for license renewal will be completed prior to the period of extended operation and every six years thereafter.

NUREG-1801 Consistency

The Inaccessible Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program is an existing program that, following enhancement, will be consistent with NUREG-1801, Section XI.E3, *Inaccessible Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements*.

Exceptions to NUREG-1801

None

Enhancements

Prior to the period of extended operation, the following enhancements will be implemented in the program elements:

Scope of the Program (Element 1)

Procedures will be enhanced to identify the power cables, manholes, pits, and duct banks that are within the scope of the Inaccessible Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program.

Preventive Actions (Element 2) and Parameters Monitored or Inspected (Element 3)

Procedures will be enhanced to include periodic inspection of pits and duct banks, to ensure power cables/splices and support structures are not submerged or immersed in water, and to ensure that cable support structures are intact. Inspections will be performed at least annually based on water accumulation over time and after event driven occurrences. Power cables subject to significant moisture are tested periodically.

Detection of Aging Effects (Element 4)

Procedures will be enhanced to ensure in-scope power cables are tested at least once every six years.

Acceptance Criteria (Element 6)

Procedures will be enhanced to ensure cables/splices and support structures are not submerged or immersed in standing water.

Corrective Actions (Element 7)

Procedures will be enhanced to require an engineering evaluation when the test acceptance criteria are not met.

Operating Experience

The following discussion of operating experience provides objective evidence that the Inaccessible Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program will be effective in ensuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation.

1. Callaway has been performing an inspection of safety related manhole MH01 on a 36 month frequency. Water was found in the manhole in 2003, 2006, and 2009 below medium-voltage safety-related cables. The evaluation indicates the manhole cover seals were degraded and, since 2009, new seals for the manhole covers have been installed at each inspection of MH01. Foundation sealant, drain pipes, and flashing have

been installed around MH01 in 2010. PMs were generated to increase inspection frequency to 18 months in 2011.

2. Cable testing is done periodically with cable insulation resistance testers and megger testing. No degradation of safety related cables has been noted. A new tan delta test for XNB01 feeder cables has been developed.

3. A new PM has been written and implemented in 2011 to inspect for water level and pump out all in-scope manholes on a weekly basis.

Operating experience with the Inaccessible Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program has not identified any cable failures as a result of submergence and the water management in manholes has been enhanced. Occurrences that would be identified under the Inaccessible Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program will be evaluated to ensure there is no significant impact to safe operation of the plant and corrective actions will be taken to prevent recurrence. Guidance for re-evaluation, repair, or replacement is provided for locations where aging is found. Therefore, there is confidence that the continued implementation of the Inaccessible Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program will effectively identify aging prior to loss of intended function.

Conclusion

The continued implementation of the Inaccessible Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program, following enhancement, provides reasonable assurance that aging effects will be managed such that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B2.1.37 Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements

Program Description

The Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program manages increased resistance of connection to ensure that either aging of metallic cable connections is not occurring and/or that the existing preventive maintenance program is effective such that a periodic inspection is not required. The one-time test confirms the absence of age-related degradation of cable connections due to thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion, or oxidation to ensure that electrical cable connections not subject to the environmental qualification (EQ) requirements of 10 CFR 50.49 and within the scope of license renewal are capable of performing their intended function.

As part of the predictive maintenance program, infrared thermography testing is performed on non-EQ electrical cable connections, associated with active and passive components within the scope of license renewal. A representative sample of external connections will be tested prior to the period of extended operation using infrared thermography to confirm that there are no aging effects requiring management. The infrared thermography will detect increased resistance of connection due to thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion, or oxidation. The selected sample to be tested is based upon voltage level (medium and low voltage), circuit loading (high loading), connection type, and location (high temperature, high humidity, vibration, etc.). The technical basis for the sample selection is documented. The acceptance criteria for thermography testing will be based on the temperature rise above the reference temperature. The reference temperature will be ambient temperatures or the baseline temperature data from the same type of connections being tested. The one-time testing of a sample of non-EQ electrical cable connectors is representative, with reasonable assurance, that non-EQ electrical cable connections within similar application, circuit loading conditions, and environments are bounded by the testing.

NUREG-1801 Consistency

The Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program is a new program that, when implemented, will be consistent with NUREG-1801, Section XI.E6, *Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements*.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

The following discussion of operating experience provides objective evidence that the Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program will be effective in ensuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation.

