LICENSE RENEWAL APPLICATION

WOLF CREEK GENERATING STATION
UNIT 1

Docket No. 50-482
Facility Operating License No.
NPF-42

(Revision 0)

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CHAPTER 1

ADMINISTRATIVE INFORMATION

1.0 ADMINISTRATIVE INFORMATION

1.1 GENERAL INFORMATION

1.1.1 Names of Applicant and Co-Owners

Wolf Creek Nuclear Operating Corporation (WCNOC) hereby applies for a renewed operating license for the Wolf Creek Generating Station (WCGS), Unit 1.

WCNOC, a Delaware corporation, was organized on April 14, 1986, to operate, maintain, repair and eventually decommission WCGS. WCNOC is a jointly-owned corporation formed by the owners of WCGS: Kansas Gas and Electric Company (KGE), Kansas City Power & Light Company (KCPL) and Kansas Electric Power Cooperative, Inc. (KEPCo). Ownership shares are 47 percent KGE, 47 percent KCPL and 6 percent KEPCo. WCNOC is authorized to act as an agent for the owners and has exclusive responsibility and control over the physical construction, operation, and maintenance of the facility.

The Company is not owned, controlled, or dominated by an alien, a foreign corporation, or a foreign government.

1.1.2 Addresses of Applicant and Co-Owners

Wolf Creek Nuclear Operating Corporation
1550 Oxen Lane, NE
P.O. Box 411
Burlington, Kansas 66839

Kansas Gas and Electric Company
777 West Central
Wichita, Kansas 67201

Kansas City Power & Light Company
P.O. Box 418679
Kansas City, Missouri 64141-9679

Kansas Electric Power Cooperative, Inc.
P.O. Box 4877
Topeka, Kansas 66604

1.1.3 Descriptions of Business or Occupation of Applicant and Co-Owners

Kansas Gas and Electric Company, a wholly owned subsidiary of Westar Energy, Inc., is a regulated electric utility conducting business using the name “Westar Energy.” KGE provides electric generation, transmission and distribution services to approximately 308,000 customers in south-central and southeastern Kansas, including the Wichita metropolitan area. Corporate headquarters is located in Wichita, Kansas.

Kansas City Power & Light Company (KCPL), a wholly owned subsidiary of Great Plains Energy Incorporated, is a regulated electric utility that engages in the generation, transmission, distribution and sale of electricity to nearly 500,000 customers in the Kansas City metropolitan area and 24 northwestern Missouri and Kansas counties - a territory of about 4,600 square miles.

Kansas Electric Power Cooperative, Inc. (KEPCo), headquartered at Topeka, Kansas, was incorporated in 1975 as a not-for-profit generation and transmission cooperative (G&T). It is KEPCo's responsibility to procure an adequate and reliable power supply for its 19 distribution rural electric cooperative members. KEPCo is governed by a Board of Trustees representing each of its 19 members, which collectively serve more than 100,000 electric meters in two-thirds of rural Kansas.

1.1.4 Descriptions of Organization and Management of Applicant and Co-Owners

The directors and principal officers of WCNOC and Co-owners and their addresses are presented below. All persons listed are U. S. citizens.

Wolf Creek Nuclear Operating Corporation Board of Directors	
Name	**Address**
Terry Bassham	1201 Walnut Street, Kansas City, MO 64106
Michael J. Chesser	P.O. Box 411, Burlington, KS 66839
William H. Downey	1201 Walnut Street, Kansas City, MO 64106
Stephen T. Easley	1201 Walnut Street, Kansas City, MO 64106
Thomas L. Grennan	P.O. Box 4877, Topeka, KS 66604
James S. Haines, Jr.	818 S Kansas Avenue, Topeka, KS 66612
Stephen E. Parr	P.O. Box 4877, Topeka, KS 66604
William B. Moore	818 S Kansas Avenue, Topeka, KS 66612

Wolf Creek Nuclear Operating Corporation Board of Directors (Continued)	
Name	**Address**
Richard A. Muench	P.O. Box 411, Burlington, KS 66839
Mark A. Ruelle	818 S Kansas Avenue, Topeka, KS 66612
Douglas R. Sterbenz	818 S Kansas Avenue, Topeka, KS 66612
Coleen Wells	P.O. Box 4877, Topeka, KS 66604

Wolf Creek Nuclear Operating Corporation Principal Officers		
Name	**Title**	**Address**
Richard A. Muench	President and Chief Executive Officer	P.O. Box 411 Burlington, KS 66839
Terry J. Garrett	Vice President Engineering	P.O. Box 411 Burlington, KS 66839
Stephen E. Hedges	Vice President Operations and Plant Manager	P.O. Box 411 Burlington, KS 66839
Annette F. Stull	Vice President and Chief Administrative Officer	P.O. Box 411 Burlington, KS 66839
Matthew W. Sunseri	Vice President Oversight	P.O. Box 411 Burlington, KS 66839
Warren B. Wood	General Counsel/Secretary	P.O. Box 411 Burlington, KS 66839

Kansas Gas and Electric Company Board of Directors	
Name	**Address**
William B. Moore	818 S Kansas Avenue, Topeka, KS 66612
Douglas R. Sterbenz	818 S Kansas Avenue, Topeka, KS 66612
Caroline A. Williams	818 S Kansas Avenue, Topeka, KS 66612

Kansas Gas and Electric Company Officers		
Name	**Title**	**Address**
William B. Moore	President	818 S Kansas Avenue, Topeka, KS 66612
Caroline A. Williams	Vice President	818 S Kansas Avenue, Topeka, KS 66612
Kelly B. Harrison.	Vice President	818 S Kansas Avenue, Topeka, KS 66612
Mark A. Ruelle	Vice President & Treasurer	818 S Kansas Avenue, Topeka, KS 66612
Larry D. Irick	Secretary	818 S Kansas Avenue, Topeka, KS 66612
Jill Z. Frasco	Asst. Secretary	818 S Kansas Avenue, Topeka, KS 66612

Kansas City Power & Light Company Board of Directors	
Name	**Address**
Michael J. Chesser	1201 Walnut Street, Kansas City, MO 64106
William H. Downey	1201 Walnut Street, Kansas City, MO 64106
Dr. David L. Bodde	1201 Walnut Street, Kansas City, MO 64106
Mark A. Ernst	1201 Walnut Street, Kansas City, MO 64106
Randall C. Ferguson	1201 Walnut Street, Kansas City, MO 64106
Luis A. Jimenez	1201 Walnut Street, Kansas City, MO 64106
James A. Mitchell	1201 Walnut Street, Kansas City, MO 64106
William C. Nelson	1201 Walnut Street, Kansas City, MO 64106
Dr. Linda Hood Talbott	1201 Walnut Street, Kansas City, MO 64106

Kansas City Power & Light Company Officers		
Name	**Title**	**Address**
Michael J. Chesser	Chairman of the Board	1201 Walnut Street, Kansas City, MO 64106
William H. Downey	President & CEO	1201 Walnut Street, Kansas City, MO 64106
Terry Bassham	CFO	1201 Walnut Street, Kansas City, MO 64106
Lora C. Cheatum	VP-Administrative Services	1201 Walnut Street, Kansas City, MO 64106
Michael W. Cline	Treasurer	1201 Walnut Street, Kansas City, MO 64106
F. Dana Crawford	VP-Plant Operations	1201 Walnut Street, Kansas City, MO 64106
Barbara B. Curry	Secretary	1201 Walnut Street, Kansas City, MO 64106
Stephen T. Easley	Sr. VP-Supply	1201 Walnut Street, Kansas City, MO 64106
Chris B. Giles	VP-Regulatory Affairs	1201 Walnut Street, Kansas City, MO 64106
William P. Herdegen III	VP-Customer Operations	1201 Walnut Street, Kansas City, MO 64106
John R. Marshall	Sr. VP-Delivery	1201 Walnut Street, Kansas City, MO 64106
William G. Riggins	VP-Legal & Environmental Affairs & General Counsel	1201 Walnut Street, Kansas City, MO 64106
Marvin L. Rollison	VP-Corporate Culture & Community Strategy	1201 Walnut Street, Kansas City, MO 64106
Richard A. Spring	VP-Transmission Services	1201 Walnut Street, Kansas City, MO 64106
Lori A. Wright	Controller	1201 Walnut Street, Kansas City, MO 64106

Kansas Electric Power Cooperative, Inc. Board of Trustees	
Name	**Address**
Dwight Engelland	Ark Valley Electric Cooperative Assn., Inc. P.O. Box 1246, South Hutchinson, KS 67504
Kenneth J. Maginley	Bluestem Electric Cooperative, Inc. P.O. Box 5, Wamego, KS 66547
Dale Bodenhausen	Brown-Atchinson Electric Cooperative Assn., Inc. P.O. Box 230, Horton, KS 66439
Richard Pearson	Butler Rural Electric Cooperative Assn., Inc. P.O. Box 1242, El Dorado, KS 67042

Kansas Electric Power Cooperative, Inc. Board of Trustees (Continued)	
Name	**Address**
Dwane Kessinger	Caney Valley Electric Cooperative Assn., Inc. P.O. Box 308, Cedar Vale, KS 67042
Kirk A. Thompson	CMS Electric Cooperative, Inc. P.O. Box 790, Meade KS 67864
Harlow Haney	DS&O Rural Electric Cooperative Assn., Inc P.O. Box 286, Solomon, KS 67480
Robert E. Reece	Flint Hills Rural Electric Cooperative Assn., Inc. P.O. Box B, Council Grove, KS 66846
Dennis Peckman	Heartland Rural Electric Cooperative, Inc. P.O. Box 40, Girard, KS 66743
Robert Smith, Jr.	Leavenworth-Jefferson Electrical Cooperative, Inc. P.O. Box 70, McLouth, KS 66054
Scott Whittington	Lyon-Coffey Electric Cooperative, Inc. P.O. Box 229, Burlington, KS 66839
Gordon Coulter	Ninnescah Electric Cooperative Assn., Inc. P.O. Box 967, Pratt, KS 67124
Gilbert Berland	Prairie Land Electric Cooperative, Inc. P.O. Box 360, Norton, KS 67654
Dennis Duft	Radiant Electric Cooperative, Inc. P.O. Box 390, Fredonia, KS 66736
Melroy Kopsa	Rolling Hills Electric Cooperative, Inc. P.O. Box 307, Mankato, KS 66956
David Reichenberger	Sedgwick County Electric Cooperative Assn., Inc. P.O. Box 220, Cheney, KS 67025
Charles Riggs	Summer-Cowley Electric Cooperative, Inc. P.O. Box 220, Wellington, KS 67152
Bryan Coover	Twin Valley Electric Cooperative, Inc. P.O. Box 385, Altamont, KS 67330
Marvin Hampton	Victory Electric Cooperative Assn., Inc. P.O. Box 1335, Dodge City, KS 67801

Kansas Electric Power Cooperative, Inc. Officers		
Name	**Title**	**Address**
Kenneth J. Maginley	President	Bluestem Electric Cooperative, Inc. P.O. Box 5, Wamego, KS 66547
Stephen E. Parr	Executive VP & CEO	Kansas Electric Power Cooperative, Inc. P.O. Box 4877, Topeka, KS 66604
Thomas L. Grennan	Sr. VP & COO	Kansas Electric Power Cooperative, Inc. P.O. Box 4877, Topeka, KS 66604
Leslie W. Evans	VP - Power Supply	Kansas Electric Power Cooperative, Inc. P.O. Box 4877, Topeka, KS 66604
J. Michael Peters	VP - Administration & General Counsel	Kansas Electric Power Cooperative, Inc. P.O. Box 4877, Topeka, KS 66604
Robert D. Bowser	VP - Regulatory & Technical Services	Kansas Electric Power Cooperative, Inc. P.O. Box 4877, Topeka, KS 66604
Coleen Wells	VP - Finance & Controller	Kansas Electric Power Cooperative, Inc. P.O. Box 4877, Topeka, KS 66604

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

Wolf Creek Nuclear Operating Corporation (WCNOC) requests renewal of the Class 103 operating license for Wolf Creek Generating Station (License Nos. NPF-42) for a period of 20 years beyond the expiration of the current license, midnight on March 11, 2025.

Because the current licensing basis is carried forward with the possible exception of some aging issues, WCNOC expects the form and content of the license to be generally the same as presently exists. WCNOC, thus, requests similar extensions of specific licenses under 10 CFR Parts 30, 40, and 70 that are contained in the current 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), WCNOC 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 Parts 25 and/or 95.

1.1.8 Regulatory Agencies

Regulatory agencies with jurisdiction over WCGS are listed below.

Kansas Corporation Commission
1500 SW Arrowhead Road
Topeka, KS 66604-4027

Missouri Public Service Commission
Governor Office Building
200 Madison Street
PO Box 360
Jefferson City, MO 65102-0360

Federal Energy Regulatory Commission
888 First St. N. E.
Washington, DC 20426

Securities and Exchange Commission
450 Fifth Street NW
Washington, DC 20549

1.1.9 Local News Publications

News publications in circulation near WCGS that are considered appropriate to give reasonable notice of the application are as follows:

The Coffey County Republican
P.O. Box A
Burlington, Kansas 66839

The Topeka Capital Journal
616 SE Jefferson
Topeka, KS 66607

The Emporia Gazette
517 Merchant St
Emporia, KS 66801

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 for Wolf Creek states in Article VII that the agreement shall terminate at the time of expiration of that license specified in Item 3 of the Attachment to the agreement. Item 3 of the Attachment to the indemnity agreement, as amended, lists license number NPF-42.

The Company requests that conforming changes be made to the indemnity agreement, and/or the Attachment to the agreement, as required, to ensure that the indemnity agreement continues to apply during both the terms of the current license and the terms of the renewed license. Applicant understands that no changes may be necessary for this purpose if the current license number is retained.

1.2 GENERAL LICENSE INFORMATION

1.2.1 Application Updates, Renewed Licenses, 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 contents of the license renewal application will be provided.

In accordance with 10 CFR 54.21(d), WCNOC will maintain a summary list in the WCGS Updated Safety Analysis Reports (USAR) of activities that are required to manage the effects of aging for the systems, structures or components in 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 1.7 are listed for information only.

1.2.3 Contact Information

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

Mr. Terry J. Garrett
Vice President Engineering
Wolf Creek Nuclear Operating Corporation
P.O. Box 411
Burlington, Kansas 66839

with copies to:

Mr. Kevin J. Moles
Manager Regulatory Affairs

Mrs. Lorrie I. Bell
License Renewal Project Manager

1.3 PURPOSE

This document provides information required by 10 CFR 54 to support the application for renewed licenses for Wolf Creek Generating Station. The application contains technical information required by 10 CFR 54.21, technical specification changes required by 10 CFR 54.22 (if applicable), and environmental information required by 10 CFR 54.23. The information contained herein is intended to provide the NRC with an adequate basis to make the findings required by 10 CFR 54.29.

1.4 DESCRIPTION OF THE PLANT

Wolf Creek Generating Station (WCGS), Unit No. 1, is located approximately 3.5 miles northeast of the town of Burlington, in Coffey County, Kansas. The site is situated approximately 3.5 miles east of the Neosho River and the John Redmond Reservoir. The nearest population center is Emporia, Kansas, located 28 miles west northwest of the site. It is approximately 75 miles southwest of Kansas City, Kansas.

The nuclear steam supply system for WCGS is a pressurized water reactor that was designed and supplied by Westinghouse Electric Corporation. The licensed reactor core power is 3565 MWt. The estimated turbine generator output is 1228 MWe.

The containment structure (reactor building) is a carbon steel-lined concrete structure and the base slab is reinforced concrete. The reactor building houses the reactor, reactor coolant system, steam generators, pressurizer, reactor coolant pumps, accumulators, and containment air coolers. The auxiliary building houses the engineered safety features and the nuclear auxiliary systems equipment. The turbine building houses the turbine generator, main feed pumps, and other steam and power conversion equipment. The fuel building houses the new fuel storage vault, the fuel storage pool, the fuel handling system, and a portion of the spent fuel pool cooling and cleanup system. The radwaste building houses the radioactive waste treatment facilities and the boron recycle components. The control building houses the main control room, Class 1E switchgear, the Class 1E battery rooms, the access control area, cable spreading rooms, and portions of the main control room emergency ventilation systems. The diesel generator building houses the diesel generators and associated equipment.

Descriptions of the WCGS systems and structures can be found in the WCGS Updated Safety Analysis Report (USAR). Additional descriptive information about the WCGS systems and structures is provided in Section 2 of this application.

1.5 APPLICATION STRUCTURE

This license renewal application is structured in accordance with Regulatory Guide 1.188, “Standard Format and Content for Applications to Renew Nuclear Plant Operating Licenses,” and NEI 95-10, "Industry Guideline on Implementing the Requirements of 10 CFR Part 54 - The License Renewal Rule,” Revision 6. In addition, Section 3, “Aging Management Review Results” 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 which existing programs should 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 Results” of this application.

The application is divided into the following major 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, and 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, general references, 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 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 structures and components that perform their intended function 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, WCGS 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 is made.

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 Results

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. Chapter 3 is the link between the scoping and screening results provided in Chapter 2 and the aging management activities provided 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 through 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 containments, 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 section. This section 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 each of the analyses remain valid for the period of extended operation, the analyses have been projected to the end of the period of extended operation, or the effects of aging on the intended function(s) will be adequately managed for the period of extended operation.

Appendix A – Updated Final Safety Analysis Report Supplement

As required by 10 CFR 54.21(d), the Updated Safety Analysis Report (USAR) supplement contains a summary of activities credited for managing the effects of aging for the period of extended operation. In addition, summary descriptions of time-limited aging analyses evaluations 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 – Commodity Groups (Optional)

Appendix C is not used.

Appendix D – Technical Specification Changes

This Appendix 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. No technical specification changes are requested.

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 Part 51 for WCGS.

1.6 ACRONYMS

Acronym	Meaning
AC	Alternating current
ACI	American Concrete Institute
ACSR	Aluminum Conductor Steel Reinforced
AFS	Auxiliary feedwater system
AFW	Auxiliary feedwater
ALARA	As Low As Reasonably Achievable
AMR	Aging management review
ANSI	American National Standards Institute
ARC	Alternate repair criteria
ART	Adjusted reference temperatures
ASME	American Society of Mechanical Engineers
ATWS	Anticipated transients without scram
B&PVC	Boiler and Pressure Vessel Codes
BRS	Boron recycle system
CASS	Cast austenitic stainless steel
CCS	Condensate cleanup system
CCWS	Component cooling water system
CDS	Condensate demineralizer system
CFR	Code of Federal Regulations
CFS	Condensate and feedwater system
CLB	Current licensing basis
COMS	Cold overpressurization mitigation system
CRD(M)	Control rod drive (mechanism)
CS	Core spray (system)
CST	Condensate storage tank
CUF	Cumulative usage factor
CWS	Circulating water system
DBE	Design-basis event
DC	Direct Current
DG	Diesel generator

Acronym	Meaning
DWMS	Demineralized water makeup system
DWST	Demineralized water storage tank
ECCS	Emergency core cooling systems
ECT	Eddy current testing
EDG	Emergency diesel generator
EFPY	Effective full-power years
EHC	Electro-hydraulic control
EOL	End-of-life
EPRI	Electric Power Research Institute
EQ	Environmental qualification
EQSD	Equipment Qualification Summary Document
EQWP	Equipment Qualification Work Packages
ESFS	Engineered safety feature system
ESWS	Essential service water system
FAC	Flow-accelerated corrosion
FHS	Fuel handling system
FPCC	Fuel pool cooling and cleanup
FSSD	Fire safe shutdown
GALL	Generic Aging Lessons Learned
GL	Generic Letter
HELB	High energy line break
HEPA	High efficiency particulate air
HVAC	Heating, ventilation, and air conditioning
HX	Heat exchanger
I&C	Instrumentation and controls
IGSCC	Intergranular stress corrosion cracking
IN	Information Notice
INPO	Institute of Nuclear Power Operations
IPA	Integrated plant assessment
IASCC	Irradiation-assisted stress corrosion cracking
ISI	Inservice inspection
IST	Inservice testing
LBB	Leak before break
LER	Licensee event report

Acronym	Meaning
LLRT	Local leak rate test
LOCA	Loss of coolant accident
LTOP	Low-temperature overpressure protection
LRA	License renewal application
MCC	Motor control center
MIC	Microbiologically influenced corrosion
MOV	Motor-operated valve
MRV	minimum required value
MSIV	Main steam isolation valve
MSSS	Main steam supply system
MWe	Megawatt electric
MWt	Megawatt thermal
NBI	Nuclear boiler instrumentation
NDE	Nondestructive examination
NEI	Nuclear Energy Institute
NESC	National Electrical Safety Code
NFPA	National Fire Protection Association
NRC	Nuclear Regulatory Commission
OBE	Operating basis earthquake
OCCW	Open-cycle cooling water
OE	Operating experience
OPS	Offsite power systems
P&ID	Piping and instrumentation diagram
PHS	Plant heating system
PM	Preventive maintenance
PWSCC	Primary water stress corrosion cracking
PRM	Process radiation monitoring
P-T curves	Pressure-temperature limit curves
PWR	Pressurized water reactor
RCP	Reactor coolant pump
RCPB	Reactor coolant pressure boundary
RCS	Reactor coolant system
RHR	Residual heat removal
RI-ISI	Risk Informed Inservice Inspection

Acronym	Meaning
RMWS	Reactor makeup water system
RMWST	Reactor makeup water storage tank
RPC	Rotating pancake
RPV	Reactor pressure vessel
RT_{NDT}	nil-ductility transition reference temperature
SBO	Station blackout
SCC	Stress corrosion cracking
SGBS	Steam generator blowdown system
SRP	Standard Review Plan (NUREG-1800)
SRV	Safety relief valve
SSCs	Systems, structures, and components
SSE	Safe shutdown earthquake
SV	Safety valve
SWS	Service water system
TBS	Turbine bypass system
TG	Turbine generator
TID	Total integrated dose
TLAAs	Time-limited aging analyses
UHS	Ultimate heat sink
USAR	Updated Safety Analysis Report
USE	Upper-shelf energy
UT	Ultrasonic testing
WCGS	Wolf Creek Generating Station
WOG	Westinghouse Owners Group
WCNOC	Wolf Creek Nuclear Operating Corporation
XLPE	cross linked polyethylene

1.7 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 1 – September 2005.

5. NUREG-1801, "Generic Aging Lessons Learned (GALL) Report," United States Nuclear Regulatory Commission, Revision 1 – September 2005.

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 50.63, “Loss of All Alternating Current Power.”

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

11. 10 CFR 50, Appendix B, “Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants.”

12. 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 and described in 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)

Table 2.0-1, Intended Functions: Abbreviations and Definitions, contains the meanings for the abbreviations of intended functions used in this application.

Table 2.0-1 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

Table 2.0-1 Intended Functions: Abbreviations and Definitions (Continued)

Intended Function Abbreviation	Function	Description
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
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)
NSRS	Nonsafety-related Structural Support	Provide structural support to non-safety related components whose failure could prevent satisfactory accomplishment of required safety functions.
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

Table 2.0-1 Intended Functions: Abbreviations and Definitions (Continued)

Intended Function Abbreviation	Function	Description
SCW	Shutdown Cooling Water	Provide source of cooling water for plant shutdown.
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
SS	Structural Support	Provide structural and / or functional support to safety-related components
TH	Throttle	Provide flow restriction

2.1 SCOPING AND SCREENING METHODOLOGY

For systems, structures and components (SSCs) within the scope of license renewal, 10 CFR 54.21(a)(1) requires the license renewal applicant 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 and justification of the methodology used to identify and list structures and components at WCGS 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 systems, structures and components (SSCs) within the scope of 10 CFR Part 54. This process 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 aging management review (AMR). This step of the process is called screening.

Scoping and screening has been performed consistent with the requirements of 10 CFR 54, the Statements of Consideration related to 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. In addition, the NRC staff's license renewal interim staff guidance (ISG) documents were considered as described in Section 2.1.1.2.

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, Section 2.1.5 describes the evaluation of Generic Safety Issues (GSI), and Section 2.1.6 provides conclusions.

An overview of the WCGS 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 documents

- Maintenance rule database
- Engineering drawings
- Technical position papers
- Master Equipment List and Q-List

2.1.1.1.1 Current Licensing Basis Documents

The current licensing basis (CLB) is defined in 10 CFR 54.3. A variety of current licensing basis documents were used to confirm or to determine additional system, structure, or component functions and evaluate them against the criteria of 10 CFR54.4(a). These documents are:

- WCGS Updated Safety Analysis Report (USAR) was used as a source of CLB information for the plant.
- Safety evaluation reports (SERs) reflect the NRC Staff understanding of plant SSC functional requirements, performance characteristics, and related regulatory commitments. WCGS SERs were reviewed, as needed, to obtain information relevant to scoping and screening.
- Technical specifications provide safety limits, limiting conditions for operation, and surveillance requirements applicable to plant SSCs whose functions are critical to nuclear safety. Technical specification bases provide discussions of SSC functional characteristics that underlie the limits and requirements. The technical specification requirements and bases were reviewed to obtain additional information supporting the functional evaluation of SSCs.
- Licensing correspondence reflecting WCGS commitments related to various SSCs and programs was reviewed.

2.1.1.1.2 Maintenance Rule Database

The maintenance rule database was used as a source to identify functions for systems and structures. The maintenance rule database provides descriptions of the functions for each system and structure and evaluations of those functions against the safety-related criteria listed in 10 CFR 50.65(b)(1), which are similar to the safety-related criteria of 10 CFR 54.4(a)(1).

The maintenance rule database also identifies system and structure functions that may fall into the category of nonsafety-related affecting safety-related. The criterion related to nonsafety-related affecting safety-related for license renewal (10 CFR 54.4(a)(2)) and for the maintenance rule (10 CFR 50.65(b)(2)(ii)) are similar, and the evaluations documented in the maintenance rule database were used as input for license renewal evaluations.

2.1.1.1.3 Engineering Drawings

Engineering drawings that provide layout and configuration details were reviewed for mechanical systems and structures. This included electrical, mechanical, and structural drawings.

2.1.1.1.4 Technical Position Papers

Technical position papers were prepared as part of the preparation for the license renewal project to support scoping evaluations for criterion 10 CFR 54.4(a)(2) and each of the regulated events identified in 10 CFR 54.4(a)(3).

The following technical position papers were prepared and are discussed further in Sections 2.1.2.2, 2.1.2.3, and 2.1.4.3:

- Criterion (a)(2) Technical Position Paper
- Fire Protection Technical Position Paper
- Environmental Qualification Technical Position Paper
- Pressurized Thermal Shock Technical Position Paper
- Anticipated Transients Without Scram Technical Position Paper
- Station Blackout Technical Position Paper
- Electrical/I&C Plant Spaces Approach Position Paper

2.1.1.1.5 Master Equipment List Database

WCGS maintains a master equipment list as part of the Engineering Information System. The WCGS Q-List identifies the components with safety-related quality safety classifications. The WCGS safety-related quality safety classification is consistent with the criteria in 10 CFR 54.4(a)(1). All components on the WCGS Q-List with a safety-related quality safety classification are in the scope of license renewal. .

2.1.1.1.6 License Renewal Database Management Tool

The WCGS license renewal database management tool, also referred to as the license renewal database, was developed as a project tool to support scoping and screening evaluation activities, aging evaluation and aging management program evaluation activities, and to document references and other information used in preparing the license renewal application. It provides the platform for the administration of equipment data and output reports. The license renewal database files for each system and structure were initially populated by down-loading component records from the WCGS master equipment list database.

2.1.1.2 Interim Staff Guidance Discussion

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.

The following ISGs remain open and are in process:

- ISG-19B Cracking of nickel-alloy components in the reactor coolant pressure boundary is under development by the NRC.
- ISG-23 Replacement parts necessary to meet 10 CFR 50.48 (Fire Protection) is under review by the NRC to determine if this ISG is needed.
- ISG-2006-01 Corrosion of the Mark I Steel Containment Drywell Shell is under NRC review but is not applicable to WCGS.
- ISG-2006-02 Proposed staff guidance on acceptance review for environmental requirements is under development by the NRC.
- ISG-2006-03 Proposed staff guidance for preparing Severe Accident Mitigation Alternatives (SAMA) Analyses has been issued for comment by the NRC. The WCGS SAMA analysis provided as a part of Appendix E is consistent with the guidance of NEI 05-01 as discussed in this ISG.

2.1.2 Scoping Criteria

Systems, structures, and components which satisfy the criteria in 10 CFR 54.4(a)(1), (a)(2) and (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) of this section."

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 Title10 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 that could result in potential offsite exposure comparable to the guidelines in 10 CFR 50.34(a)(1), 10 CFR 50.67(b)(2), or 10 CFR 100.11, as applicable.

Safety-related classifications for systems and structures at WCGS are reported in the USAR or in design basis documents such as engineering drawings, evaluations, or calculations. Safety-related classifications for components are documented on engineering drawings and in the WCGS Q-List. The safety-related classification as reported in these source documents has been relied upon to identify SSCs satisfying one or more of the criteria of 10 CFR 54.4(a)(1). These SSCs have been identified as within the scope of license renewal.

2.1.2.2 Title 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 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, the maintenance rule system/structure functional reports, plant specific and industry operating experience, and by system and structure functional evaluations.

Initial Nonsafety-related SSCs Required to Support Safety- related SSCs

The WCGS USAR and other current licensing basis documents were reviewed for every nonsafety-related plant system or structure, to determine whether the system or structure was credited with supporting satisfactory accomplishment of a safety-related function. Nonsafety-related systems or structures explicitly credited in CLB documents with supporting accomplishment of a safety-related function were classified as satisfying criterion 10 CFR 54.4(a)(2) and were included within the scope of license renewal.

Nonsafety-related SSCs Directly Connected to Safety-related SSCs

Nonsafety-related SSCs were included within the scope of license renewal, where possible, up to the first seismic anchor past the safety/nonsafety interface for those nonsafety-related mechanical SSCs that are connected to a safety-related SSC and must provide structural integrity. In a significant majority of cases at WCGS, an actual seismic anchor exists to serve as the boundary for the nonsafety structural integrity feature. In cases where seismic anchors were not available to serve as the license renewal boundary, other methods as provided for in NEI 95-10, including equivalent anchors were utilized to establish the license renewal boundary. Some examples of these other methods were:

- A combination of restraints or supports such that the nonsafety-related piping and associated structures and components attached to safety-related piping is included in scope up to a boundary point that encompasses two (2) supports in each of three (3) orthogonal directions.

- 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 is included in scope as it has a support function for the safety-related piping.
- Nonsafety-related piping runs that are connected at both ends to safety-related piping include the entire run of nonsafety-related piping.

Nonsafety-related SSCs with Spatial Interaction with Safety-related SSCs

Nonsafety-related SSCs which are not connected to safety-related piping and/or which are not required for structural integrity, but have a spatial relationship such that their failure could adversely impact the performance of a safety- related SSC intended function, were included in the scope of license renewal per NEI 95-10, Appendix F. The following spatial interactions were considered when determining if a nonsafety-related SSC should be included in-scope:

- pipe whip
- jet impingement
- flooding
- spray
- physical impact

All safety related structures were considered as potential locations for safety-related/nonsafety-related interactions that could result in a criterion 10 CFR 54.4(a)(2) intended function. This original set of all safety-related structures was divided into two groups for further evaluation based on the apparent likelihood that some of the structures could be easily shown to have no nonsafety-related fluid-filled components.

The safety-related structures that were expected to have no nonsafety-related fluid-filled components were identified. These structures were then confirmed to have no nonsafety-related fluid-filled components by walkdowns, and reference to other sources, both electronic and otherwise, of equipment location information.

The remaining structures from the original list of safety-related structures that were expected to contain nonsafety-related fluid-filled components that could perform a criterion 10 CFR 54.4(a)(2) intended function were identified. As these buildings have different configurations and sizes, slightly varying approaches were considered for further evaluation including use of the project equipment location database, walkdowns, and review of design documents.

Additional evaluations were performed to enable adding the component level detail to the license renewal boundary drawings for criterion 10 CFR 54.4(a)(2) to satisfy the recommendations of NEI 95-10, Appendix F.

2.1.2.3 Title 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).

Technical position papers were prepared to provide input to the SSC scoping process. The purpose of these position papers was to evaluate the WCGS 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 technical position papers was used during system and structure scoping to identify system and structure intended functions for Criterion (a)(3), and again during component scoping 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, and further requires all nuclear power plants licensed to operate prior to January 1, 1979, to comply with Sections III.G, III.J and III.O of Appendix R to 10 CFR 50.

The WCGS Fire Protection Program licensing basis is based on Appendix A to Branch Technical Position (BTP) APCSB 9.5-1, “Guidelines for Fire Protection for Nuclear Power Plants Docketed Prior to July 1, 1976” and 10CFR50, Appendix R, “Fire Protection Program for Nuclear Power Facilities Operating Prior to January 1, 1979.”

Comparisons of the WCGS Fire Protection Program to the two bases documents are provided in USAR Tables 9.5A-1 and 9.5E-1. WCGS is divided into distinct fire areas separated by Appendix R equivalent fire barriers.

Fire protection for the purposes of license renewal is an inclusive term to describe a station’s ability to minimize the adverse effects of fires on structures, systems, and components important to safety. Based on General Design Criterion 3, “Fire Protection” of 10CFR50 Appendix A, fire protection includes:

- Proper design to minimize the probability and effect of fires and explosions,
- Control of transient and permanent storage of combustible material,

- Installation of fire detection and fighting systems and a program to manage their use, testing, and staffing, and
- Methods to bring the station to safe shutdown conditions regardless of the fire location.

The position paper summarizes the results of a detailed review performed on the fire protection program documents demonstrating compliance with the requirements of 10 CFR 50.48 for the plant. The position paper provides a list of systems and structures credited in the fire protection program documents.

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

2.1.2.3.2 Environmental Qualification

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 environmental qualification (10 CFR 50.49). The WCGS environmental qualification (EQ) program applies to electrical equipment important to safety that is located in a harsh environment.

WCGS USAR Table 3.11(B)-3, Identification of Safety-Related Equipment and Components: Equipment Qualification was used as the basis to create a list of qualified systems.

The environmental qualification position paper provides lists of systems that include EQ components.

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

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 position paper was developed to review the licensing basis for pressurized thermal shock at WCGS. For WCGS, 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).

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 anticipated transient without scram (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 changes 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. Each pressurized water reactor must have equipment from sensor output to final actuation device, which is diverse from the reactor trip system, to automatically initiate the auxiliary feedwater system and initiate a turbine trip.

The following equipment is required by the ATWS Rule for reduction of risk from an ATWS Event at WCGS:

- The ATWS Mitigation System Actuation Circuitry (AMSAC) cabinet.
- Four Reactor Protection System narrow range steam generator level loops and two turbine impulse pressure loops.
- The Balance of Plant (BOP) Engineered Safety Features Actuation System (ESFAS) and Turbine Generator Electrohydraulic Control (EHC) cabinets.
- The steam generator blowdown isolation valves and the steam generator sample isolation valves.

ATWS equipment is described in WCGS USAR Section 7.7.1.11, ATWS Mitigation System Actuation Circuitry (AMSAC) and the accident analysis for ATWS is discussed in Section 15.8.

All ATWS SSCs are 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 (10 CFR 50.63).

The SBO rule (10 CFR 50.63) requires that nuclear power plants have the capability to withstand and recover from the loss of offsite and onsite AC power of a specified duration (the coping duration). Regulatory Guide 1.155 provides guidance on selecting the time period for which a licensee must cope with the SBO. WCGS used RG 1.155 to calculate a plant-specific coping time period. A “four hour” coping duration was determined for WCGS based on expected frequency of loss of offsite power and the probable time needed for its restoration. Redundancy and reliability in onsite emergency AC power source (emergency diesel generators) was also factored in the evaluation.

Equipment needed to cope with and recover from an SBO is identified in the WCGS Coping Assessment and is included in USAR Appendix 8.3A. The plant system portion of the offsite power system is within the scope of license renewal. The WCGS offsite power for SBO recovery is provided via two paths. The first path is via the XMR01 Startup Transformer which is supplied 345KV power from the Wolf Creek substation. The 345KV system equipment beyond the disconnects is part of the offsite transmission system (grid) and not in the scope of license renewal. The second path is provided via the 4.16 KV ESF01 Transformer which is supplied 13.8KV power form the Wolf Creek substation. The 13.8KV system equipment including the 13.8 switchgear is part of the offsite transmission system (grid) and not in the scope of license renewal. Westar Energy is the owner of the Wolf Creek substation and is responsible for grid equipment operations and maintenance.

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

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

2.1.3 Scoping Methodology

Scoping of the WCGS 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 WCGS scoping evaluation results have been retained in the license renewal database. The following sections describe the methodology used for scoping. Separate discussions of mechanical system scoping methodology, structures scoping methodology, and electrical and I&C system scoping methodology are provided.

2.1.3.1 Mechanical System Scoping Methodology

A list of all mechanical systems was developed. These mechanical systems were evaluated to the criteria of 10 CFR 54.4(a). The list of mechanical systems and the results of the scoping are provided in Section 2.2.

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

- Identification of the system purpose and functions

- Comparison of system functions against criteria of 10 CFR 54.4 (a)(1-3)
- Identification of supporting systems
- Determination of the system evaluation boundary
- Creation of license renewal drawings
- Component level scoping
- Document 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 USAR system descriptions, Maintenance Rule database records, current licensing basis documents, design basis documents (including P&IDs), and system operating descriptions.

Determination of the System License Renewal Boundary

After the system intended functions were identified, the system evaluation boundary was determined and marked–up on P&IDs. All of the components needed for the system to perform its intended functions are included within the license renewal boundary. Mechanical system P&IDs that show the system configuration, including component equipment identification numbers, were used to define the evaluation boundary of a system and to define the level of detail that was appropriate to support the scoping and screening evaluations of mechanical components. The system scoping summaries included in Section 2.3 of this application provide a description of the evaluation boundary for each mechanical system in the scope of the Rule.

The process to determine the system evaluation boundary required close examination of interfaces with other systems. System interfaces were closely evaluated to ensure that all components were included in the evaluation boundary of one of the interfacing systems. The potential concern was that the two interfacing systems could be identified in such a way that one or more components at the interface between systems would not be in one of the two systems' evaluation boundaries.

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

All 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) and were classified as intended functions. Functions performed by nonsafety-related systems or parts of systems that are required to ensure success of a safety-related function were identified as satisfying criterion (a)(2) and classified as intended functions. Functions that were credited in one of the regulated events were identified as satisfying criterion (a)(3) and classified as intended functions. A function may have been classified as an intended function under more than one of the three criteria in 10 CFR 54.4.

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 in the license renewal database was augmented to state that the system was determined to be outside 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 listed in the license renewal database were identified as outside the scope of the Rule and were excluded from further scoping or screening evaluations.

Identification of Supporting Systems

After a system was determined to be in the scope of the Rule, an evaluation was performed to identify all of its supporting systems. Each of the supporting systems was then reviewed to determine if its failure could prevent satisfactory accomplishment of any intended functions of the in-scope system. When it was determined that a supporting system was needed to maintain an intended function of the in-scope system, the supporting system was determined to be in-scope. When a supporting system was identified as being in-scope, the scoping evaluation for the supporting system was reviewed and revised as necessary. This step in the scoping process ensured that all supporting systems' intended functions were identified.