1. Callaway routinely performs infrared thermography on electrical components and connections. A review of the plant operating experience identified scans where electrical cable connections showed thermal anomalies. The connections associated with these thermal anomalies were cleaned and re-tightened. No loss of equipment intended function has occurred due to these thermal anomalies.

Operating experience with the Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program has identified loose connections prior to loss of function. Occurrences that would be identified under the Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program will be evaluated to ensure there is no significant impact to safe operation of the plant and corrective actions will be taken to prevent recurrence. Guidance for re-evaluation, repair, or replacement is provided for locations where aging is found. There is confidence that the implementation of the Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program will effectively identify aging prior to loss of intended function.

Industry and plant-specific operating experience will be evaluated in the development and implementation of this program.

Conclusion

The implementation of the Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program will provide reasonable assurance that aging effects will be managed such that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B2.1.38 Monitoring of Neutron-Absorbing Materials Other than Boraflex

Program Description

The Monitoring of Neutron-Absorbing Materials Other than Boraflex program manages reduction of neutron-absorbing capacity; change in dimensions, and loss of material to ensure that aging of the Boral® neutron-absorbing material used in the spent fuel storage racks does not invalidate the criticality analysis of the spent fuel pool.

The program is a monitoring program which performs inspections and in-situ testing of the Boral® panels in the spent fuel pool. Testing includes areal density measurements of the boron-10 in the Boral® panels, and visual inspections of the Boral® panel sheaths to look for geometry changes caused by bulging or swelling. The results are evaluated against acceptance criteria and previous inspections to determine whether corrective actions are required. If required, appropriate actions are taken to ensure the required five percent sub-criticality margin is maintained. Monitoring of the Boral® panels in the spent fuel pool will be performed on a ten-year frequency.

The Monitoring of Neutron-Absorbing Materials Other than Boraflex program is a new program that will be implemented prior to the period of extended operation.

NUREG-1801 Consistency

The Monitoring of Neutron-Absorbing Materials Other than Boraflex program is a new program that, when implemented, will be consistent with NUREG-1801, Section XI.M40*, Monitoring of Neutron-Absorbing Materials Other than Boraflex*.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

The following discussion of operating experience provides objective evidence that the Monitoring of Neutron Absorbing Materials Other than Boraflex program will be effective in ensuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation:

1. The Monitoring of Neutron-Absorbing Materials Other than Boraflex program is a new program for Callaway. Industry operating experience that forms the basis for this program is included in the operating experience element of the corresponding NUREG-1801, aging management program descriptions. Plant-specific operating

experience was reviewed to ensure that the operating experience discussed in the NUREG-1801, aging management program is bounding, i.e., that there is no unique plant-specific operating experience in addition to that described in NUREG-1801. The Callaway Corrective Action Program was searched to determine if aging of Boral® has been identified to date.

No reduction of neutron-absorbing capacity, change in dimensions, and loss of material for Boral® were found in a search of Callaway historical information. Occurrences that would be identified under the Monitoring of Neutron Absorbing -Materials Other than Boraflex program will be evaluated to ensure there is no significant impact to safe operation of the plant and corrective actions will be taken to prevent recurrence. Guidance for re-evaluation, repair, or replacement is provided for locations where aging is found. There is confidence that the implementation of the Monitoring of Neutron-Absorbing Materials Other than Boraflex program will effectively identify aging prior to loss of intended function.

Industry and plant-specific operating experience will be evaluated in the development and implementation of this program.

Conclusion

The implementation of Monitoring of Neutron-Absorbing Materials Other than Boraflex program will provide reasonable assurance that aging effects will be managed such that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B2.1.39 Metal Enclosed Bus

Program Description

The program manages age-related degradation of in-scope non-segregated phase metal enclosed bus. Bus enclosure assemblies (internal and external), bus bar insulation, bus bar insulating supports, and bus bar bolted connections are included. The metal enclosed buses (MEBs) within the scope of this program are the MEBs that provide service water to fire protection hose stations in the essential service water pump house via essential service water piping.