Creation of License Renewal Drawings

A license renewal drawing was created for each mechanical system determined to be in-scope of license renewal. The license renewal drawings were created in conjunction with the component scoping. License renewal drawings reflect the system evaluation boundary. The diagrams were created by marking-up the plant piping and instrumentation diagrams (P&IDs) associated with the mechanical system being evaluated. License renewal drawings include: 1) the system evaluation boundary; 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 in the scope of the rule solely for 10 CFR 54.4(a)(2) are shown on the license renewal drawings.

Component Level Scoping

The system component list obtained from the plant component database was down loaded into the license renewal database component table. System components are uniquely identified by the combination of plant name, unit, system name, system identification, component descriptions, and component types that are included in each record of the license renewal database.

Every safety related component meeting scoping criterion (a)(1) was included within the scope of the license renewal rule. All other components in the license renewal database for a given system were reviewed to determine if they supported any of the intended functions for a given system. This was done by reviewing the system functions, drawings, and other information sources to determine if failure of the component would result in failure of a system intended function.

A component was determined to be in-scope if it was safety related meeting the criteria of 10 CFR 54.4a(1), if it was determined that the component was needed to fulfill a system intended function, if the component met the criteria of 10 CFR 54.4a(2), or if the component was needed to support the intended function of the system needed to meet the criteria of 10 CFR 54.4a(3) for regulated events. The results of the component scoping are documented in the license renewal database.

The license renewal drawing for each in-scope system was reviewed to identify those components within the system required to support the system intended functions. Not all components on the P&IDs are included in the plant component and license renewal databases. Each system license renewal drawing was reviewed and any commodity types (such as piping supports) indicated on the drawing to be in-scope for license renewal were added to the component list in the license renewal database. These components were identified as within the scope of license renewal.

The license renewal database includes uniquely identified components that are not explicitly shown on the P&IDs or on the license renewal drawings. Each of these components was evaluated individually to determine whether the component supports a system level intended function, meets the criteria of 10 CFR 54.4a(2), or is credited for a regulated event. Components meeting one of these three criteria were identified in the license renewal database as within the scope of the Rule. Components not meeting one of these three criteria were identified in the license renewal database as out-of-scope.

The component scoping methodology described above was performed for every mechanical component found within an in-scope system. All electrical and instrument and control components within the evaluation boundary of in-scope mechanical systems were included within the scope of license renewal and evaluated using the spaces approach described in Section 2.1.3.3. The electrical and instrument and control components from all plant systems and structures were scoped collectively. This conservative scoping approach was applied to all electrical and instrument and control components provided the component did not have a mechanical component function such as a pressure boundary such as for flow elements, flow indicators, flow orifices, and sight gauges. In those instances, the components were evaluated individually for aging along with other components in the mechanical system.

All mechanical system components in the license renewal database 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 aging management review. The screening methodology is discussed in Section 2.1.4.

Document Scoping Results and References

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

2.1.3.2 Structure Scoping Methodology

A list of all structures at WCGS was developed that included free-standing buildings, separately evaluated rooms that are contiguous with free-standing buildings, tank foundations, and other miscellaneous structures. These structures are listed in Section 2.2, Table 2.2-1, WCGS Scoping Results. The list of structures used for scoping was developed through review of site plot drawings in conjunction with a walkdown of the property. The WCGS USAR was relied upon to identify the safety classifications of structures and structural components. Category I structures and structural components were considered safety-related.

The scoping methodology utilized for structures was similar to the mechanical system-level scoping described in Section 2.1.3.1. Structure descriptions were prepared, including the structure purpose and all functions. Structure evaluation boundaries were determined, including examination of structure interfaces. This information was included in the license renewal database. All 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 in the license renewal database. In those instances where the structure intended functions required support from other structures or systems, the supporting systems or structures were identified and evaluated against the criteria in 10 CFR 54.4(a)(2). A list of references supporting the evaluation of each structure was documented in the license renewal database.

Structural Boundary Drawings

Unlike mechanical systems, individual license renewal drawings were not created for structures. However, a single drawing based on the site plot plan was created. The license renewal drawing displays all of the structures in relation to one another.

Structural Component Scoping

Although the controlled plant component database does include some structural components, it does not include most of the structural components that are evaluated during an aging management review. For structures determined to be within the scope of license renewal, more detailed structural drawings were reviewed and, where needed, walkdowns were performed, to identify structural elements (such as steel structures, foundations, floors, walls, ceilings, penetrations, stairways or curbs). For in-scope structures, all structural components that are required to support the intended functions of the structure were entered into the license renewal database and were identified as in-scope of license renewal. These structural components were entered in the license renewal database as generic structural components. For each in-scope structure, all of the structural components listed in the license renewal database were evaluated and a determination was made as to whether the structural component was required to support the intended functions of the structure. Structural components that support the intended functions of the structure were identified in the license renewal database as within the scope of license renewal.

2.1.3.3 Electrical and I&C System Scoping Methodology

A list of electrical and I&C systems was developed and the systems were scoped against the criteria of 10 CFR 54.4(a). The list of electrical and I&C systems and the results of the scoping are provided in Table 2.2-1, WCGS Scoping Results.

System Level Scoping

At the system level, the scoping methodology utilized for electrical and I&C systems was similar to the mechanical system-level scoping described in Section 2.1.3.1. The USAR descriptions, maintenance rule database records, current licensing basis 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. All system level functions were evaluated against the criteria of 10 CFR 54.4(a)(1), (a)(2) and (a)(3). The supporting systems needed to maintain the in-scope system intended functions were identified and evaluated against the criteria in 10 CFR 54.4(a)(2). The results of the system level scoping along with a list of references supporting the evaluation of each electrical and instrument and control system were documented in the license renewal database.

Electrical Boundary Drawings

Unlike mechanical systems, individual license renewal drawings were not created for each electrical and I&C system. Two license renewal drawings were created. The plant One Line

Diagram schematically shows the portions of the plant AC electrical distribution system, including the Station Blackout recovery path, that are included in the scope of license renewal. The plant DC Main Single Line schematically shows the portions of the plant DC electrical distribution system that are included in the scope of license renewal.

Component Level Scoping

All electrical and I&C components that perform an intended function as described in 10 CFR 54.4 for in-scope systems were included in the scope of license renewal.

The controlled plant component database does not list electrical component types such as cable, connections, fuse holders, terminal blocks, high-voltage transmission conductor, connections and insulators, 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 WCGS. The electrical component types installed at WCGS but not listed in the plant component database were added into the license renewal database for evaluation 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 aging management review. This section, and the accompanying subsections for mechanical systems, electrical and instrument and control systems, and structures, describes the process used to perform screening for WCGS.

All SSCs listed in the WCGS license renewal database were scoped to the criteria of 10 CFR 54.4(a). All of 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 aging management review. The screening methodology utilized is described in this section of the application.

Title 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. For simplicity, 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”. Also for simplicity, 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. Components that are not “long-lived” are known as “short-lived”.

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 WCGS license renewal screening process. Slightly differing screening methodologies have been applied for mechanical systems, electrical and instrument and control systems, and structures. The screening methodology applied for each category of system and for structures is described in the following paragraphs.

2.1.4.1 Mechanical System Component Screening Methodology

In mechanical systems, component screening was a continuation of the component scoping activity. Mechanical systems were scoped at the system level and scoping continued to the component level. After a mechanical system component was categorized in the license renewal database 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 identified in the license renewal database as subject to aging management review.

Each component that was identified as subject to an aging management review 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. Most in-scope passive components perform only one intended function. However, a few in-scope component types may perform more than one function. The results of the component screening were recorded in the license renewal database. The list of component intended functions utilized in the screening of mechanical system components can be found in Table 2.0-1, Intended Functions Abbreviations and Definitions.

During the screening process, a few in-scope passive components were recognized in the screening process as short-lived components. Components that were recognized during screening as short-lived were eliminated from the aging management review process and the basis for the classification as short-lived was documented in the license renewal database. All other in-scope passive components were identified in the License Renewal database as subject to an aging management review. During the aging management review process, if detailed review of maintenance procedures and requirements determined that a component previously categorized as long-lived was subject to replacement based on a qualified life or specified time period; the component was re-categorized as short-lived and eliminated from the aging management review evaluation process.

Consumables were considered in the process for determining the structures and components subject to an aging management review. Consumables comprise the following four categories: (a) packing, gaskets, component seals, O-rings; (b) structural sealants; (c) oil, grease and component filters; (d) system filters, fire extinguishers, fire hoses and air packs. Consumables were considered based on the guidelines of NEI 95-10, Table 4.1-2, Treatment of Consumables and NUREG-1800, Table 2.1-3, Specific Staff Guidance on Screening.

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 in the scope of license renewal and subject to aging management review, and is included as a component type in each appropriate in-scope system.

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, the structure screening methodology classified the component as passive. This is consistent with guidance found in NEI 95-10, Appendix B. During the structural screening process, the intended function(s) of structural components were determined and recorded in the license renewal database. In the structure screening process, an evaluation was made to determine whether in-scope structural components were subject to replacement based on a qualified time period. If an in-scope structural component was determined to be subject to replacement based on a qualified time period, the component was identified as short-lived and was excluded from an aging management review. In such a case, the basis for determining that the structural component was short-lived was documented in the license renewal database. The list of component intended functions utilized in the screening of structural components is found in Table 2.0-1, Intended Functions Abbreviations and Definitions.

2.1.4.3 Electrical and I&C System Component Screening Methodology

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

2.1.5 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, Supplement 29, dated November 2005, the following GSIs have been evaluated for License Renewal:

1. GSI-156.6.1, Pipe Break Effects on Systems and Components

This GSI involves assumed high energy line breaks in which the effects of the resulting pipe break prevent the operation of systems required to mitigate the effects of the break. The aspects of pipe breaks that are associated with degradation are addressed in the aging management review tables associated with mechanical systems in Chapter 3.0. TLAA evaluations of high energy line breaks are presented in Section 4.3.2.10, High Energy Line Break Postulation Based on Fatigue Cumulative Usage Factor.

2. GSI-163, Multiple Steam Generator Tube Leakage

This GSI involves the potential multiple steam generator tube leaks during a main steam line break that cannot be isolated. Steam generator tubes are part of the reactor coolant pressure boundary and are the subject of an aging management review and TLAA evaluation as documented in Section 3.1 and Chapter 4.0. Aging management of steam generator tubes is addressed within the current licensing basis of the plant and will continue to be addressed during the period of extended operation by the Steam Generator Tube Integrity program discussed in Section B2.1.8.

3. GSI-168, Environmental Qualification of Electrical Equipment

This GSI relates to aging of electrical equipment that is subject to the qualification requirements of 10 CFR 50.49. In accordance with NRC Regulatory Issue Summary (RIS) 2003- 09, “Environmental Qualification of Low-Voltage Instrumentation and Control Cables,” GSI-168 has been resolved. Consistent with the guidance provided in RIS 2003-09, no additional information is required to address GSI-168. Environmental Qualification evaluations of electrical equipment are identified as a TLAA and are addressed in Section 4.4 of this application.

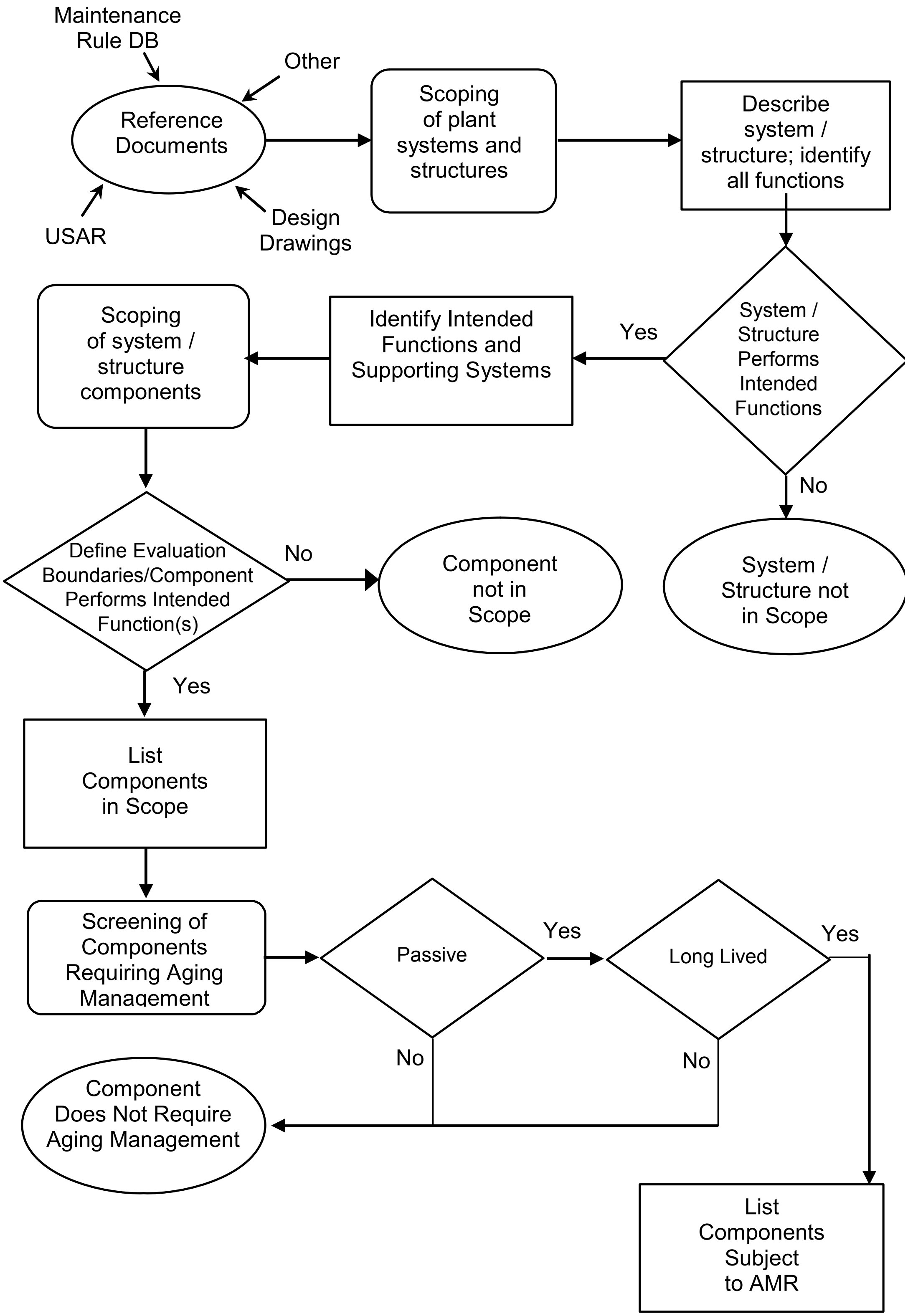
4. GSI-190, Fatigue Evaluation of Metal Components for 60-year Plant Life

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 of this application.

2.1.6 Conclusions

The scoping and screening methodology described above was used for the WCGS 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 requirements of 10 CFR 54.4 and 10 CFR 54.21(a)(1).

Figure 2.1-1
Scoping and Screening Process Flow



2.2 PLANT-LEVEL SCOPING RESULTS

Table 2.2-1, WCGS Scoping Results, provides the results of the WCGS assessment to identify the plant systems and structures that are within the scope of license renewal. Table 2.2-1 lists all WCGS mechanical, electrical and instrument and control systems, and structures. For in-scope mechanical systems and structures, a reference is given to the appropriate section of the application that provides a description and the screening results of the system or structure. For electrical and I&C systems, no description is necessary since these systems were evaluated based on the “spaces approach” as described in Section 2.5.

For each system and structure 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, indicating the evaluation boundaries of the systems and structures.

Table 2.2-1 WCGS Scoping Results

System/Structure	In Scope	Section 2 Scoping Results
Reactor Vessel, Internals, and Reactor Coolant System		
Reactor coolant system	Yes	2.3.1.2
Reactor core	Yes	2.3.1.4
Reactor vessel and internals	Yes	2.3.1.1
Steam generators	Yes	2.3.1.3
Engineered Safety Features		
Breathing air system	Yes	2.3.2.8
Containment purge HVAC system	Yes	2.3.2.7
Containment spray system	Yes	2.3.2.2
Containment integrated leak rate test system	Yes	2.3.2.3
Decontamination system	Yes	2.3.2.4
High pressure coolant injection system includes: Accumulator safety injection system Borated refueling water storage system	Yes	2.3.2.10
Hydrogen control system	Yes	2.3.2.9
Liquid radwaste system	Yes	2.3.2.5
Nuclear sampling system	Yes	2.3.2.1
Reactor makeup water system	Yes	2.3.2.6
Residual heat removal system	Yes	2.3.2.11
Auxiliary Systems		
Auxiliary building HVAC system	Yes	2.3.3.8
Chemical and volume control system	Yes	2.3.3.7
Compressed air system includes: Service gas system	Yes	2.3.3.6
Component cooling water system	Yes	2.3.3.4
Containment cooling system	Yes	2.3.3.5
Control building HVAC system includes: Ventilation charcoal filtering system	Yes	2.3.3.9

Table 2.2-1 WCGS Scoping Results (Continued)

System/Structure	In Scope	Section 2 Scoping Results
Cranes, hoists, and elevator system	Yes	2.3.3.19
Diesel generator building HVAC system	Yes	2.3.3.13
Emergency diesel engine fuel oil storage and transfer system	Yes	2.3.3.15
Emergency diesel engine system	Yes	2.3.3.16
Essential service water system	Yes	2.3.3.3
Essential service water pumphouse building HVAC system	Yes	2.3.3.11
Fire protection system	Yes	2.3.3.14
Floor and equipment drains system	Yes	2.3.3.17
Fuel building HVAC system	Yes	2.3.3.10
Fuel handling – fuel storage and handling system	Yes	2.3.3.1
Fuel pool cooling and cleanup system	Yes	2.3.3.2
Oily waste system	Yes	2.3.3.18
Miscellaneous buildings HVAC system	Yes	2.3.3.12
Miscellaneous auxiliary systems in-scope only for criterion 10CFR54.4(a)(2), includes:	Yes	2.3.3.21
Service water system		
Essential service water chemical addition system		
Chemical and detergent waste system		
Gaseous radwaste system		
Demineralized water makeup storage and transfer system		
Domestic water system		
Plant heating system		
Boron recycle system		
Central chilled water system		
Yard drainage system		
Secondary liquid waste system		
Turbine building HVAC system	Yes	2.3.3.20
Circulating water system includes:	No	N/A
Screen wash system		
Acid feed system		
Chemical injection system		
Gland water and motor cooling water systems		
Circulating water system – yard		
Circulating water system – power block		
Closed cooling water system	No	N/A
Cooling lake makeup water and blowdown system	No	N/A
Demineralized water group includes:	No	N/A
Makeup demineralizer system		
Caustic handling system		
Miscellaneous gas systems:	No	N/A
Carbon dioxide gas system		

Table 2.2-1 WCGS Scoping Results (Continued)

System/Structure	In Scope	Section 2 Scoping Results
Hydrogen gas system		
I&C shop nitrogen gas system		
Nitrogen gas system		
Oxygen gas system		
Miscellaneous compressed air systems includes:	No	N/A
I&C shop compressed air system		
MMO service air system		
Shop service air system		
Miscellaneous diesels group includes: Diesel generator system – Emergency Operations Facility and Technical Support Center	No	N/A
Miscellaneous drains system includes:	No	N/A
Waste water treatment system		
Sanitary drainage system		
Roof drain system		
Chemical onsite and offsite drainage		
Equipment and floor drains		
Miscellaneous HVAC includes:	No	N/A
Containment atmosphere control system		
Radwaste building HVAC system		
I&C shop HVAC		
I&C shop computer HVAC		
Health physics computer room HVAC		
ED Center HVAC		
Circulating water and makeup water screenhouse ventilation		
Shop building machine shop area ventilation		
Shop building HVAC		
Administration building HVAC		
Technical support building HVAC		
Waste water treatment ventilation		
Administrative/Shop building HVAC refrigeration		
Solid radwaste system	No	N/A
Radioactive liquid release system	No	N/A
Process sampling and analysis system	No	N/A
Sewage treatment system	No	N/A
Steam and Power Conversion System		
Auxiliary feedwater system	Yes	2.3.4.6
Condensate system includes:	Yes	2.3.4.4
Condensate storage and transfer system		
Feedwater system includes:	Yes	2.3.4.3
Condensate and feedwater chemical addition system		
Main turbine system	Yes	2.3.4.1

Table 2.2-1 WCGS Scoping Results (Continued)

System/Structure	In Scope	Section 2 Scoping Results
Main steam system includes:	Yes	2.3.4.2
Auxiliary steam system		
Auxiliary turbine system		
Steam generator blowdown system	Yes	2.3.4.5
Auxiliary steam generator system includes:	No	N/A
Auxiliary steam chemical addition system		
Fuel oil system		
Condensate demineralizer system	No	N/A
Feedwater heater extraction drains and vents system	No	N/A
Turbine/Generator auxiliaries includes:	No	N/A
Condenser air removal system		
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 turbine control oil system		
Containments, Structures, and Component Supports		
Auxiliary building	Yes	2.4.5
Circulating water screen house	Yes	2.4.14
Communications corridor	Yes	2.4.9
Concrete support structures for station transformers (ESF, Startup, Main, Unit Auxiliary and Station Service)	Yes	2.4.21
Condensate storage tank foundation and valve house	Yes	2.4.20
Control building	Yes	2.4.2
Diesel generator building	Yes	2.4.3
Emergency fuel oil tank vaults	Yes	2.4.7
Essential service water discharge structure	Yes	2.4.16
Essential service water electrical duct banks and manways	Yes	2.4.8
Essential service water pumphouse	Yes	2.4.13
Essential service water access vaults	Yes	2.4.11
Essential service water valve house	Yes	2.4.18
Fuel building	Yes	2.4.12
Main dam and auxiliary spillway	Yes	2.4.17
Radwaste building	Yes	2.4.6
Reactor building	Yes	2.4.1
Refueling water storage tank foundation and valve house	Yes	2.4.19
Supports	Yes	2.4.22
Transmission towers	Yes	2.4.10
Turbine building	Yes	2.4.4
Ultimate heat sink	Yes	2.4.15
Miscellaneous site structures includes:	No	N/A
Heating fuel oil storage tank and pumphouse		

Table 2.2-1 WCGS Scoping Results (Continued)

System/Structure	In Scope	Section 2 Scoping Results
Circulating water discharge structure		
CO2 and H2 storage area		
O2 and N2 storage area		
Accelerometer (seismic monitoring)		
Waste oil storage area		
Sitework (Inside the protected area)		
Propane gas tank area		
Demineralized water tank TAN01 foundation		
Acid tank foundation and berm		
Storage areas (NW laydown yard)		
Miscellaneous yard foundations		
Roadways		
Site railroad		
Site overview (outside protected area boundary)		
Sewage lagoon		
Sanitary sewer lift stations		
Chlorine retention tank foundation		
Clearwell tank foundation		
Filtered water storage tank foundation		
Dry cement storage tank foundation (inactive)		
Miscellaneous site buildings includes:	No	N/A
Hot machine shop		
Radwaste storage addition		
Walter P. Chrysler Support Complex including shop and support building West		
ESW chemical addition		
Technical support center		
Olive Ann Beech Operations Administration		
Charles Evans Whittaker Security building		
Security DG building		
Makeup water screenhouse (MUSH)		
Dwight D. Eisenhower Learning Center Buildings A, B, and C		
Makeup water discharge structure (MUDS)		
Meteorological tower facility		
Dosimetry building		
Lube oil and chemical storage building		
William Allen White skills training center		
Amelia Earhart Materials Center		
Amelia Earhart West Storage building		
Vehicle maintenance		
Outage support building		
Fire training facility		
Lime sludge pond		

Table 2.2-1 WCGS Scoping Results (Continued)

System/Structure	In Scope	Section 2 Scoping Results
Waste water treatment facility		
Miscellaneous storage building		
Chlorine building (Inactive)		
Paint storage		
Paint shop		
Waste paint solids and solvent building		
Paint Shop Breakroom		
Paint Shop Miscellaneous Storage		
Hazardous waste storage area		
Hazardous waste storage support building		
Owens Corning building		
CWSH Chemical storage area		
Anti-scale acid tank and pumphouse		
Biocide Building		
Northwest Laydown Yard Storage Building		
Kelly building #7		
Potable water storage tank and pumphouse		
Garage		
Arthur Capper OTJ Training Center		
Cable reel shop		
New Strawn warehouse		
Charles Curtis Development Center		
Pipe fab shop		
Administrative services shop		
Ron Evans outage processing center		
Communications/Services/Misc. building		
Main Gate North Security building		
Security Search building		
Edward P. McCabe support facility		
Lakeview and Flint Hills residence		
Clyde Cessna Administration facility		
Secondary access		
Vehicle Access Station		
Security Weapons Range		
Lake access facility		
Water treatment building		
X-Ray building		
Cathodic protection rectifier building		
Mux Building #2		
Reactor makeup water storage water tank foundation	No	N/A
Switchyard relay houses	No	N/A
Electrical and Instrumentation and Controls		
125VDC System (Class IE power system)	Yes	N/A
125VDC System (Non-Class IE power system)	Yes	N/A

Table 2.2-1 WCGS Scoping Results (Continued)

System/Structure	In Scope	Section 2 Scoping Results
Anticipated transient without scram mitigation circuitry (AMSAC)	Yes	N/A
Auxiliary power system (Site)	Yes	N/A
Emergency lighting DC system	Yes	N/A
Engineered safety features actuation system (ESFAS)	Yes	N/A
Ex-core neutron monitoring system	Yes	N/A
Higher medium voltage system 13.8KV	Yes	N/A
Instrument AC power system – 120V (Class IE power system)	Yes	N/A
Instrument AC power system (Non-Class IE power system)	Yes	N/A
Load shedding and emergency load sequencing system	Yes	N/A
Low voltage system – 480V (Class IE power system)	Yes	N/A
Low voltage system – 480V (Non-Class IE power system)	Yes	N/A
Lower medium voltage system – 4.16KV (Class IE power system)	Yes	N/A
Lower medium voltage system 4.16KV (Non-Class IE power system)	Yes	N/A
Main control board includes:	Yes	N/A
Plant annunciator system		
Miscellaneous control panels		
Main generation system includes:	Yes	N/A
Excitation and voltage regulation system		
Supervisory control system		
Off-Site power includes:	Yes	N/A
Startup transformer system		
Public address system (Intercom)	Yes	N/A
Reactor protection system	Yes	N/A
Standby generation system	Yes	N/A
Radiation monitoring system	Yes	N/A
250VDC system (Non-Class IE power system) includes:	No	N/A
Battery and DC distribution system (Site)		
Instrumentation systems includes:	No	N/A
Area radiation monitoring system		
Reactor control system		
Reactor instrument system		
Closed circuit television system		
Seismic instrumentation system		
Post accident monitoring system		
Meteorological instrumentation system		
Computer systems includes:	No	N/A
Balance of plant computer system		
Radioactive release information system and safety assessment system		
Loose parts monitoring system		

Table 2.2-1 WCGS Scoping Results (Continued)

System/Structure	In Scope	Section 2 Scoping Results
Radiation chemistry computer		
NSSS computer		
Emergency response facility information system		
Site computers I&C shop		
Communication system includes:	No	N/A
Alert and notification system		
Telephone system		
Fiber optic communications		
Communication		
Construction yard loop power includes:	No	N/A
Uninterruptible AC power system power panels		
Freeze protection and heat tracing systems	No	N/A
Grounding and cathodic protection system	No	N/A
In-core neutron monitoring system	No	N/A
Main control room panels and local instrument panels	No	N/A
Normal lighting system includes:	No	N/A
120/208V power		
Standby lighting AC system		
Site emergency lighting		
DC lighting		
Lighting panel		
Plant security system	No	N/A
Switchyard	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 types that require aging management review, arranged by system. 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,
- A reference to the applicable WCGS USAR section(s),
- A reference to the applicable license renewal boundary drawings,
- A listing of mechanical component types that are 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
- Engineered safety features
- Auxiliary systems
- Steam and power conversion system

2.3.1 Reactor Vessel, Internals, and Reactor Coolant System

This section of the application addresses scoping and screening results for the following:

- Reactor vessel and internals
- Reactor coolant system
- Steam generators
- Reactor core

2.3.1.1 Reactor Vessel and Internals

System Description

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 control rod drive mechanisms (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 in-core instrumentation.

The reactor vessel internals support the reactor core, maintain fuel alignment, direct the reactor coolant flow within the reactor vessel, provide shielding, and provide guides for in-core instrumentation. The reactor vessel internals consist of three major assemblies: the lower internals assembly, the upper internals assembly and the in-core instrumentation support structure.

The lower internals assembly includes the baffle and former plates, core barrel assembly, neutron panel, core plates, lower support forging and columns, secondary core support, energy absorbers, tie plates, manway cover and support ring. The upper internals assembly includes the upper support columns and plate, upper core plate, control rod guide tubes and head cooling spray nozzles. The in-core instrumentation support structure includes the flux thimble tubes and guide tubes, seal table and fittings and upper instrumentation columns. Components that provide interfaces between the major assemblies include the radial keys, clevis inserts, fuel alignment pins, head/vessel alignment pins, upper core plate alignment pins and holddown spring.

System Function

The reactor vessel supports the reactor core and control rod drive mechanisms and provides a pressure boundary for reactor coolant. The reactor vessel internals support the core, maintain fuel alignment, direct coolant flow and provide gamma and neutron shielding.

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 the system support requirements for fire protection, pressurized thermal shock and station blackout requirements based on the criteria of 10 CFR 54.4(a)(3).

WCGS USAR References

Additional details of the reactor vessel and internals are included in USAR Sections 3.9(N).5, 5.1, 5.2, and 5.3.

License Renewal Drawings

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

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 Closure Head (Closure Studs, Nuts, Washers, O-Ring Leak Monitoring Tubes, Refueling Seal Ledge, Lifting Lugs, Ventilation Shroud Support Ring)	Pressure Boundary Structural Support
RV Control Rod Drive Head Penetration (CRDM Flange, CRDM Tubes, CRDM Cap, CRDM Latch Housing, CRDM Rod Travel Housing)	Pressure Boundary
RV Core Support Pads (Core Support Pads)	Structural Support
RV Nozzle Safe Ends and Welds (Inlet Nozzle Safe Ends, Outlet Nozzle Safe Ends, Inlet Nozzle Safe End Welds, Outlet Nozzle Safe End Welds)	Pressure Boundary

Table 2.3.1-1 Reactor Vessel and Internals (Continued)

Component Type	Intended Function
RV Nozzles (Inlet Nozzles, Outlet Nozzles)	Pressure Boundary
RV Penetrations (Instrument Tubes (Top Head), Head Vent Pipe, High Pressure Conduits, Flux Thimble Guide Tube Penetration)	Pressure Boundary
RV Shell (Bottom Head Dome, Vessel Shell – Upper, Vessel Shell – Intermediate, Vessel Shell – Lower, Vessel Flange)	Pressure Boundary
RV Shell Head (Closure Head Dome, Closure Head Flange)	Pressure Boundary
RVI Baffle/Former Assembly (Baffle Plates, Former Plates, Baffle/Former Bolts)	Direct Flow Shielding Structural Support
RVI Control Rod Guide Tube Assembly (Control Rod Guide Tube Bolts, Control Rod Guide Tube Support Pins, Control Rod Guide Tubes)	Structural Support
RVI Core Barrel Assembly (Core Barrel, Core Barrel Flange, Core Barrel Outlet Nozzles, Neutron Panel)	Direct Flow Shielding Structural Support
RVI Instrumentation Support Structures (Flux Thimble Guide Tubes, Flux Thimble Tubes, Upper Instrumentation Columns, Seal Fittings, Seal Table)	Pressure Boundary Structural Support
RVI Lower Internals Assembly (Clevis Insert Bolts, Fuel Alignment Pins, Lower Core Plate, Radial Keys, Clevis Inserts, Lower Support Forging, Lower Support Columns, Lower Support Column Bolts, Secondary Core Support, Energy Absorbers, Lower Tie Plate, Upper Tie Plate, Manway Cover, Support Ring)	Direct Flow Structural Support
RVI Upper Internals Assembly (Holddown Spring, Upper Core Plate Alignment Pins, Upper Support Columns, Upper Support Column Bolts, Upper Core Plate, Upper Support Plate, Head/Vessel Alignment Pins, Head Cooling Spray Nozzles)	Direct Flow Structural Support

The aging management review 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 reactor coolant system (RCS) transfers the heat generated in the reactor core and by the reactor coolant pumps to the steam generators where the heat is transferred to the main steam system to produce steam to drive the turbine-generator. The borated demineralized water circulated in the RCS acts as a neutron moderator and reflector, as a neutron absorber for chemical shim control in the reactor core, and as a heat transfer medium.

The RCS pressure boundary provides a barrier for containing the coolant under all anticipated conditions and for limiting leakage and radioactivity release.

RCS pressure is controlled by the use of the pressurizer where water and steam are maintained in equilibrium by electrical heaters and water sprays. Steam can be formed or condensed to minimize pressure variations due to contraction and expansion of the reactor coolant.

Spring-loaded safety valves and power-operated relief valves from the pressurizer allow steam discharge from the RCS. Discharged steam is piped to the pressurizer relief tank where the steam is condensed and cooled by mixing with water.

The RCS consists of reactor coolant pumps, steam generators (evaluated in Section 2.3.1.3), a pressurizer, pressurizer relief tank, pressurizer relief and safety valves and the associated piping, valves and instrumentation.

System Function

The RCS pressure boundary is designed to provide a barrier to limit leakage of reactor coolant and release of radioactive isotopes. The RCS, in conjunction with the reactor control and protection systems, is designed to maintain the reactor coolant at conditions of temperature, pressure, and flow adequate to protect the core from damage. The RCS is designed to maintain homogeneity of boron and rate of change of reactor coolant temperature such that uncontrolled reactivity changes do not occur.

The RCS provides containment isolation for penetrations P-22, P-39, P-40, P-41, P-59, P-62 and P-91.

The RCS is within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1). Portions are in scope as non-safety-related affecting safety-related components for structural integrity and spatial interaction based on the criterion of 10 CFR 54.4(a)(2).

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

WCGS USAR References

Additional details of the RCS are included in USAR Sections 5.1, 5.2, 5.4, 9.5B, and Table 6.2.4-1.

License Renewal Drawings

The license renewal drawings for the RCS are listed below:

LR-WCGS-BB-M-12BB01
LR-WCGS-BB-M-12BB02
LR-WCGS-BB-M-12BB03
LR-WCGS-BB-M-12BB04

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 <= 4 inch	Pressure Boundary
Closure Bolting	Pressure Boundary
Flow Element	Leakage Boundary (spatial) Pressure Boundary
Heat Exchanger Shell Side RCP Motor Air Cooler Water Boxes (HX # 1)	Pressure Boundary
Heat Exchanger Tube Side RCP Upper Bearing Cooler Head, (HX # 2) RCP Upper Bearing Cooler Tubes (HX # 3) RCP Upper Bearing Cooler Tube Sheet (HX # 4) RCP Lower Bearing Cooler Head (HX # 5) RCP Lower Bearing Cooler Tube Sheet (HX # 6) RCP Lower Bearing Cooler Tubes (HX # 7) RCP Motor Air Cooler Tubes (HX # 8) RCP Thermal Barrier Cooling Coil Tubes (HX # 9)	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)
Pressurizer Relief Tank	Structural Integrity (attached)
Pump	Pressure Boundary
Pressurizer Heater Bundle Diaphragm Plate	Structural Support
Pressurizer Heater Sheaths and Sleeves	Pressure Boundary
Pressurizer Instrument Penetrations	Pressure Boundary
Pressurizer Integral Support	Structural Support
Pressurizer Manways and Covers	Pressure Boundary
Pressurizer Nozzles	Pressure Boundary
Pressurizer Shell/Heads	Pressure Boundary
Pressurizer Safe Ends	Pressure Boundary
Rupture Disc	Leakage boundary (spatial)
Thermowell	Leakage boundary (spatial) Pressure Boundary
Tubing	Pressure Boundary
Valve	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)

The aging management review 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 Steam Generators

System Description

The steam generator system consists of primary and secondary pressure boundaries including all pieces and parts within the pressure boundary and all penetrations out to and including the safe ends of the penetration nozzles.

System Function

The steam generator provides heat removal by the generation of steam for normal operation, design basis event mitigation, station black out and fire safe shutdown requirements. The steam generator also provides an assured source of steam to the turbine driven auxiliary feedwater pump. The primary channel head and tubes form part of the reactor coolant pressure boundary. The steam generators form a part of the containment pressure boundary to prevent the release of fission products to the environment.

The steam generators are within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1). Portions are in scope as non-safety-related affecting safety-related components based on the criterion of 10 CFR 54.4(a)(2). The steam generator supports fire protection and station blackout requirements based on the criteria of 10 CFR 54.4(a)(3).

WCGS USAR References

Additional details of the steam generators are included in USAR Sections 5.4.2 and 10.3.1.1.

License Renewal Drawings

There are no license renewal drawings for the steam generators.

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.3.1-3, Steam Generators.

Table 2.3.1-3 Steam Generators

Component Type	Intended Function
Steam Generator Closure Bolting (SG Primary Manway Closure Bolting, SG Secondary Manway Closure Bolting, SG Secondary Handhole Closure Bolting, SG Secondary Instrument Hole Cover Closure Bolting)	Pressure Boundary

Table 2.3.1-3 Steam Generators (Continued)

Component Type	Intended Function
Steam Generator Feedring (SG Feedwater Ring, Feedwater Ring J-Tubes)	Direct Flow
Steam Generator Flow Distribution Baffle (SG Flow Distribution Baffle)	Direct Flow
Steam Generator Internal Structures (Non-pressure boundary miscellaneous internal parts, SG Anti Vibration Bars, SG Wrapper, SG Secondary Blowdown Apparatus)	Direct Flow Structural Support
Steam Generator Plugs (Mechanical SG Tube Plugs, Steam Generator Welded Tube Plug)	Pressure Boundary
Steam Generator Primary Head and Divider Plate (Channel Head, Tubesheet – Primary Face, Primary Channel Divider Plate, SG Primary Nozzle Closure Ring)	Direct Flow Nonsafety-related Structural Support Pressure Boundary
Steam Generator Primary Manways and Flanges (Primary Manway, SG Primary Manway Cover)	Pressure Boundary
Steam Generator Primary Nozzles and Safe Ends (Primary Coolant Nozzle, Primary Coolant Nozzle Safe End Weld, SG Primary Head Drain)	Pressure Boundary
Steam Generator Secondary Manways and Flanges (Secondary Manway, SG Secondary Manway Cover, SG Secondary Handhole, SG Secondary Handhole Cover, SG Secondary Instrument Hole Cover)	Pressure Boundary
Steam Generator Secondary Nozzles and Safe Ends (Bottom Blowdown, Secondary Side Shell Drain, Wide Range Water Level Tap, Feedwater Inlet Nozzle, Sampling Tap, Narrow Range Water Level Tap, Wet Layup Tap, Steam Outlet Nozzle and integral flow restrictor)	Pressure Boundary Throttle
Steam Generator Secondary Shell (Tubesheet – Secondary Face, Secondary Shell)	Pressure Boundary
Steam Generator Tube Support Plates (Tube Support Plates)	Structural Support

Table 2.3.1-3 Steam Generators (Continued)

Component Type	Intended Function
Steam Generator Tubes (SG Tubes)	Heat Transfer Pressure Boundary
Tubing	Leakage Boundary (spatial)

The aging management review 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 - Steam Generators.