The internal portions of bus enclosure assemblies are inspected for cracks, corrosion, foreign debris, excessive dust buildup, and evidence of water intrusion. Bus insulation is inspected for signs of reduced insulation resistance due to thermal/thermoxidative degradation of organics/thermoplastics, radiation-induced oxidation, moisture/debris intrusion, or ohmic heating, as indicated by embrittlement, cracking, chipping, melting, discoloration, or swelling, which may indicate overheating or aging degradation. The internal bus insulating supports are inspected for structural integrity and signs of cracks. The external portions of the MEB, including gaskets and sealants, are inspected for surface cracking, crazing, scuffing, dimensional change (e.g., “ballooning” and “necking”), shrinkage, discoloration, hardening and loss of strength due to elastomer degradation. The external surfaces are inspected for loss of material due to general, pitting, and crevice corrosion. A sample (20 percent of the population with a maximum of 25) of the accessible bolted connections will be inspected for increased resistance of connection due to loosening of bolts using thermography or by measuring connection resistance. For accessible bolted connections that are covered with heat shrink tape, sleeving, insulating boots, etc., a visual inspection of insulating material will be conducted.

The first inspection of the metal enclosed bus, including a sample of bolted connections, will be completed prior to the period of extended operation and every 10 years thereafter. Where visual inspection of insulating material is conducted, the inspection interval of bolted connections will be every five years thereafter.

NUREG-1801 Consistency

The Metal Enclosed Bus program is a new program that, when implemented, will be consistent with NUREG-1801, Section XI.E4*, Metal Enclosed Bus*.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

The following discussion of operating experience provides objective evidence that the Metal Enclosed Bus program will be effective in ensuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation.

1. The Metal Enclosed Bus program is a new program for Callaway. Industry operating experience that forms the basis for this program is included in the operating experience element of the corresponding NUREG-1801 aging management program. Plant-specific operating experience was reviewed to ensure that the operating experience discussed in the corresponding NUREG-1801 aging management program is bounding, i.e., that there is no unique plant-specific operating experience in addition to that described in NUREG-1801. The Callaway Corrective Action Program was searched to determine if MEB failures have occurred. Callaway operating experience with the Metal Enclosed Bus program has not identified any corrective actions related to the MEBs within the scope of license renewal.

Occurrences that would be identified under the Metal Enclosed Bus program will be evaluated to ensure there is no significant impact to safe operation of the plant and corrective actions will be taken to prevent recurrence. Guidance for re-evaluation, repair, or replacement is provided for locations where aging is found. There is confidence that the implementation of the Metal Enclosed Bus program will effectively identify aging prior to loss of intended function.

Industry and plant-specific operating experience will be evaluated in the development and implementation of this program.

Conclusion

The implementation of Metal Enclosed Bus program will provide reasonable assurance that aging effects will be managed such that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B3 TLAA SUPPORT ACTIVITIES

B3.1 FATIGUE MONITORING

Program Description

The Fatigue Monitoring program manages fatigue cracking caused by anticipated cyclic strains in metal components of the reactor coolant pressure boundary. The program ensures that actual plant experience remains bounded by the thermal and pressure transient numbers and severities analyzed in the design calculations, or that corrective actions maintain the design and licensing basis.

The Fatigue Monitoring program tracks fatigue by one of the following methods:

1) The Cycle Counting (CC) monitoring method tracks transient event cycles affecting the location to ensure that the numbers of transient events analyzed by the fatigue analyses are not exceeded. This method does not calculate cumulative usage factors (CUFs).

2) The Cycle-Based Fatigue (CBF) monitoring method utilizes the CC results and stress intensity ranges generated with the ASME III methods that use six stress-tensors to perform CUF calculations for a given location. The fatigue accumulation is tracked to determine approach to the ASME allowable fatigue limit of 1.0.

3) The Stress-Based Fatigue (SBF) monitoring method computes a "real time" stress history for a given component from data collected from plant instruments to calculate transient pressure and temperature, and the corresponding stress history at the critical location in the component. The stress history is analyzed to identify stress cycles, and then a CUF is computed. The CUF will be calculated using a three dimensional, six component stress tensor method meeting ASME III NB-3200 requirements, or Ameren Missouri will benchmark the method consistent with the NRC Regulatory Issue Summary RIS 2008-30.

The Fatigue Monitoring program requires periodic reviews of the plant instrumentation and operator logs to ensure that the fatigue critical thermal and pressure transients have not exceeded design transient severity or analyzed number, and to ensure that usage factors will not exceed the allowable value of 1.0 without corrective actions.

The Fatigue Monitoring program will be enhanced to include the effects of the reactor coolant environment on component fatigue life for a set of sample reactor coolant system locations. The set includes fatigue monitoring of the NUREG/CR-6260 sample locations for a newer-vintage Westinghouse Plant and plant-specific bounding environmentally assisted fatigue (EAF) locations. The supporting environmental factors, F(en), calculations will be performed with NUREG/CR-6909 or NUREG/CR-6583 for carbon and low alloy steels, NUREG/CR-6909 or NUREG/CR-5704 for austenitic stainless steels, and NUREG/CR-6909 for nickel alloys.

NUREG-1801 Consistency

The Fatigue Monitoring program is an existing program that, following enhancement, will be consistent with NUREG-1801, Section X.M1, *Fatigue Monitoring*.

Exceptions to NUREG-1801

None

Enhancements

Prior to the period of extended operation, the following enhancements will be implemented in the following program elements:

Scope of the Program - Element 1

Procedures will be enhanced to include fatigue usage calculations that consider the effects of the reactor water environment for a set of sample reactor coolant system locations. The set includes the NUREG/CR-6260 sample locations for a newer-vintage Westinghouse Plant, and plant-specific bounding EAF locations.

Procedures will be enhanced to ensure the fatigue crack growth analyses, which support the leak-before-break analyses, ASME Section XI evaluations, and the HELB break selection criterion remain valid by counting the transients used in the analyses.

Preventive Actions - Element 2

Procedures will be enhanced to require the review of the temperature and pressure transient data from the operator logs and plant instrumentation to ensure actual transient severity is bounded by the design and to include environmental effects where applicable. If a transient occurs which exceeds the design transient definition the event is documented in the Corrective Action Program and corrective actions are taken.

Parameters Monitored or Inspected - Element 3

Procedures will be enhanced to include additional transients that contribute significantly to fatigue usage identified by evaluation of ASME Section III fatigue and fatigue crack growth analyses.

Procedures will be enhanced to include additional locations which receive more detailed monitoring. These locations are identified by evaluation of ASME Section III fatigue analyses and the locations evaluated for effects of the reactor coolant environment. The monitoring methods will be benchmarked consistent with the NRC RIS 2008-30.

Monitoring and Trending - Element 5

Procedures will be enhanced to project the transient count and fatigue accumulation of monitored components into the future.

Acceptance Criteria - Element 6

Procedures will be enhanced to include additional cycle count and fatigue usage action limits, which permit completion of corrective actions if the design limits are expected to be exceeded within the next three fuel cycles. The fatigue results associated with the NUREG/CR-6260 sample locations for a newer vintage Westinghouse plant and plant-specific bounding EAF locations will account for environmental effects on fatigue. The cycle count action limits for the hot leg surge nozzle will incorporate the 60 year cycle projections used in the hot leg surge nozzle EAF analysis.

Corrective Actions - Element 7

Procedures will be enhanced to include appropriate corrective actions to be invoked if a component approaches a cycle count or CUF action limit or if an experienced transient exceeds the design transient definition. If an action limit is reached, corrective actions include fatigue reanalysis, repair, or replacement. When a cycle counting action limit is reached, action will be taken to ensure that the analytical bases of the HELB locations are maintained. Re-analysis of a fatigue crack growth analysis must be consistent with or reconciled to the originally submitted analysis and receive the same level of regulatory review as the original analysis.

Operating Experience

The following discussion of operating experience provides objective evidence that the Fatigue Monitoring program will be effective in ensuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation.

1. In response to NRC Bulletin 88-11, *Pressurizer Surge Line Thermal Stratification*, Westinghouse performed a plant-specific evaluation of Callaway pressurizer surge line. It was concluded that thermal stratification does not affect the integrity of the pressurizer surge line. Callaway responses to NRC Bulletin 88-11 describe the inspections, analyses, and procedural revisions made to ensure that thermal stratification does not affect the integrity of the pressurizer surge line. There have been no signs of damage from surge line movement.