2.3.1.4 Reactor Core

System Description

The reactor core includes an array of fuel assemblies that are similar in mechanical design, but different in fuel enrichment. Fuel assemblies contain the fissionable material that sustains a nuclear reaction when the reactor core is critical. Each fuel assembly consists of 264 fuel rods, 24 guide thimble tubes, and one instrumentation thimble tube arranged within a supporting structure. The fuel assembly structure consists of a bottom nozzle, thimble screws, top nozzle, guide thimbles, inserts, lock tubes, and grids.

The reactor core system also includes the rod cluster control assemblies (RCCAs) and burnable absorber assemblies. The RCCAs consist of 24 absorber rods fastened at the top end to a common hub or spider assembly.

System Function

Each fuel assembly in the reactor core allows efficient heat transfer to the coolant and provides a fission product barrier.

The reactor core is within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1).

The fuel assemblies, rod cluster control assemblies (RCCAs) and burnable absorber assemblies are short-lived and are not subject to aging management review.

WCGS USAR References

Additional details of the reactor core are included in USAR Section 4.2.

License Renewal Drawings

There are no license renewal drawings for the reactor core.

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.3.1-4, Reactor Core.

Table 2.3.1-4 Reactor Core

Component Type	Intended Function
None	N/A

2.3.2 Engineered Safety Features

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

- Nuclear sampling system
- Containment spray system
- Containment integrated leak rate test system
- Decontamination system
- Liquid Radwaste system
- Reactor makeup water system
- Containment purge HVAC system
- Breathing air system
- Hydrogen control system
- Floor and equipment drains system
- High pressure coolant injection system
- Residual heat removal system

2.3.2.1 Nuclear Sampling System

System Description

The purpose of the nuclear sampling system is to obtain and analyze samples from various systems and locations in the nuclear steam supply system (NSSS) for radiological monitoring and control of chemistry parameters. The system consists of piping, tubing, valves, coolers and analysis equipment necessary to collect and analyze process stream samples. Sample station rooms are located in the auxiliary building, radwaste building and turbine building to service NSSS, radwaste and secondary sample points respectively.

System Function

The nuclear sampling system provides automatic isolation functions for the system containment penetrations. Portions of the nuclear sampling system are within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1). Portions of the system tubing and piping routed through the auxiliary building and reactor building have the potential for spatial interaction with safety related systems, structures and components. Piping attached to the nuclear sampling system containment penetrations is in scope for structural integrity. Portions are in scope as non-safety-related affecting safety-related components based on the criterion of 10 CFR 54.4(a)(2). Some portions related to containment isolation support requirements for environmental qualification based on the criteria of 10 CFR 54.4(a)(3).

WCGS USAR References

Additional details of the nuclear sampling system are included in USAR Sections 5.1, 5.4 and 9.3.2.

License Renewal Drawings

The license renewal drawings for the nuclear sampling system are listed below:

LR-WCGS-SJ-M-12SJ01
LR-WCGS-SJ-M-12SJ03
LR-WCGS-SJ-M-12SJ04

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.3.2-1, Nuclear Sampling System.

Table 2.3.2-1 Nuclear Sampling System

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

The aging management review results for these component types are provided in Table 3.2.2-1, Engineered Safety Features System – Summary of Aging Management Evaluation - Nuclear Sampling System.

2.3.2.2 Containment Spray System

System Description

The purpose of the containment spray system is to provide borated alkaline water for removing decay heat and iodine from the containment atmosphere in post accident conditions. The system consists of two redundant trains, each of which includes a containment spray pump, spray nozzles and associated valves and piping. Suction paths are provided from the refueling water storage tank for initial system flow and from the containment recirculation sumps for long term operation. Each train is provided with a discharge path through the spray nozzles located in the upper containment. A common spray additive tank provides sodium hydroxide via eductors to both trains to ensure a basic pH that promotes absorption of iodine from the containment atmosphere.

System Function

The containment spray system removes decay heat and radioactive iodine from the containment atmosphere in post accident conditions to maintain the containment pressure below design limits and maintain offsite release less than the limits of 10CFR100.

Containment isolation valves, suction line guard pipes and valve encapsulations are provided to ensure that containment integrity is maintained in single failure scenarios.

The containment spray system is within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1). Portions are in scope as non-safety-related affecting safety-related components for structural integrity and spatial interaction based on the criterion of 10 CFR 54.4(a)(2). Portions of the containment spray system support fire protection and environmental qualification requirements based upon the criteria of 10 CFR 54.4(a)(3).

WCGS USAR References

Additional details of the containment spray system are included in USAR Section 6.5.2, Table 3.11(B)-3 and Table 3.11(B)-9.

License Renewal Drawings

The license renewal drawing for the containment spray system is listed below:

LR-WCGS-EN-M-12EN01

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.3.2-2, Containment Spray System.

Table 2.3.2-2 Containment Spray System

Component Type	Intended Function
Closure Bolting	Leakage Boundary (spatial) Pressure Boundary
Eductor	Pressure Boundary
Expansion Joint	Pressure Boundary
Flow Element	Pressure Boundary
Orifice	Leakage Boundary (spatial)
Piping	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)
Pump	Pressure Boundary
Spray Nozzle	Spray
Tank	Pressure Boundary
Tubing	Pressure Boundary
Valve	Leakage Boundary (spatial) Pressure Boundary
Vortex Breaker	Direct Flow

The aging management review results for these component types are provided in Table 3.2.2-2, Engineered Safety Features System – Summary of Aging Management Evaluation - Containment Spray System.

2.3.2.3 Containment Integrated Leak Rate Test System

System Description

The containment integrated leak rate test system provides a means for periodic testing of containment leakage by pressurizing the containment building and monitoring leakage to the atmosphere. The system consists of the air compressors, filters, dryers, instrumentation, piping and valves associated with delivering compressed air to the containment for conducting the test. However, WCGS has made the decision to use temporary air compressors as a source of pressurization for containment leak rate testing. The system containment penetrations are isolated with blank flanges during normal plant operation and form part of the containment boundary.

System Function

The containment integrated leak rate test system provides a containment integrity function by normally installed blank flanges inboard and outboard of all containment integrated leak rate test system penetrations through the containment wall and by manual valves in lines branching from the volume between the inboard and outboard blank flanges.

Portions of the containment integrated leak rate test system are within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1).

WCGS USAR References

Additional details of the containment integrated leak rate test system are included in USAR Sections 6.2, 6.2.4 and 6.2.6.2.

License Renewal Drawings

The license renewal drawing for the containment integrated leak rate test system is listed below:

LR-WCGS-GP-M-12GP01

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.3.2-3, Containment Integrated Leak Rate Test System.

Table 2.3.2-3 Containment Integrated Leak Rate Test System

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

The aging management review results for these component types are provided in Table 3.2.2-3, Engineered Safety Features System – Summary of Aging Management Evaluation - Containment Integrated Leak Rate Test System.

2.3.2.4 Decontamination System

System Description

The decontamination system is used to decontaminate removable components in the hot machine shop in the auxiliary building and to supply water to the cask washdown pit in the fuel building. The decontamination system consists of a cask washdown pit in the fuel building, wash tanks, pumps, filters, spray booth, ultrasonic generator, turbulator, and associated piping and valves.

System Function

Portions of the decontamination system provide containment isolation for the reactor vessel head decontamination penetration P-43. The decontamination system is in the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1). Portions of the decontamination system provide structural integrity for the containment penetration. Portions are in scope as non-safety-related components affecting safety-related components based on the criterion of 10 CFR 54.4(a)(2).

WCGS USAR References

Additional details of the decontamination system are included in USAR Section 12.3.1.1.2 and Table 6.2.4-1

License Renewal Drawings

The license renewal drawing for the decontamination system is listed below:

LR-WCGS-HD-M-12HD01

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.3.2-4, Decontamination System.

Table 2.3.2-4 Decontamination System

Component Type	Intended Function
Closure Bolting	Pressure Boundary
Piping	Pressure Boundary Structural Integrity (attached)
Valve	Pressure Boundary

The aging management review results for these component types are provided in Table 3.2.2-4, Engineered Safety Features System – Summary of Aging Management Evaluation - Decontamination System.

2.3.2.5 Liquid Radwaste System

System Description

The function of the liquid radwaste system (LRS) 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 processed liquid radwaste may be either stored for reuse within the plant or discharged to the environment.

System Function

Portions of the LRS provide containment isolation for penetrations P-26 (reactor coolant drain tank discharge) and P-44 (reactor coolant drain tank vent).

The LRS is within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1). Portions are in scope as non-safety-related affecting safety-related components based on the criterion of 10 CFR 54.4(a)(2) due to spatial interaction and structural integrity of piping lines in the reactor building, auxiliary building and control building. Portions of the LRS are support environmental qualification requirements based on the criteria of 10 CFR 54.4(a)(3).

WCGS USAR References

Additional details of the liquid radwaste system are included in USAR Section 11.2.

License Renewal Drawings

The license renewal drawings for the liquid radwaste system are listed below:

LR-WCGS-HB-M-12HB01
LR-WCGS-HB-M-12HB03
LR-WCGS-HB-M-12HB04

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.3.2-5, Liquid Radwaste System.

Table 2.3.2-5 Liquid Radwaste System

Component Type	Intended Function
Closure Bolting	Leakage Boundary (spatial) Pressure Boundary
Flow Element	Leakage Boundary (spatial) Pressure Boundary
Heat Exchanger Shell Side RC Drain Tank Heat Exchanger Shell (HX # 10)	Pressure Boundary
Heat Exchanger Tube Side RC Drain Tank Heat Exchanger Tube Sheet (HX # 11) RC Drain Tank Heat Exchanger Tubes (HX # 12) RC Drain Tank Heat Exchanger Head (HX # 13)	Pressure Boundary
Heater	Leakage Boundary (spatial)
Instrument Bellows	Leakage Boundary (spatial)
Piping	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)
Pump	Leakage Boundary (spatial)
Tank	Leakage Boundary (spatial)
Thermowell	Leakage Boundary (spatial) Pressure Boundary
Tubing	Leakage Boundary (spatial) Pressure Boundary
Valve	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)

The aging management review results for these component types are provided in Table 3.2.2-5, Engineered Safety Features System – Summary of Aging Management Evaluation - Liquid Radwaste System.

2.3.2.6 Reactor Makeup Water System

System Description

The reactor makeup water system (RMWS) stores deaerated water to be used upon demand within the plant. The RMWS receives filtered, deaerated, demineralized water from the demineralized water storage and transfer system. The RMWS consists of one storage tank, two transfer pumps and a tank steam coil heater, and the associated piping, valves, and instrumentation.

System Function

The RMWS provides containment isolation for penetration P-25. The RMWS containment penetration is within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1). Portions are in scope as non-safety-related affecting safety-related components for structural integrity and spatial interaction based on the criterion of 10 CFR 54.4(a)(2). Portions of the RMWS containment support environmental qualification requirements based on the criteria of 10 CFR 54.4(a)(3).

WCGS USAR References

Additional details of the RMWS are included in USAR Section 9.2.7 and Table 6.2.4-1.

License Renewal Drawings

The license renewal drawing for the reactor makeup water system is listed below:

LR-WCGS-BL-M-12BL01

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.3.2-6, Reactor Makeup Water System.

Table 2.3.2-6 Reactor Makeup Water System

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

Table 2.3.2-6 Reactor Makeup Water System (Continued)

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

The aging management review results for these component types are provided in Table 3.2.2-6, Engineered Safety Features System – Summary of Aging Management Evaluation - Reactor Makeup Water System.

2.3.2.7 Containment Purge HVAC System

System Description

The purpose of the containment purge HVAC system is to provide ventilation of the containment for habitability when required and provide a vent path for equalization of containment pressure with the atmosphere. The containment minipurge sub-system removes noble gas from the containment prior to and during personnel access to the containment in modes 1, 2, 3 and 4. It also equalizes containment internal pressure with the external pressure in modes 1, 2, 3 and 4.

The containment shutdown purge sub-system supplies outside air into the containment for ventilation and cooling or heating needed for prolonged containment access following a shutdown and during refueling. The containment purge system consists of the common HVAC intake, common unit vent, nonessential filtering units, supply fans, exhaust fans, containment isolation valves, radiation monitors and associated ventilation ducts.

System Function

Containment isolation is provided by two valves at each penetration providing redundancy for the isolation function. The common intake provides air and tornado isolation for various essential and nonessential HVAC systems. The unit vent provides a common monitored vent path and tornado protection for various essential and nonessential HVAC systems.

The containment purge system is within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1). Portions are in scope as non-safety-related affecting safety-related components based on the criterion of 10 CFR 54.4(a)(2). The supply air handling unit coils of the containment purge HVAC system have been evaluated in this scope due to the potential for spatial interaction with systems located in the auxiliary building due to the potential for leaking water. Portions of the containment purge system are required to support environmental qualification requirements based on the criteria of 10 CFR 54.4(a)(3).

WCGS USAR References

Additional details of the containment purge HVAC system are included in USAR Sections 7.3.2, 9.4.1.2.2, 9.4.3.1.1 and 9.4.6.1.1 and Table 3.11(B)-3.

License Renewal Drawings

The license renewal drawing for the containment purge HVAC system is listed below:

LR-WCGS-GT-M-12GT01

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.3.2-7, Containment Purge HVAC System.

Table 2.3.2-7 Containment Purge HVAC System

Component Type	Intended Function
Closure Bolting	Leakage Boundary (spatial) Pressure Boundary
Damper	Fire Barrier Pressure Boundary
Ductwork	Direct Flow Pressure Boundary
Flex Connector	Pressure Boundary
Heat Exchanger Tube Side Containment Purge Supply Air Unit Chilled Water Heat Exchanger Tubes (HX # 14) Containment Purge Supply Air Unit Hot Water Heat Exchanger Tubes (HX # 15) Containment Mini Purge Supply Air Unit Hot Water Heat Exchanger Tubes (HX # 16)	Leakage Boundary (spatial)

Table 2.3.2-7 Containment Purge HVAC System (Continued)

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

The aging management review results for these component types are provided in Table 3.2.2-7, Engineered Safety Features System – Summary of Aging Management Evaluation - Containment Purge HVAC System.

2.3.2.8 Breathing Air System

System Description

The breathing air system provides clean, purified breathing air for personnel using respiratory protection and body cooling equipment in radiologically controlled areas. The system consists of compressors, receivers, filters, dryers, instrumentation, piping, and associated valves.

System Function

Portions of the breathing air system provide containment isolation for piping penetration P-98. The breathing air system is in the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1). Portions of the breathing system provide structural integrity for safety-related portions of the system.

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

WCGS USAR References

Additional details of the breathing air system are included in USAR Section 9.5.10.

License Renewal Drawings

The license renewal drawing for the breathing air system is listed below:

LR-WCGS-KB-M-12KB01

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.3.2-8, Breathing Air System.

Table 2.3.2-8 Breathing Air System

Component Type	Intended Function
Closure Bolting	Pressure Boundary
Piping	Pressure Boundary Structural Integrity (attached)
Valve	Pressure Boundary Structural Integrity (attached)

The aging management review results for these component types are provided in Table 3.2.2-8, Engineered Safety Features System – Summary of Aging Management Evaluation - Breathing Air System.

2.3.2.9 Hydrogen Control System

System Description

The purpose of the hydrogen control system is to maintain the containment atmosphere concentration less than 4.0 percent by volume following a loss of coolant accident (LOCA). The system consists of the electric hydrogen recombiners, the hydrogen analyzers, the hydrogen purge exhaust path and the hydrogen mixing fans. The electric recombiners are located in containment and heat the containment atmosphere causing hydrogen to thermally recombine with oxygen. Hydrogen monitoring is performed by hydrogen analyzers and associated sample lines with their containment isolation valves. The hydrogen purge exhaust path consists of one penetration through which the containment atmosphere is vented and filtered. Hydrogen mixing fans draw air from each steam generator compartment and discharge it toward the upper regions of the containment.

System Function

The hydrogen control system maintains the containment atmosphere hydrogen concentration less than 4.0 volume percent in post LOCA conditions with two redundant thermal hydrogen recombiners located in containment. A sampling subsystem monitors the containment atmosphere and draws samples. A purge path provides a backup in the unlikely event the recombiners are unable to maintain the containment atmosphere hydrogen concentration less than 4 percent by volume. The containment design is such that mixing, adequate to prevent formation of hydrogen pockets, is assured without reliance on mixing fans.

Containment isolation is provided by two valves each at penetrations P-56, P-65, P-97, P-99, and P-101.

The 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 purge system support environmental qualification requirements based on the criteria of 10 CFR 54.4(a)(3).

WCGS USAR References

Additional details of the hydrogen control system are included in USAR Section 6.2.5 and Table 3.11(B)-3.

License Renewal Drawings

The license renewal drawing for the hydrogen control system is listed below:

LR-WCGS-GS-M-12GS01

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.3.2-9, Hydrogen Control System.

Table 2.3.2-9 Hydrogen Control System

Component Type	Intended Function
Closure Bolting	Pressure Boundary
Orifice	Pressure Boundary
Piping	Pressure Boundary Structural Integrity (attached)
Recombiner	Direct Flow
Sample Vessel	Pressure Boundary
Tubing	Pressure Boundary
Valve	Pressure Boundary

The aging management review results for these component types are provided in Table 3.2.2-9, Engineered Safety Features System – Summary of Aging Management Evaluation - Hydrogen Control System.

2.3.2.10 High Pressure Coolant Injection System

System Description

The high pressure coolant injection (HPCI) system includes the borated refueling water storage system and the accumulator safety injection system.

The HPCI system is a portion of the emergency core cooling systems (ECCS). The high pressure coolant injection system consists of the safety injection pumps, boron injection tank, and associated piping, valves and instrumentation.

The borated refueling water storage system provides treated borated water for the ECCS and containment spray system during a design basis event and during refueling operations. The borated refueling water storage system consists of the refueling water storage tank (RWST) and associated piping, valves and instrumentation. The accumulator safety injection system injects treated borated water into the RCS using pressurized nitrogen gas. The accumulator safety injection system consists of four tanks (accumulators) containing borated water pressurized with nitrogen, along with associated piping, valves and instrumentation.

System Function

The HPCI system provides core cooling, inventory control and reactivity control to the reactor coolant system as a result of a design basis event.

The HPCI system provides containment isolation for penetrations P-45, P-48, P-49, P-58, P-87, P-88 and P-92.

The HPCI system is within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1). Portions are in scope as non-safety-related affecting safety-related components for structural integrity and spatial interaction based on the criterion of 10 CFR 54.4(a)(2). Portions of the high pressure coolant injection system support fire protection and environmental qualification requirements based on the criteria of 10 CFR 54.4(a)(3).

WCGS USAR References

Additional details of the high pressure coolant injection system are included in USAR Section 6.3 and Table 6.2.4.-1.

License Renewal Drawings

The license renewal drawings for the high pressure coolant injection system are listed below:

LR-WCGS-EM-M-12BN01
LR-WCGS-EM-M-12EM01

LR-WCGS-EM-M-12EM02
LR-WCGS-EM-M-12EP01

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.3.2-10, High Pressure Coolant Injection System.