2. NRC Regulatory Issue Summary RIS 2008-30, *Fatigue Analysis Of Nuclear Power Plant Components* informed licensees of analysis methodology (Green's function) used to demonstrate compliance with the ASME Code fatigue acceptance criteria could be non-conservative if not correctly applied. Ameren Missouri is committed to using a three dimensional, six component stress tensor method meeting ASME III NB-3200 requirements, or benchmarking the chosen method. This benchmarking has been

performed for the normal and alternate charging nozzle to order to implement SBF at that location. Any additional locations which will be monitored with SBF must meet the ASME III NB-3200 requirements or be benchmarked.

3 An error was identified in the previous SBF transfer function for the normal and alternate charging nozzles. The SBF transfer function incorrectly included thermal sleeves for the nozzles and therefore would calculate less fatigue than the nozzles would actually accumulate. The extent of this condition is limited only to the normal and alternate charging nozzle SBF models. The transfer function has been updated to exclude thermal sleeves. The SBF transfer functions for the normal and alternate charging nozzles were also benchmarked in accordance with NRC RIS 2008-30.

4. The CVCS design specification identifies the nominal letdown flow of 75 gpm with maximum flow of 120 gpm. Callaway operated from 1993 to 2011 at the maximum letdown flow, but has returned to the nominal value of 75 gpm. The effects of this increased flow rate have been evaluated. To account for the increase in fatigue, Callaway reduced the assumed number of load following transients to be more consistent with its operation as a base load plant. Also, starting in Refuel Outage 17, Callaway has switched from the normal charging flow path to the alternate charging flow path in order to spread fatigue over the two paths.

The operating experience of the Fatigue Monitoring program did not identify an adverse trend in performance. Occurrences that would be identified under the Fatigue Monitoring program will be evaluated to ensure there is no significant impact to safe operation of the plant, and corrective actions will be taken to prevent recurrence. Guidance for re-evaluation, repair, or replacement is provided for locations where aging is found. There is confidence that the continued implementation of the Fatigue Monitoring program will effectively identify aging prior to loss of intended function.

Conclusion

The continued implementation of the Fatigue Monitoring program, following enhancement, provides reasonable assurance that aging effects will be managed such that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B3.2 ENVIRONMENTAL QUALIFICATION (EQ) OF ELECTRIC COMPONENTS

Program Description

Callaway is a NUREG-0588 Category I plant. Electrical equipment within the scope of the Callaway EQ Program is environmentally qualified in accordance with NUREG-0588, Category I requirements as supplemented by 10 CFR 50.49. The NRC evaluated Callaway electrical equipment qualification based on Regulatory Guide 1.89 Revision 0, because Revision 1 was not yet issued. 10 CFR 50.49 and Regulatory Guide 1.89 Revision 0 and Revision 1 all invoke IEEE Standard 323-1974, which provides the criteria for safety-related equipment ("Class 1E" equipment). IEEE Standard 323-1974 also provides the basis for categorizing components important to safety, and defines environmental service conditions. The Callaway EQ Program therefore includes and identifies electrical components that are important to safety and that could be exposed to harsh environment accident conditions, consistent with 10 CFR 50.49. Compliance with 10 CFR 50.49 provides reasonable assurance that the component can perform its intended functions during accident conditions after experiencing the effects of inservice aging.

The Callaway EQ Program manages component thermal, radiation, and cyclical aging through the use of aging evaluations based on 10 CFR 50.49(f) qualification methods. As required by 10 CFR 50.49, EQ components not qualified for the current license term are to be refurbished or replaced, or have their qualification extended prior to reaching the aging limits established in the evaluation. Aging evaluations for EQ components that specify a qualification of at least 40 years are considered time-limited aging analyses (TLAAs) for License Renewal.

A list of qualified components is maintained in the Callaway Equipment List (CEL). For each component, the CEL references the Equipment Qualification Data Packages (EQDPs), which include the qualified life, specification, electrical characteristics, and environmental conditions. These equipment data packages are maintained in the Equipment Qualification Management System (EQMS). The equipment data packages in the EQMS are reanalyzed to extend the qualification of a component on a routine basis pursuant to 10 CFR 50.49(e) and utilizing the following methods.

Analytical Methods: The analytical models used in the reanalysis of an aging evaluation are the same as those previously applied. The Arrhenius methodology is an acceptable model for a thermal aging evaluation. For license renewal radiation aging evaluation, 60-year normal radiation dose is established by extrapolating the 40-year normal dose (40-year dose times 1.5) plus accident radiation dose. 60-year cyclical aging is established in a similar manner. Other models may be justified on a case-by-case basis.

Data Collection and Reduction Methods: Reducing excess conservatism in the component service conditions (for example, temperature, radiation, and cycles) used in the prior aging evaluation is the chief method used for a reanalysis. Actual monitored service conditions such as temperature are generally lower than the design service conditions used in the prior aging evaluation and therefore can support extended thermal life of the equipment.

Underlying Assumptions: EQ component aging evaluations contain sufficient conservatism to account for most environmental changes occurring due to plant modifications and events. When unexpected adverse conditions are identified during operational or maintenance activities that affect the normal operating environment of a qualified component, the affected EQ component is evaluated and appropriate corrective actions are taken, which may include changes to the qualification bases and conclusions.

Excess conservatism may be reduced by reevaluating the component service conditions and material properties used in prior aging evaluations for radiation and cyclical aging, to justify a value that would support extended life.

Acceptance Criteria and Corrective Actions: If qualification cannot be extended by reanalysis, the component is refurbished or replaced prior to exceeding the period for which the current qualification remains valid. A reanalysis is to be performed in a timely manner (that is, sufficient time is available to refurbish, replace or re-qualify the component if reanalysis is unsuccessful).

The Callaway EQ program also assigns qualified lives to safety-related mechanical components located in harsh environments. The components are managed with the EQ maintenance and/or surveillance programs.

NUREG-1801 Consistency

The Environmental Qualification (EQ) of Electric Components program is an existing program that is consistent with NUREG-1801, Section X.E1, *Environmental Qualification (EQ) of Electric Components.*

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

The following discussion of operating experience provides objective evidence that the Environmental Qualification (EQ) of Electric Components program will be effective in ensuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation:

1. In 2010, Callaway performed a self assessment of the EQ program. The self assessment team identified several documentation, procedure, training, and data collection improvements to the current program. The self assessment identified the following items as possible gaps in the Callaway EQ Program that could affect the ability of the equipment to meet its intended function(s) consistent with the CLB for the period of extended operation:

   a. Post Accident Operating Time (PAOT) calculation does not consider motor winding temperature rise and no justification is provided. EQ engineer calculated PAOT with the heat rise added to the calculation and demonstrated that margin is available and plant qualification evaluation supports qualification.

   b. MSIV area temperature exceeded 120°F (design) at least six times in a two year period. Qualification reevaluation for components installed in main steam isolation valve/feedwater isolation valve was required to ensure that the degradation due to elevated temperature was accounted for and the component will be replaced prior to expiring life. The EQ engineer calculated qualified life and determined that a brief temperature spike does not impact qualified life.

2. In October 2008, overheating of the Grayboot connections caused the connectors to exceed their qualified life of 40 years. The cause of the condition was loose or inadequate crimps which resulted in more resistance across the connection causing the overheating. The overheating then caused the connectors to become weakened. The evaluation and extent of condition resulted in reterminating the hydrogen mixing fans using bolted ring tongue connections and Raychem rather than the Grayboot GB-3 connectors.

The operating experience of the Environmental Qualification (EQ) of Electrical Components program did not show any adverse trend in performance. The above examples provide objective evidence that the Environmental Qualification (EQ) of Electrical Components program methods are capable of detecting aging effects. Occurrences that would be identified under the Environmental Qualification (EQ) of Electrical Components program will be evaluated to ensure there is no significant impact to safe operation of the plant, and corrective actions will be taken to prevent recurrence. Guidance for re-evaluation, repair, or replacement is provided for locations where aging is found. There is confidence that the continued implementation of the Environmental Qualification (EQ) of Electrical Components program will effectively identify aging effects prior to loss of intended function.

Conclusion

The continued implementation of the Environmental Qualification (EQ) of Electric Components program provides reasonable assurance that aging effects will be managed such that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B3.3 CONCRETE CONTAINMENT TENDON PRESTRESS

Program Description

The Concrete Containment Tendon Prestress Program, inspection frequencies, and acceptance criteria are in accordance with Section XI, Subsection IWL of the ASME Boiler and Pressure Vessel Code, 2001 Edition through the 2003 Addenda as required by 10 CFR 50.55a(b)(2)(viii)(B), except where an exemption or relief has been authorized by the NRC.