Table 2.3.2-10 High Pressure Coolant Injection System

Component Type	Intended Function
Accumulator	Pressure Boundary
Class 1 Piping <= 4in	Pressure Boundary
Closure Bolting	Leakage Boundary (spatial) Pressure Boundary
Filter	Filter Pressure Boundary
Flow Element	Leakage Boundary (spatial) Pressure Boundary
Heat Exchanger Shell Side HPCI Pump Lube Oil Cooler Shell (HX # 17)	Pressure Boundary
Heat Exchanger Tube Side HPCI Pump Lube Oil Cooler Tubes (HX # 18) HPCI Pump Lube Oil Cooler Tube Sheet (HX # 19) HPCI Pump Lube Oil Cooler Heads (HX # 20)	Heat Transfer Pressure Boundary
Instrument Bellows	Pressure Boundary
Orifice	Pressure Boundary
Piping	Leakage Boundary (spatial) Pressure Boundary, SIA
Pump	Pressure Boundary
Sight Gauge	Pressure Boundary
Tank	Pressure Boundary
Thermowell	Leakage Boundary (spatial) Pressure Boundary

Table 2.3.2-10 High Pressure Coolant Injection System (Continued)

Component Type	Intended Function
Tubing	Leakage Boundary (spatial) Pressure Boundary
Valve	Leakage Boundary (spatial) Pressure Boundary, SIA

The aging management review results for these component types are provided in Table 3.2.2-10, Engineered Safety Features System – Summary of Aging Management Evaluation - High Pressure Coolant Injection System.

2.3.2.11 Residual Heat Removal System

System Description

The purpose of the residual heat removal (RHR) system is to remove decay heat in post accident conditions and to provide safety injection during a LOCA.

The system is also used for shutdown cooling in non-accident conditions to remove decay heat and consists of two redundant trains, each of which includes a containment recirculation sump, RHR pump, heat exchanger and associated valves and piping. Suction paths are provided from the refueling water storage tank for safety injection flow and from the containment recirculation sumps for long term post LOCA decay heat removal. Each train is provided with a discharge path to both the hot and cold legs.

System Function

The RHR System provides borated water for reactor coolant system makeup in LOCA conditions and for removing decay heat in post accident conditions. Containment isolation valves, suction line guard pipes and valve encapsulations are provided to ensure that containment integrity is maintained in single failure scenarios.

The RHR system is within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1). Portions of the RHR system are in scope for structural integrity, and RHR test lines and drain lines form spatial leakage boundaries that are within the scope based on the criterion of 10 CFR 54.4(a)(2). Portions of the RHR system support fire protection and environmental qualification requirements based on the criteria of 10 CFR 54.4(a)(3).

WCGS USAR References

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

License Renewal Drawings

The license renewal drawing for the residual heat removal system is listed below: LR-WCGS-EJ-M-12EJ01

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.3.2-11, Residual Heat Removal System.

Table 2.3.2-11 Residual Heat Removal System

Component Type	Intended Function
Class 1 Piping <= 4in	Pressure Boundary
Closure Bolting	Leakage Boundary (spatial) Pressure Boundary
Expansion Joint	Pressure Boundary
Flow Element	Pressure Boundary
Heat Exchanger Shell Side RHR Heat Exchanger Shell (HX # 21) RHR Heat Exchanger Tube Supports (HX # 22)	Pressure Boundary Structural Support
Heat Exchanger Tube Side RHR Heat Exchanger Tubes (HX # 23) RHR Heat Exchanger Tube Sheet (HX # 24) RHR Heat Exchanger Channel Head (HX # 25)	Heat Transfer Pressure Boundary
Insulation	Insulate
Orifice	Pressure Boundary Throttle
Piping	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)
Pump	Pressure Boundary
Screen	Filter
Spacer Ring	Pressure Boundary
Tank	Pressure Boundary
Thermowell	Pressure Boundary
Tubing	Pressure Boundary

Table 2.3.2-11 Residual Heat Removal System (Continued)

Component Type	Intended Function
Valve	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)
Vortex Breaker	Direct Flow

The aging management review results for these component types are provided in Table 3.2.2-11, Engineered Safety Features System – Summary of Aging Management Evaluation - Residual Heat Removal System.

2.3.3 Auxiliary Systems

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

- Fuel handling—Fuel storage and handling system
- Fuel pool cooling and cleanup system
- Essential service water system
- Component cooling water system
- Containment cooling system
- Compressed air system
- Chemical and volume control system
- Auxiliary building HVAC system
- Control building HVAC system
- Fuel building HVAC system
- Essential service water pumphouse building HVAC system
- Miscellaneous buildings HVAC system
- Diesel generator building HVAC system
- Fire protection system
- Emergency diesel fuel oil storage and transfer system
- Emergency diesel engine system
- Floor and equipment drains system
- Oily waste system
- Cranes, hoists and elevator system
- Turbine building HVAC air removal system

- Auxiliary systems within the scope of license renewal only based on the criterion of 10 CFR 54.4(a)(2):
  - Service water system
  - Essential service water chemical addition system
  - Chemical and detergent waste system
  - Gaseous radwaste system
  - Demineralized water makeup storage and transfer system
  - Domestic water system
  - Plant heating system
  - Boron recycle system
  - Central chilled water system
  - Yard drainage system
  - Secondary liquid waste system

2.3.3.1 Fuel Handling – Fuel Storage and Handling System

System Description

The purpose of the fuel handling – fuel storage and handling system is to provide onsite storage of fuel assemblies, manipulation of fuel, and servicing of the reactor. The system consists of machines, devices, cranes, elevators, transfer systems, fixtures, tooling, and storage racks. Crane rails and their supports are evaluated with their appropriate structure. The following cranes, fuel handling equipment, neutron absorbers and fuel racks are within the scope of license renewal.

- Spent fuel pool bridge crane
- Containment building polar crane
- Cask handling crane
- Refueling machine
- Reactor vessel head lifting device
- Reactor vessel internals lifting device
- Rod cluster control changing fixture
- 17X17 spent fuel assembly handling tool
- Reactor cavity permanent seal ring
- Load cell

- Boral neutron absorbers
- New fuel storage racks
- Spent fuel storage racks

System Function

The fuel storage facilities provide for onsite storage of new and spent fuel assemblies such that a sub-critical arrangement is always maintained under normal and postulated accident conditions. The fuel handling system allows for manipulation of the fuel during receipt, inspection and storage, refueling and ship out. Reactor servicing consists of those operations necessary to support refueling, maintenance, and in-service inspection.

The fuel storage, fuel handling, and reactor servicing system is within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1). Portions are in scope as non-safety-related affecting safety-related components based on the criterion of 10 CFR 54.4(a)(2).

WCGS USAR References

Additional details for the fuel handling—fuel storage and handling system are included in USAR Sections 9.1.1, 9.1.2, 9.1.4, 15.7.4 and 15.7.5.

License Renewal Drawings

There are no license renewal drawings for the fuel handling—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 Handling—Fuel Storage and Handling System.

Table 2.3.3-1 Fuel Handling—Fuel Storage and Handling System

Component Type	Intended Function
Crane	Nonsafety-related Structural Support Structural Support
Fuel Handling Equipment	Missile Barrier Nonsafety-related Structural Support Pressure Boundary Structural Support
Neutron Absorbers (Boral)	Absorb Neutrons
New Fuel Racks	Structural Support

Spent Fuel Racks	Structural Support

The aging management review results for these component types are provided in Table 3.3.2-1, Auxiliary Systems – Summary of Aging Management Evaluation - Fuel Handling—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 (FPCC) system is to remove decay heat from the stored spent fuel and maintain purity and optical clarity of the water in the spent fuel pool, the fuel transfer canal and the refueling canal. The system consists of a fuel pool cooling loop with associated pumps, heat exchangers, strainers, piping and valves, a fuel pool cleanup loop with associated pumps, filters, demineralizer, strainers, piping and valves and a fuel pool surface skimmer loop with associated skimmers, pump, piping and valves.

System Function

The FPCC system maintains the fuel storage pool water temperature below prescribed limits by removing decay heat generated by stored spent fuel assemblies. Heat is transferred from the fuel storage pool water to the component cooling water system. If system cooling is lost, two redundant feeds from the emergency service water system can provide water directly to the spent fuel pool to maintain level, which will boil off to cool the spent fuel assemblies.

FPCC system components providing containment isolation include the fuel transfer tube and three piping penetrations associated with the refueling pool supply, suction, and skimmer.

The FPCC system is within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1). Portions are in scope as non-safety-related affecting safety-related components for structural integrity and spatial interaction based on the criterion of 10 CFR 54.4(a)(2).

WCGS USAR References

Additional details of the fuel pool cooling and cleanup system are included in USAR Section 9.1.3 and Table 6.2.4-1.

License Renewal Drawings

The license renewal drawings for the fuel pool cooling and cleanup system are listed below:

LR-WCGS-EC-M-12EC01
LR-WCGS-EC-M-12EC02

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
Flow Element	Leakage Boundary (spatial) Pressure Boundary
Expansion Joint Bellows	Pressure Boundary
Heat Exchanger Shell Side Fuel Pool Cooling Heat Exchanger Shell (HX # 26)	Pressure Boundary
Heat Exchanger Tube Side Fuel Pool Cooling Heat Exchanger Tube Sheet (HX # 27) Fuel Pool Cooling Heat Exchanger Tubes (HX # 28) Fuel Pool Cooling Heat Exchanger Head (HX # 29)	Heat Transfer Pressure Boundary
Penetrations Mechanical	Pressure Boundary
Piping	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)
Pump	Leakage Boundary (spatial) Pressure Boundary
Thermowell	Pressure Boundary
Tubing	Leakage Boundary (spatial) Pressure Boundary
Valve	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)

The aging management review 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 Essential Service Water

System Description

The purpose of the essential service water system (ESWS) is to provide cooling water from the ultimate heat sink (UHS) for plant components which require cooling for safe shutdown of the reactor. The ESWS is an open-cycle system which consists of two separate 100-percent capacity trains of traveling screens, pumps, pump pre-lube storage tanks, self-cleaning strainers, piping, valves, and instrumentation. One pump supplies cooling water to each flow path. Each flow path is fed from the UHS intake channel via separated forebays in the essential service water pump house. Each train of the ESWS provides cooling water to the associated train of safety-related components. The heated water is discharged to the UHS via the ESW discharge structure. Each train of the system is interconnected with the non-safety-related service water system. Two motor-operated isolation valves are provided in each crosstie header where it connects to the service water system.

System Function

The ESWS provides filtered cooling water to transfer heat from plant components, which require cooling for safe shutdown of the reactor, to the UHS. The ESWS provides emergency makeup from the UHS to the fuel storage 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 also provides containment isolation for four system piping penetrations.

The ESWS is within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1). Portions are in scope as non-safety-related affecting safety-related components based on the criterion of 10 CFR 54.4(a)(2). Portions of the system support fire protection and environmental qualification requirements based on the criteria of 10 CFR 54.4(a)(3).

WCGS USAR References

Additional details of the essential service water system are included in USAR Sections 1.2.9.4.2, 9.2.1.2 and 9.4.8 and Table 3.11(B)-3, Table 3.11(B)-9 and Table 6.2.4-1.

License Renewal Drawings

The license renewal drawings for the essential service water system are listed below:

LR-WCGS-EF-M-12EF01
LR-WCGS-EF-M-12EF02
LR-WCGS-EF-M-K2EF01
LR-WCGS-EF-M-K2EF03

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.3.3-3, Essential Service Water System.

Table 2.3.3-3 Essential Service Water System

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

The aging management review results for these component types are provided in Table 3.3.2-3, Auxiliary Systems – Summary of Aging Management Evaluation - Essential Service Water System.

2.3.3.4 Component Cooling Water System

System Description

The purpose of the component cooling water system (CCWS) is to provide cooling water to engineered safety features systems following a design basis event and transfer the heat to the essential service water system (ESWS). The CCWS also provides cooling water to the safety-related spent fuel pool heat exchangers and transfers sufficient heat energy to the ESWS to prevent the ESWS inlet trash racks from being blocked by frazil ice. The CCWS consists of four circulating pumps, two heat exchangers, two surge tanks, one chemical addition tank, and associated piping, valves, and instrumentation.

System Function

The CCWS provides cooling water to transfer heat from engineered safety features components, which require cooling for safe shutdown of the reactor, to the ESWS. The CCWS also provides cooling water to the safety-related spent fuel pool heat exchangers and transfers sufficient heat energy to the ESWS to provide freeze protection for the ESWS intake structure. Frazil ice formation is inhibited by a warming line branching from each essential service water return line that supplies heated water to the intake structure. The CCWS also provides containment isolation for three system piping penetrating containment barriers.

The component cooling water system is within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1). Portions are in scope as non-safety-related affecting safety-related components for structural integrity and spatial interaction based on the criterion of 10 CFR 54.4(a)(2). Portions of the system support fire protection, environmental qualification, and station blackout requirements based on the criteria of 10 CFR 54.4(a)(3).

WCGS USAR References

Additional details of the component cooling water system is included in USAR Section 9.2.2 and Table 3.11(B)-3, Table 3.11(B)-9 and Table 6.2.4-1.

License Renewal Drawings

The license renewal drawings for the component cooling water system are listed below:

LR-WCGS-EG-M-12EG01
LR-WCGS-EG-M-12EG02
LR-WCGS-EG-M-12EG03

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.3.3-4, Component Cooling Water System.

Table 2.3.3-4 Component Cooling Water System

Component Type	Intended Function
Closure Bolting	Leakage Boundary (spatial) Pressure Boundary
Flow Element	Leakage Boundary (spatial) Pressure Boundary
Heat Exchanger Shell Side CCW Heat Exchanger Shell (HX # 30)	Pressure Boundary
Heat Exchanger Tube Side CCW Heat Exchanger Tube Sheet (HX # 31) CCW Heat Exchanger Tubes (HX # 32) CCW Heat Exchanger Head (HX # 33)	Heat Transfer Pressure Boundary
Piping	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)
Pump	Pressure Boundary
Sight Gauge	Pressure Boundary
Tank	Leakage Boundary (spatial) Pressure Boundary
Thermowell	Pressure Boundary
Tubing	Leakage Boundary (spatial) Pressure Boundary
Valve	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached

The aging management review results for these component types are provided in Table 3.3.2-4, Auxiliary Systems – Summary of Aging Management Evaluation - Component Cooling Water System.

2.3.3.5 Containment Cooling System

System Description

The purpose of the containment cooling system is to remove heat energy from the containment. The containment cooling system also transfers sufficient heat energy to the essential service water system (ESWS) to prevent the ESWS inlet trash racks from being blocked by frazil ice. The containment cooling system consists of four containment coolers, cooling water piping, and valves.

System Function

The containment cooling system, in conjunction with the containment spray system, removes sufficient energy and subsequent decay heat from the containment atmosphere following a design basis LOCA or MSLB inside the containment to maintain the containment below the design pressure. Heat removed from the containment atmosphere by the containment coolers is transferred to the ESWS. This provides sufficient heat energy to prevent the ESWS inlet trash racks from being blocked by frazil ice. Freeze protection for the ESWS intake structure is provided by a warming line which branches from each essential service water return line. The containment cooling system also provides containment isolation (containment penetrations associated with containment pressure sensing instrumentation).

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 system support fire protection and environmental qualification requirements based on the criteria of 10 CFR 54.4(a)(3).

WCGS USAR References

Additional details of the containment cooling system are included in USAR Sections 6.2.2.2, 9.2.1.2.2.3 and 9.4.6 and Table 3.11(B)-3 and Table 3.11(B)-9.

License Renewal Drawings

The license renewal drawing for the containment cooling system is listed below:

LR-WCGS-GN-M-12GN01

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.3.3-5, Containment Cooling System.

Table 2.3.3-5 Containment Cooling System

Component Type	Intended Function
Closure Bolting	Pressure Boundary
Heat Exchanger Shell Side Containment Cooler Fan Housing (HX # 34) Containment Cooler Frame (HX # 35) Containment Cooler Housing (HX # 36) Containment Cooler Discharge Plenum (HX # 37)	Pressure Boundary Structural Support
Heat Exchanger Tube Side Containment Cooler Manifold (HX # 38) Containment Cooler Header (HX # 39) Containment Cooler Tubes (HX # 40)	Heat Transfer Pressure Boundary
Instrument Bellows	Pressure Boundary
Piping	Pressure Boundary
Thermowell	Pressure Boundary
Tubing	Pressure Boundary
Valve	Pressure Boundary

The aging management review results for these component types are provided in Table 3.3.2-5, Auxiliary Systems – Summary of Aging Management Evaluation - Containment Cooling System.

2.3.3.6 Compressed Air System

System Description

The compressed air system (CAS) supplies both instrument air and service air for plant use. The CAS provides a continuous supply of filtered, oil-free air to a common header that branches into the instrument air and service air subsystems. Service air is directly distributed throughout the plant for normal maintenance services. Instrument air first passes through a desiccant drying and filtering train prior to delivery to plant instrumentation and control components and containment air lock operations. The CAS also provides a backup supply of compressed gas for the main feedwater control valves and a safety-related backup air supply for the auxiliary feedwater control valves and main steam atmospheric relief valves. The backup compressed gas accumulators for the main feedwater control valves, auxiliary feedwater control valves and main steam atmospheric relief valves are filled and pressurized with nitrogen from the service gas system. The normal source of air for operation of these components is CAS instrument air. The CAS is non safety-related except for the safety-related backup compressed gas accumulators, safety-related containment penetration piping and safety-related containment personnel air lock air piping. The CAS consists of four compressors, receivers, filters, desiccant dryers, instrumentation, piping, and associated valves.

The service gas system is included in the compressed air system.

System Function

Portions of the CAS provide a safety-related backup supply of compressed nitrogen from the service gas system for operation of the auxiliary feedwater control valves and main steam atmospheric relief valves in case CAS instrument air is lost. Portions of the CAS provide containment isolation for instrument air piping penetration P-63 and service air penetration P-30. The CAS is in the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1).

Non safety-related portions of the CAS in the auxiliary building and reactor building attach to safety-related penetration piping (P-30 & P-63) and non safety-related CAS relief valve piping in the auxiliary building attaches to safety-related backup air supply piping for auxiliary feedwater control valves and main steam atmospheric relief valves such that the structural failure of the non safety-related piping could prevent satisfactory accomplishment of safety-related system functions. Portions are in scope as non-safety-related components affecting safety-related components based on the criterion of 10 CFR 54.4(a)(2).

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

WCGS USAR References

Additional details of the compressed air system are included in USAR Sections 9.3.1 and 9.3.5.

License Renewal Drawings

The license renewal drawings for the compressed air system are listed below:

LR-WCGS-KA-M-12KA01
LR-WCGS-KA-M-12KA02
LR-WCGS-KA-M-12KA04
LR-WCGS-KA-M-12KA05
LR-WCGS-KA-M-12KH01

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.3.3-6, Compressed Air System.

Table 2.3.3-6 Compressed Air System

Component Type	Intended Function
Accumulator	Pressure Boundary
Closure Bolting	Pressure Boundary
Orifice	Structural Integrity (attached)
Piping	Pressure Boundary Structural Integrity (attached)
Tubing	Pressure Boundary
Valve	Pressure Boundary Structural Integrity (attached)

The aging management review results for these component types are provided in Table 3.3.2-6, Auxiliary Systems – Summary of Aging Management Evaluation - Compressed Air System.

2.3.3.7 Chemical and Volume Control System

System Description

The chemical and volume control system (CVCS) consists of the following subsystems:

1) 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. Reactor coolant is let down to the CVCS from a reactor coolant loop cross-over leg. It then flows through the shell side of the regenerative heat exchanger. The coolant then experiences a large pressure reduction as it passes through the letdown orifice(s) and flows through the tube side of the letdown heat exchanger where its temperature is further reduced. Downstream of the letdown heat exchanger, a second pressure reduction occurs by the low pressure letdown valve. The coolant then flows through one of the mixed bed demineralizers, through the reactor coolant filter and into the volume control tank (VCT) through a spray nozzle in the top of the tank. Three charging pumps (one “normal” pump and two standby 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 (RCP) seal water injection.

2) 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 VCT 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.

3) The reactor makeup control subsystem provides makeup water to the RCS. The reactor makeup control system is used 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 refueling water storage 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.

4) The boron thermal regeneration subsystem 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. Storage and release of boron is determined by the temperature of the fluid entering the thermal regeneration demineralizers. A chiller unit and a group of heat exchangers are employed to provide the desired fluid temperatures at the demineralizer inlets for either storage or release operation of the system. After passing through the demineralizers, the letdown stream enters the shell side of the moderating heat exchanger, passes through the tube side of the letdown chiller heat exchanger, and then goes to the VCT via the reactor coolant filter and letdown line. Although the boron thermal regeneration system 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.

System Function

The chemical and control volume system maintains reactor coolant system pressure boundary, supplies water to the reactor coolant pump seals, provides injection flow to the RCS for safety injection, and varies boron concentration for reactivity control.

The CVCS provides containment isolation for penetrations P-23, P-24 and P-80.

The CVCS is within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1). Portions are in scope as non-safety-related affecting safety-related components based on the criterion of 10 CFR 54.4(a)(2) for spatial interaction and structural integrity in the reactor building and auxiliary building. Portions of the CVCS support fire protection, environmental qualification, and station blackout requirements based on the criteria of 10 CFR 54.4(a)(3).

WCGS USAR References

Additional details of the chemical and volume control system are included in USAR Section 9.3.4 and Table 6.2.4-1.

License Renewal Drawings

The license renewal drawings for the chemical and volume control system are listed below:

LR-WCGS-BG-M-12BG01
LR-WCGS-BG-M-12BG02
LR-WCGS-BG-M-12BG03
LR-WCGS-BG-M-12BG04
LR-WCGS-BG-M-12BG05

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.3.3-7, Chemical and Volume Control System.

Table 2.3.3-7 Chemical and Volume Control System

Component Type	Intended Function
Class 1 Piping <= 4in	Pressure Boundary
Closure Bolting	Leakage Boundary (spatial) Pressure Boundary
Filter	Filter Pressure Boundary
Flexible Hoses	Pressure Boundary

Table 2.3.3-7 Chemical and Volume Control System (Continued)

Component Type	Intended Function
Flow Element	Leakage Boundary (spatial) Pressure Boundary
Heat Exchanger Shell Side Letdown Heat Exchanger Shell (HX # 41) Excess Letdown Heat Exchanger Shell (HX #42) Seal Water Heat Exchanger Shell (HX # 43) Centrifugal Charging Pump Lube Oil Cooler Shell (HX # 44) Moderating Heat Exchanger Shell (HX # 45) Letdown Reheat Heat Exchanger Shell (HX # 46) Regenerative Heat Exchanger Shell (HX # 47)	Leakage Boundary (spatial) Pressure Boundary
Heat Exchanger Tube Side Centrifugal Charging Pump Lube Oil Cooler Tubes (HX # 48) Centrifugal Charging Pump Lube Oil Cooler Tube Sheet (HX # 49) Centrifugal Charging Pump Lube Oil Cooler Head (HX # 50) Letdown Heat Exchanger Tube Sheet (HX # 51) Letdown Heat Exchanger Tubes (HX # 52) Letdown Heat Exchanger Head (HX # 53) Excess Letdown Heat Exchanger Tube Sheet (HX # 54) Excess Letdown Heat Exchanger Tubes (HX # 55) Excess Letdown Heat Exchanger Head (HX # 56) Seal Water Heat Exchanger Tube Sheet (HX # 57) Seal Water Heat Exchanger Tubes (HX # 58) Seal Water Heat Exchanger Head (HX # 59) Moderating Heat Exchanger Head (HX # 60) Moderating Heat Exchanger Tubes (HX # 61) Moderating Heat Exchanger Tube Sheet (HX # 62) Letdown Reheat Heat Exchanger Tube Sheet (HX # 63) Letdown Reheat Heat Exchanger Tubes (HX # 64) Letdown Reheat Heat Exchanger Head (HX # 65) Regenerative Heat Exchanger Tube Sheet (HX # 66) Regenerative Heat Exchanger Tubes (HX # 67) Regenerative Heat Exchanger Head (HX # 68)	Heat Transfer Leakage Boundary (spatial) Pressure Boundary
Instrument Bellows	Leakage Boundary (spatial) Pressure Boundary
Insulation	Insulate
Orifice	Leakage Boundary (spatial) Pressure Boundary Throttle
Piping	Leakage Boundary (spatial) Pressure Boundary

Table 2.3.3-7 Chemical and Volume Control System (Continued)

Component Type	Intended Function
	Structural Integrity (attached)
Pump	Leakage Boundary (spatial) Pressure Boundary
Sight Gauge	Pressure Boundary
Tank	Leakage Boundary (spatial) Pressure Boundary 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 aging management review results for these component types are provided in Table 3.3.2-7, Auxiliary Systems – Summary of Aging Management Evaluation - Chemical and Volume Control System.

2.3.3.8 Auxiliary Building HVAC System

System Description

The auxiliary building HVAC system consists of the following four subsystems:

Auxiliary building supply subsystem—provides conditioned outside air to the auxiliary building for ventilation and for cooling of safety-related equipment rooms in each level of the auxiliary building. The auxiliary building supply subsystem is isolated upon a safety injection signal.

Auxiliary building/fuel building normal exhaust subsystem—the auxiliary and fuel buildings share this exhaust subsystem that exhausts clean auxiliary/fuel building air to the environment. This subsystem also exhausts decontamination tank scrubber air to the environment. The auxiliary building/fuel building normal exhaust subsystem is isolated upon a safety injection signal or in the event of a radioactive release from a fuel handling accident in the fuel building.

Emergency exhaust subsystem—collects and processes airborne particulates in the auxiliary building/fuel building. This subsystem also exhausts air purged from the containment via the containment hydrogen control system. Air is exhausted to the vent stack.

Access tunnel transfer fan – transfers air from the auxiliary building to the radwaste tunnel. This subsystem is split between the auxiliary building HVAC system and the miscellaneous building HVAC system..

System Function

The auxiliary building HVAC system is required to maintain a suitable environment for safety-related equipment under both normal conditions and during design basis events. Portions of the auxiliary building HVAC system are isolated upon a safety injection signal. The portion of the auxiliary building/fuel building normal exhaust subsystem serving the fuel building is automatically isolated, and the exhaust fan flow maintained in the event of a radioactive release from a fuel handling event.

Individual pump room coolers provide a suitable ambient environment for the electric motor drivers for the safety-related pumps. The penetration room coolers provide a suitable atmosphere for the safety-related electrical equipment located in the electrical penetration rooms.

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 non-safety-related affecting safety-related components for spatial interaction based upon the criterion of 10 CFR 54.4(a)(2). Portions of the auxiliary building HVAC system support fire protection and environmental qualification requirements based upon the criteria of 10 CFR 54.4(a)(3).

WCGS USAR References

Additional details of the auxiliary building HVAC system are included in USAR Sections 9.4.2 and 9.4.3 and Table 9.4-8 and Table 9.4-9.

License Renewal Drawings

The license renewal drawings of the auxiliary building HVAC system are listed below:

LR-WCGS-GL-M-12GL01
LR-WCGS-GL-M-12GL02
LR-WCGS-GL-M-12GL03

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.3.3-8, Auxiliary Building HVAC System.

Table 2.3.3-8 Auxiliary Building HVAC System

Component Type	Intended Function
Closure Bolting	Pressure Boundary
Damper	Fire Barrier Pressure Boundary
Ductwork	Pressure Boundary
Fan	Pressure Boundary
Flex Connector	Pressure Boundary
Heat Exchanger Shell Side Safety Injection Pump Room Cooler Fins (HX # 69) Safety Injection Pump Room Cooler Casing (HX # 70) RHR Pump Room Cooler Fins (HX # 71) RHR Pump Room Cooler Casing (HX # 72) CCW Pump Room Cooler Fins (HX # 73) CCW Pump Room Cooler Casing (HX # 74) Charging Pump Room Cooler Fins (HX #75) Charging Pump Room Cooler Casing (HX # 76) Containment Spray Pump Room Cooler Fins (HX # 77) Containment Spray Pump Room Cooler Casing (HX # 78) Penetration Room Cooler Fins (HX # 79) Penetration Room Cooler Casing (HX # 80)	Heat Transfer Pressure Boundary

Table 2.3.3-8 Auxiliary Building HVAC System (Continued)

Component Type	Intended Function
Heat Exchanger Tube Side Auxiliary Building Basement Corridor Unit Heater Coils (HX # 81) Auxiliary Building Basement Corridor Fan Coil Unit (HX # 82) Auxiliary Building Hot Instrument Shop Unit Heater Coils (HX # 83) Auxiliary Building Interim Floor Corridor Unit Heater Coils (HX # 84) Auxiliary Building Operating Floor HVAC Equipment Room Unit Heater Coils (HX # 85) Auxiliary Building Personnel Access Area Unit Heater Coils (HX # 86) Auxiliary Building Supply Air Unit Cooling Coils (HX # 87) Auxiliary Building Supply Air Unit Heating Coils (HX # 88) Electrical Equipment Room Cooler Coils (HX # 89) Ground Floor Fan Coil Unit Coils (HX # 90) Normal Charging Pump Fan Coil Unit Cooling Coils (HX # 91) Component Cooling Water Pump Room Fan Coil Unit (HX # 92) Safety Injection Pump Room Cooler Head (HX # 93) Safety Injection Pump Room Cooler Tubes (HX # 94) RHR Pump Room Cooler Head (HX # 95) RHR Pump Room Cooler Tubes (HX # 96) Component Cooling Water Pump Room Cooler Head (HX # 97) Component Cooling Water Pump Room Cooler Tubes (HX # 98) Charging Pump Room Cooler Head (HX # 99) Charging Pump Room Cooler Tubes (HX # 100) Containment Spray Pump Room Cooler Head (HX # 101) Containment Spray Pump Room Cooler Tubes (HX # 102) Penetration Room Cooler Head (HX # 103) Penetration Room Cooler Tubes (HX # 104)	Heat Transfer Leakage Boundary (spatial) Pressure Boundary
Piping	Leakage Boundary (spatial) Pressure Boundary
Pump	Leakage Boundary (spatial)
Tank	Leakage Boundary (spatial)

Table 2.3.3-8 Auxiliary Building HVAC System (Continued)

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

The aging management review results for these component types are provided in Table 3.3.2-8, Auxiliary Systems – Summary of Aging Management Evaluation - Auxiliary Building HVAC System.

2.3.3.9 Control Building HVAC System

System Description

The control building HVAC system consists of seven subsystems:

Control building supply subsystem—supplies outside conditioned air to the control building under normal conditions and is isolated in accident conditions.

Control building exhaust subsystem—exhausts air from clean areas of the control building under normal conditions and is isolated in accident conditions.

Access control exhaust subsystem—exhausts air from potentially contaminated portions of control building. Air is filtered, and then exhausted through the unit vent. This subsystem is isolated in accident conditions.

Control room air conditioning subsystem—maintains suitable environment for personnel and equipment during normal and accident conditions.

Class 1E electrical equipment air conditioning subsystem—maintains suitable environment for Class 1E electrical equipment during normal and accident conditions.

Secondary alarm station (SAS) room air conditioning subsystem—provides a suitable environment for SAS during normal conditions. This subsystem is non-safety related and is not in the scope of license renewal.

Counting room recirculation subsystem—provides a suitable environment for personnel and equipment in counting room during normal conditions. This subsystem is non-safety related and is not in the scope of license renewal.

System Function

The control room air conditioning subsystem, the Class 1E electrical equipment air conditioning subsystem, and portions of the control building supply, portions of the control building exhaust, and portions of the access control exhaust subsystems are safety-related and required to function following a design basis event and to achieve and maintain the plant in a safe shutdown condition. These subsystems are required to maintain a suitable environment for the control room and for Class 1E electrical equipment under both normal conditions and during design basis events. The control building HVAC system also provides isolation of non-safety-related portions of the HVAC system on a control room ventilation isolation signal so that habitability of the control room is not compromised.

The control building HVAC system is within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1). Portions of the control building HVAC system are in scope as non-safety-related affecting safety-related components for spatial interaction based upon the criterion of 10 CFR 54.4(a)(2). Portions of the control building HVAC system support fire protection and environmental qualification requirements based upon the criteria of 10 CFR 54.4(a)(3).

WCGS USAR References

Additional details of the control building HVAC system are included in USAR Sections 6.4, 6.5.1, 7.3.4, 9.4.1.

License Renewal Drawings

The license renewal drawings of the control building HVAC system are listed below:

LR-WCGS-GK-M-12GK01
LR-WCGS-GK-M-12GK02
LR-WCGS-GK-M-12GK03
LR-WCGS-GK-M-12GK04

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.3.3-9, Control Building HVAC System.

Table 2.3.3-9 Control Building HVAC System

Component Type	Intended Function
Adsorber	Pressure Boundary
Closure Bolting	Pressure Boundary
Compressor	Pressure Boundary
Damper	Fire Barrier Pressure Boundary
Ductwork	Pressure Boundary
Fan	Pressure Boundary
Flex Connectors	Pressure Boundary
Heat Exchanger Shell Side Control Room A/C Unit Cooling Fins (HX # 105) Control Room A/C Unit Condenser Shell (HX # 106) Control Room A/C Unit Housing (HX # 107) Class 1E Electrical Equipment Room A/C Unit Cooling Fins (HX # 108) Class 1E Electrical Equipment Room A/C Unit Condenser Shell (HX # 109) Class 1E Electrical Equipment Room A/C Unit Housing (HX # 110)	Heat Transfer Pressure Boundary

Table 2.3.3-9 Control Building HVAC System (Continued)

Component Type	Intended Function
Heat Exchanger Tube Side Control Building Supply Air Unit Cooling Coils (HX # 111) Control Building Supply Air Unit Heating Coils (HX # 112) Access Control Fan Coil Unit Tubes (HX # 113) Control Room A/C Unit Cooling Coils (HX # 114) Control Room A/C Unit Condenser Tubes (HX # 115) Control Room A/C Unit Condenser Tube Sheet (HX # 116) Control Room A/C Unit Condenser Channel Head (HX # 117) Control Room A/C Unit Cooling Coil Header (HX # 118) Class 1E Electrical Equipment Room A/C Unit Cooling Coils (HX # 119) Class 1E Electrical Equipment Room A/C Unit Condenser Tubes (HX # 120) Class 1E Electrical Equipment Room A/C Unit Condenser Tube Sheet (HX # 121) Class 1E Electrical Equipment Room A/C Unit Condenser Channel Head (HX # 122) Class 1E Electrical Equipment Room A/C Unit Cooling Coil Header (HX # 123)	Heat Transfer Leakage Boundary (spatial) Pressure Boundary
Piping	Leakage Boundary (spatial) Pressure Boundary
Pump	Leakage Boundary (spatial)
Tubing	Leakage Boundary (spatial) Pressure Boundary
Valve	Leakage Boundary (spatial) Pressure Boundary

The aging management review results for these component types are provided in Table 3.3.2-9, Auxiliary Systems – Summary of Aging Management Evaluation - Control Building HVAC System.

2.3.3.10 Fuel Building HVAC System

System Description

The purpose of the fuel building HVAC system is to provide fresh air, heated or cooled, as required for the fuel building; isolate the fuel building upon receipt of a high radiation or LOCA signal; and process airborne particulate in the fuel building when required.

The fuel building HVAC system consists of the emergency exhaust system, the fuel storage pool cooling pump room coolers, and fuel building HVAC normal supply system fans and ducting.

System Function

The fuel building HVAC system spent fuel pool cooling pump room coolers provide a suitable ambient temperature for the spent fuel cooling pump motors. The fuel building HVAC system isolates the fuel building normal ventilation system upon a high radiation or LOCA signal and processes air via the emergency exhaust system to maintain the fuel building at a negative pressure.

The fuel building HVAC system is within the scope of license renewal based upon the criteria of 10 CFR 54.4(a)(1). Portions are in scope as non-safety-related affecting safety-related components for spatial interaction based upon the criterion of 10 CFR 54.4(a)(2).

WCGS USAR References

Additional details of the fuel building HVAC system are included in USAR Sections 7.3.3 and 9.4.2 and Table 9.4-6 and Table 9.4-7.

License Renewal Drawings

The license renewal drawings for the fuel building HVAC system are listed below:

LR-WCGS-GG-M-12GG01
LR-WCGS-GG-M-12GG02

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.3.3-10, Fuel Building HVAC System.

Table 2.3.3-10 Fuel Building HVAC System

Component Type	Intended Function
Adsorber	Pressure Boundary
Closure Bolting	Leakage Boundary (spatial) Pressure Boundary
Damper	Fire Barrier Pressure Boundary
Ductwork	Pressure Boundary
Fan	Pressure Boundary
Flex Connectors	Pressure Boundary
Heat Exchanger Shell Side Fuel Pool Cooling Pump Room Cooler Fins (HX # 124) Fuel Pool Cooling Pump Room Cooler Housing (HX # 125)	Heat Transfer Pressure Boundary
Heat Exchanger Tube Side Fuel Building Upper Level Unit Heater Coils (HX # 126) Fuel Building Lower Level (West Wall) Unit Heater Coils (HX # 127) Fuel Handling Area Cooling Coil (HX # 128) Fuel Building Supply Air Unit Coils (HX # 129) Fuel Building Heating Unit Coils (HX # 130) Fuel Pool Cooling Pump Room Cooler Head (HX # 131) Fuel Pool Cooling Pump Room Cooler Tubes (HX # 132)	Heat Transfer Leakage Boundary (spatial) Pressure Boundary
Heater	Pressure Boundary
Piping	Leakage Boundary (spatial) Pressure Boundary
Pump	Leakage Boundary (spatial)
Tubing	Pressure Boundary
Valve	Leakage Boundary (spatial) Pressure Boundary

The aging management review results for these component types are provided in Table 3.3.2-10, Auxiliary Systems – Summary of Aging Management Evaluation - Fuel Building HVAC System.

2.3.3.11 Essential Service Water Pumphouse Building HVAC System

System Description

The essential service water (ESW) pumphouse building HVAC system provides cooling for the ESW pump motors, using outside air as the cooling medium. Air is supplied to the building and is vented from the building through exhaust louvers. Each ESW pumproom is provided with a separate system. Electric unit heaters are provided for heating during winter months.

System Function

The function of the essential service water pumphouse building HVAC system is to provide an environment suitable for operation of the ESW pump motors and associated electrical equipment. The ESW pumphouse building HVAC system, excluding the unit heaters, is safety-related and is required to function following a design basis event.

The ESW pumphouse building HVAC system is within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1). Portions of the ESW pumphouse building HVAC system support fire protection requirements based upon the criteria of 10 CFR 54.4(a)(3).

WCGS USAR References

Additional details of the ESW pumphouse building HVAC system are included in USAR Section 9.4.8.

License Renewal Drawings

The license renewal drawing for the ESW pumphouse building HVAC system is listed below:

LR-WCGS-GD-M-K2GD01

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.3.3-11, Essential Service Water Pumphouse Building HVAC System.

Table 2.3.3-11 Essential Service Water Pumphouse Building HVAC System

Component Type	Intended Function
Closure Bolting	Pressure Boundary
Damper	Pressure Boundary
Ductwork	Pressure Boundary
Fan	Pressure Boundary
Flex connector	Pressure Boundary

The aging management review results for these components types are provided in Table 3.3.2-11, Auxiliary Systems – Summary of Aging Management Evaluation - Essential Service Water Pumphouse Building HVAC System.