The Callaway containment is prestressed concrete, hemispherical dome on a cylinder structures with a steel membrane liner and a flat foundation slab. Post tensioned tendons compress the concrete and permit the structures to withstand design basis accident internal pressures. The vertical inverted U tendons are anchored through the bottom of the basemat. The tendons are ungrouted and are inserted in ducts filled with an anti-corrosion petroleum grease.

In order to ensure that the design basis continues to be met, the Concrete Containment Tendon Prestress program acceptance criteria require that the prestress in each tendon remain above, or within a stated tolerance below, the predicted lower limit (PLL) line for the tendon group. The surveillance program PLL lines were developed from the loss of prestress model and are consistent with the proposed Regulatory Guide 1.35.1.

The program also ensures that the average tendon prestress in each of the vertical and horizontal tendon groups is maintained above its design basis minimum required value (MRV) and that the trend line of the average tendon prestress remains above the MRV until the next scheduled surveillance. The trend line is generated with a regression analysis of surveillance data and is consistent with NRC Information Notice 99-10, *Degradation of Prestressing Tendon Systems in Prestressed Concrete Containments*, Revision 1, Attachment 3.

The regression analysis demonstrated that prestress in both the vertical and horizontal ("hoop") tendon groups should remain above the applicable MRVs for at least 60 years of operation; and that all tendons should therefore maintain their design basis function for the period of extended operation without retensioning.

The 5-year tendon surveillance required by the Callaway ASME Section XI Subsection IWL Program will continue to confirm that this is so for the period of extended operation.

NUREG-1801 Consistency

The Concrete Containment Tendon Prestress program is an existing program that, following enhancement, will be consistent with NUREG-1801, Section X.S1, *Concrete Containment Tendon Prestress*.

Exceptions to NUREG-1801

None

Enhancements

Prior to the period of extended operation, the following enhancements will be implemented in the following program elements:

Scope of the Program - Element 1

The surveillance program specification will be enhanced to include random samples for the 40, 45, 50, and 55 year surveillances.

Parameters Monitored or Inspected - Element 3

The surveillance program specification will be enhanced to extend the PLL lines for the vertical and hoop tendon groups to 60 years.

Monitoring and Trending - Element 5

The surveillance program specification will be enhanced to specifically require the final report for each surveillance interval to plot the measured results against time, and to include the PLL, MRV, and trend lines.

The surveillance program specification will be enhanced to require a regression analysis consistent with the requirements of NRC Information Notice 99-10 Revision 1, Attachment 3.

Operating Experience

The following discussion of operating experience provides objective evidence that the Concrete Containment Tendon Prestress program will be effective in ensuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation.

1. The Concrete Containment Tendon Prestress program 25th year inspection report includes an examination and regression analysis of tendon prestress surveillance data through the 2010 inspection, consistent with NRC Information Notice 99-10 Revision 1, Attachment 3 (i.e., using individual-tendon data rather than averages), and therefore incorporates the entire history of tendon prestress surveillance.

   The regression analysis extends to 60 years, and demonstrates that prestress in both the vertical and horizontal ("hoop") tendon groups remain above the applicable MRVs for at least 60 years of operation; and that all tendons therefore maintain their design basis function for the period of extended operation without retensioning. Similarly, no individual-tendon data from the "common tendons" (one vertical and one horizontal, whose prestress is measured at each surveillance), or from the other sample tendons tested to date, show a loss of prestress sufficient to indicate a possible need to retension for at least 60 years. Results of tendon surveillance to date indicate that the post-tensioning system will continue to meet its design criteria through the period of extended operation.

The operating experience of the Concrete Containment Tendon Prestress program did not identify an adverse trend in performance. Occurrences that would be identified under the Concrete Containment Tendon Prestress program will be evaluated to ensure there is no significant impact to safe operation of the plant, and corrective actions will be taken to prevent recurrence. Guidance for re-evaluation, repair, or replacement is provided for locations where aging is found. There is confidence that the continued implementation of the Concrete Containment Tendon Prestress program will effectively identify aging prior to loss of intended function.

Conclusion

The continued implementation of the Concrete Containment Tendon Prestress program, following enhancement, provides reasonable assurance that aging effects will be managed such that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

APPENDIX C

(NOT USED)

APPENDIX D

TECHNICAL SPECIFICATION CHANGES

(Not Used)