2.3.3.12 Miscellaneous Buildings HVAC System

System Description

The miscellaneous buildings HVAC system consists of the following subsystems:

Tendon access gallery supply and exhaust subsystem—utilizes conditioned air from the auxiliary building for ventilation, heating and cooling during periods of personnel access. Portions of this subsystem are safety-related and relied upon to isolate the tendon access gallery supply and exhaust subsystem from the auxiliary building ventilation system upon a safety injection signal.

Main steam enclosure building supply and exhaust subsystem—provides outside air for ventilation, heating and cooling of the main steam enclosure building and exhausts air through the unit vent stack. Portions of this subsystem are safety-related and relied upon to isolate the main steam enclosure building supply and exhaust subsystem from the auxiliary building ventilation system upon a safety injection signal.

Auxiliary feedwater pump room coolers—provide a suitable environment for safety-related equipment in the auxiliary feedwater pump rooms.

Access tunnel supply and exhaust subsystem—provides a suitable environment for personnel and equipment within the access tunnel. This subsystem is split between the auxiliary building HVAC system and the miscellaneous buildings HVAC system. The portion of the subsystem associated with the miscellaneous buildings HVAC system is not in the scope of license renewal.

Auxiliary boiler room supply and exhaust subsystem—provides a suitable environment for personnel and equipment within the auxiliary boiler room. This subsystem is not in the scope of license renewal.

Refueling water storage tank valve house—unit heaters provide heating in respective areas. This subsystem is not in the scope of license renewal.

Reactor makeup water storage tank valve house—unit heaters provide heating in respective areas. This subsystem is not in the scope of license renewal.

Condensate and demineralized water pipe tunnel—unit heaters provide heating in respective areas. This subsystem is not in the scope of license renewal.

System Functions

The auxiliary feedwater pump room coolers are required to maintain a suitable environment for safety-related equipment in the auxiliary feedwater pump rooms under both normal conditions and during design basis events. Portions of the miscellaneous buildings HVAC system are relied upon to isolate the miscellaneous buildings HVAC system from the auxiliary building ventilation system upon a safety injection signal.

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 in scope as non-safety-related affecting safety-related components based upon the criterion of 10 CFR 54.4(a)(2). Specifically, non-safety-related heating and chilled water piping for the main steam enclosure building air handler and drain piping from the auxiliary feedwater pump room coolers have a spatial relationship to safety-related SSCs in the auxiliary building and could adversely impact the safety-related SSCs intended functions. Additionally, portions of the miscellaneous buildings HVAC system support fire protection and environmental qualification requirements based upon the criteria of 10 CFR 54.4(a)(3).

WCGS USAR References

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

License Renewal Drawings

The license renewal drawing for the miscellaneous buildings HVAC system is listed below:

LR-WCGS-GF-M-12GF01

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.3.3-12, Miscellaneous Buildings HVAC System.

Table 2.3.3-12 Miscellaneous Buildings HVAC System

Component Type	Intended Function
Closure Bolting	Leakage Boundary (spatial) Pressure Boundary
Damper	Fire Barrier Pressure Boundary
Ductwork	Pressure Boundary
Fan	Pressure Boundary
Flex Connector	Pressure Boundary
Heat Exchanger Shell Side Auxiliary Feedwater Pump Room Cooler Fins (HX # 133) Auxiliary Feedwater Pump Room Cooler Casing (HX #134)	Heat Transfer Pressure Boundary
Heat Exchanger Tube Side Main Steam Enclosure Building Supply Air Unit Heating Coil (HX # 135) Main Steam Enclosure Building Supply Air Unit Cooling Coil (HX # 136) Auxiliary Feedwater Pump Room Cooler Head (HX # 137) Auxiliary Feedwater Pump Room Cooler Tubes (HX # 138)	Heat Transfer Leakage Boundary (spatial) Pressure Boundary
Piping	Leakage Boundary (spatial) Pressure Boundary
Pump	Leakage Boundary (spatial)
Tubing	Leakage Boundary (spatial)

Table 2.3.3-12 Miscellaneous Buildings HVAC System (Continued)

Component Type	Intended Function
Valve	Leakage Boundary (spatial) Pressure Boundary

The aging management review results for these component types are provided in Table 3.3.2-12, Auxiliary Systems – Summary of Aging Management Evaluation - Miscellaneous Buildings HVAC System.

2.3.3.13 Diesel Generator Building HVAC System

System Description

The diesel generator building HVAC system provides combustion air and cooling for the diesel generators, using outside air as the cooling medium. Outside air is supplied to the building, circulated, and is returned outside through exhaust louvers. Each diesel generator room is provided with a separate cooling system. Electric unit heaters are provided in each room for heating.

System Function

The function of the diesel generator building HVAC system is to provide combustion air and an environment suitable for the operation of the diesel generators. The diesel generator building HVAC system, excluding the unit heaters, is safety-related and is required to function following a design basis event.

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 support fire protection requirements based upon the criteria of 10 CFR 54.4(a)(3).

WCGS USAR References

Additional details of the diesel generator building HVAC system are included in USAR Section 9.4.7.

License Renewal Drawings

The license renewal drawing for the diesel generator building HVAC system is listed below:

LR-WCGS-GM-M-12GM01

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.3.3-13, Diesel Generator Building HVAC System.

Table 2.3.3-13 Diesel Generator Building HVAC System

Component Type	Intended Function
Closure Bolting	Pressure Boundary
Damper	Pressure Boundary
Ductwork	Pressure Boundary
Fan	Pressure Boundary
Flex Connector	Pressure Boundary

The aging management review results for these component types are provided in Table 3.3.2-13, Auxiliary Systems – Summary of Aging Management Evaluation - Diesel Generator Building HVAC System.

2.3.3.14 Fire Protection System

System Description

The purpose of the fire protection system is to minimize 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 four subsystems:

- The fire water pumps, fire water pump drivers, and underground distribution system including outside loop, hydrants, sectional control valves, and isolation valves.
- Hose stations, standpipes, halon, deluge, and preaction systems within the power block, including control valves, spray nozzles, and sprinkler heads.
- Diesel fuel oil supply to the 100% capacity engine driven fire pump
- Water supply to the jockey pump from the plant service water system.

The fire pumps consist of one 100% capacity engine driven fire pump, one 100% capacity motor driven fire pump, and a jockey pump.

Halon flooding systems are provided in the control room trenches and chases, switchgear rooms, ESF switchgear rooms, MG sets room, and cable penetrations rooms.

The fire detection and actuation portion of the system is screened as part of the electrical and instrument and controls systems evaluations. Fire dampers are screened as part of the assigned HVAC systems. Other passive fire barriers are screened as part of the structures.

System Function

The fire protection system provides containment isolation for a containment penetration and is within the scope of license renewal based on the criteria of 10 CFR 54.4a(1). Portions of the fire protection system are within the scope of license renewal as non-safety-related affecting safety-related components for spatial interaction based on the criterion of 10 CFR 54.4(a)(2). Portions of the fire protection system are required to support the fire protection and environmental qualification requirements based on the criteria of 10 CFR 54.4(a)(3).

WCGS USAR References

Additional details of the fire protection system are included in USAR Section 9.5.1.1.2.

License Renewal Drawings

The license renewal drawings for the fire protection system are listed below:

LR-WCGS-KC-M-0022-1
LR-WCGS-KC-M-0023-1
LR-WCGS-KC-M-0023-2
LR-WCGS-KC-M-0028
LR-WCGS-KC-M-12KC01
LR-WCGS-KC-M-12KC02
LR-WCGS-KC-M-12KC03
LR-WCGS-KC-M-12KC04
LR-WCGS-KC-M-12KC05
LR-WCGS-KC-M-12KC06
LR-WCGS-KC-M-12KC07

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.3.3-14, Fire Protection System.

Table 2.3.3-14 Fire Protection System

Component Type	Intended Function
Closure Bolting	Leakage Boundary (spatial) Pressure Boundary
Filter	Filter Pressure Boundary
Flexible Hoses	Pressure Boundary
Hose Station	Pressure Boundary
Piping	Leakage Boundary (spatial) Pressure Boundary
Pump	Pressure Boundary
Spray Nozzle	Spray
Sprinkler Head	Pressure Boundary Spray
Strainer	Filter Pressure Boundary
Tank	Pressure Boundary
Tubing	Pressure Boundary
Valve (including fire hydrant)	Leakage Boundary (spatial) Pressure Boundary

The aging management review results for these component types are provided in Table 3.3.2-14, Auxiliary Systems – Summary of Aging Management Evaluation - Fire Protection System.

2.3.3.15 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 fuel oil for the emergency diesel engines. The system consists of an underground storage tank with a transfer pump, day tank, strainers, filters, piping, and valves for each emergency diesel engine.

System Function

The emergency diesel engine fuel oil storage and transfer system provides on-site storage and delivery of fuel oil as required for emergency diesel operation during design basis events.

The emergency diesel engine fuel oil storage and transfer system is within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1). Portions are in scope as non-safety-related affecting safety-related components for spatial interaction based on the criterion of 10 CFR 54.4(a)(2). Portions of the system support fire protection requirements based on the criteria of 10 CFR 54.4(a)(3).

WCGS USAR References

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

License Renewal Drawings

The license renewal drawing for the emergency diesel engine fuel oil storage and transfer system is listed below:

LR-WCGS-JE-M-12JE01

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.3.3-15, Emergency Diesel Engine Fuel Oil Storage and Transfer System.

Table 2.3.3-15 Emergency Diesel Engine Fuel Oil Storage and Transfer System

Component Type	Intended Function
Closure Bolting	Pressure Boundary
Instrument	Pressure Boundary
Piping	Pressure Boundary Structural Integrity (attached)
Pump	Pressure Boundary
Strainer	Filter Pressure Boundary
Tank	Pressure Boundary
Tubing	Pressure Boundary
Valve	Pressure Boundary

The aging management review results for these component types are provided in Table 3.3.2-15, Auxiliary Systems – Summary of Aging Management Evaluation - Emergency Diesel Engine Fuel Oil Storage and Transfer System.

2.3.3.16 Emergency Diesel Engine System

System Description

The purpose of the emergency diesel engine system (also known as the standby diesel engine system) is to provide emergency power in the event of a loss of offsite power. The emergency diesel engine system includes the following four sub-systems: emergency diesel engine cooling water system (EDECWS), emergency diesel engine starting system (EDESS), emergency diesel engine lubrication system (EDELS), and emergency diesel engine combustion air intake and exhaust system (EDECAIES).

The EDECWS consists of an engine-driven pump, a jacket water heat exchanger, an electric motor-driven keep-warm pump, an electric keep-warm heater, an engine-driven intercooler pump, intercooler heat exchanger, an expansion tank, and connected piping, valves, controls, and instrumentation.

Each diesel engine has its own starting system. The starting system for each diesel has two redundant, independent starting air trains, one for each bank of cylinders. Each starting air train consists of a compressor, dryer, starting air tank, filters, strainers, and connected piping, valves, controls, and instruments.

The EDESS is divided into two parts. The safety-related portion includes the air start tanks beginning at the air start tank inlet check valve and the downstream piping system. The remainder of the system is non-safety-related.

The EDELS consists of an engine-driven main oil pump, oil cooler, electric motor driven prelube/keepwarm pump, auxiliary lubricating oil makeup tank, keep-warm electric heater, engine-driven rocker lube pump, reservoir electric-driven prelube pump, rocker reservoir, bypass filter, duplex full-flow strainer, and connected piping, valves, controls, and instrumentation.

The EDECAIES consists of intake filters, intake silencers, exhaust silencer, and connected piping.

System Function

The emergency diesel engines supply emergency power to the essential loads necessary to shutdown, cool, and isolate the reactor.

The emergency diesel engine system is within the scope of license renewal based on the criteria of 10 CFR 54.4a(1). Portions are in scope as non-safety-related affecting safety-related components for structural integrity and spatial interaction based on the criterion of 10 CFR 54.4a(2). Portions of the emergency diesel engine support fire protection requirements based on the criteria of 10 CFR 54.4a(3).

WCGS USAR References

Additional details of the Emergency Diesel Engine System are included in USAR Sections 8.3.1.1.2, 8.3.1.1.3, 9.5.5, 9.5.6, 9.5.7 and 9.5.8.

License Renewal Drawings

The license renewal drawings of the emergency diesel engine system are listed below:

LR-WCGS-KJ-M-12KJ01
LR-WCGS-KJ-M-12KJ02
LR-WCGS-KJ-M-12KJ03
LR-WCGS-KJ-M-12KJ04
LR-WCGS-KJ-M-12KJ05
LR-WCGS-KJ-M-12KJ06

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.3.3-16, Emergency Diesel Engine System.

Table 2.3.3-16 Emergency Diesel Engine System

Component Type	Intended Function
Expansion Joint	Pressure Boundary
Filter	Filter Pressure Boundary
Heat Exchanger Shell Side Emergency Diesel Engine Intercooler Heat Exchanger Shell (HX # 139) Emergency Diesel Engine Jacket Water Heat Exchanger Shell (HX # 140) Emergency Diesel Engine Lube Oil Cooler Shell (HX # 141)	Pressure Boundary
Heat Exchanger Tube Side Emergency Diesel Engine Intercooler Heat Exchanger Head (HX # 142) Emergency Diesel Engine Intercooler Heat Exchanger Tube Sheets (HX # 143) Emergency Diesel Engine Intercooler Heat Exchanger Tubes (HX # 144) Emergency Diesel Engine Jacket Water Heat Exchanger Head (HX # 145) Emergency Diesel Engine Jacket Water Heat Exchanger Tube Sheets (HX # 146) Emergency Diesel Engine Jacket Water Heat Exchanger Tubes (HX # 147) Emergency Diesel Engine Lube Oil Cooler Head (HX # 148) Emergency Diesel Engine Lube Oil Cooler Tube Sheets (HX # 149) Emergency Diesel Engine Lube Oil Cooler Tubes (HX # 150)	Heat Transfer Pressure Boundary
Heater	Pressure Boundary
Insulation	Insulate

Table 2.3.3-16 Emergency Diesel Engine System (Continued)

Component Type	Intended Function
Piping	Pressure Boundary Structural Integrity (attached)
Pump	Pressure Boundary
Separator	Pressure Boundary
Sight Gauge	Pressure Boundary
Silencer	Pressure Boundary
Strainer	Filter Pressure Boundary
Tank	Pressure Boundary
Tubing	Pressure Boundary
Thermowell	Pressure Boundary
Valve	Leakage Boundary (spatial) Pressure Boundary

The aging management review results for these component types are provided in Table 3.3.2-16, Auxiliary Systems – Summary of Aging Management Evaluation - Emergency Diesel Engine System.

2.3.3.17 Floor and Equipment Drains System

System Description

The purpose of the floor and equipment drains system is to identify gross pipe ruptures or failures that could raise the water levels and flood safety-related systems. Safety-related level instrumentation for the sumps in the auxiliary building, RHR pump rooms, control building, and containment are used in conjunction with the plant computer to determine leak rates in the subject buildings. Redundant safety-related sump pump discharge isolation valves are provided which isolate on any safety injection system signal and prevent the discharge of the control building, auxiliary building and RHR pump room sump pumps from leaving the auxiliary building. The floor and equipment drains system consists of three sub-systems; the dirty radwaste drain sub-system, the clean radwaste drain sub-system, and the leak detection sub-system. The floor and equipment drains system consists of piping, valves, and instrumentation.

System Function

The floor and equipment drains system identifies or activates alarms of a potential flooding condition in the containment, RHR pump rooms, control building, fuel building and auxiliary building. The floor and equipment drains system also provides isolation of discharge of RHR, auxiliary building and control building sumps on the safety injection signal to prevent pumping potentially radioactive water to other parts of the plant. Additionally, the system provides containment isolation for one piping penetration and provides for reactor coolant pump (RCP) oil collection to preclude a RCP oil fire in the reactor building. The floor and equipment drains system contains components whose failure could prevent the satisfactory accomplishment of a safety-related function for systems, structures, and components (structural integrity and spatial interaction) in the auxiliary, control, fuel, and reactor buildings.

The floor and equipment drains system is within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1). Portions are in scope as non-safety-related affecting safety-related components for structural integrity and spatial interaction based on the criterion of 10 CFR 54.4(a)(2). Portions of the system support environmental qualification, fire protection, and station blackout requirements based on the criteria of 10 CFR 54.4(a)(3).

WCGS USAR References

Additional details of the floor and equipment drains system are included in USAR Section 9.3.3 and Table 3.11(B)-3, Table 3.11(B)-9 and Table 6.2.4-1.

License Renewal Drawings

The license renewal drawings for the floor and equipment drains system are listed below:

LR-WCGS-LF-M-12LF01
LR-WCGS-LF-M-12LF03
LR-WCGS-LF-M-12LF05
LR-WCGS-LF-M-12LF06
LR-WCGS-LF-M-12LF07
LR-WCGS-LF-M-12LF08
LR-WCGS-LF-M-12LF09
LR-WCGS-LF-M-12LF10

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.3.3-17, Floor and Equipment Drains System.

Table 2.3.3-17 Floor and Equipment Drains System

Component Type	Intended Function
Bellows	Pressure Boundary
Closure Bolting	Leakage Boundary (spatial) Pressure Boundary
Flame Arrestor	Pressure Boundary
Piping	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)
Sight Gauge	Pressure Boundary
Tank	Pressure Boundary
Tubing	Leakage Boundary (spatial)
Valve	Leakage Boundary (spatial) Pressure Boundary

The aging management review results for these component types are provided in Table 3.3.2-17, Auxiliary Systems – Summary of Aging Management Evaluation - Floor and Equipment Drains System.

2.3.3.18 Oily Waste System

System Description

The purpose of the oily waste system is to collect non-radioactive potentially oily liquid waste from the turbine building, diesel generator building, communications corridor, control building, and selected areas of the auxiliary building. Other floor and equipment drains are scoped as part of the floor and equipment drains system and miscellaneous drains system. The oily waste system detects gross water leakage and/or accumulation in the diesel generator and control building oily waste sumps and alerts station operators. The portion of the oily waste system serving the control room includes a loop seal that facilitates control room pressurization. The portion of the oily waste system serving the containment mini purge supply unit includes a loop seal that prevents flow of air through the oily waste system. The loop seals and associated piping are classified non-safety-related.

Non-radioactive wastes are collected in sumps and pumped to an oil/water separator outside of the power block for processing and disposal. Radiation monitoring and automatic system isolation is provided in the power block. Potentially oily wastes are routed to the cooling lake after passing through the oil separator. The oily waste system consists of piping, valves, tanks, and pumps.

System Function

The oily waste system contains safety-related indicators in the basement of the control building and in the diesel generator room to provide indication of a potential flooding condition in those areas. These level indicators provide indication of an event which could prevent the capability to shutdown the reactor and maintain it in a safe shutdown condition.

The oily waste system is in scope of license renewal based on the criteria of 10 CFR 54.4(a)(1). Portions of the oily waste system are within the scope of license renewal as non-safety-related components affecting safety-related components for spatial interaction based on the criterion of 10 CFR 54.4(a)(2).

WCGS USAR References

Additional details of the oily waste system are included in USAR Section 9.3.3.2.1.2.

License Renewal Drawings

The license renewal drawings for the oily waste system are listed below:

LR-WCGS-LE-M-12LE01
LR-WCGS-LE-M-12LE02

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.3.3-18, Oily Waste System.

Table 2.3.3-18 Oily Waste System

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

The aging management review results for these component types are provided in Table 3.3.2-18, Auxiliary Systems – Summary of Aging Management Evaluation - Oily Waste System.

2.3.3.19 Cranes, Hoists and Elevators System

System Description

The purpose of the cranes, hoists and elevators system is to provide lifting and maneuvering capacity in the containment building, fuel building, diesel generator building, auxiliary building and various non-safety related buildings and shops about the site. This system is composed of multiple cranes, doors, elevators, hoists, monorails, manlifts and trolleys. Crane rails and their supports are evaluated with their appropriate structure. The following cranes, hoists, and monorails are within the scope of license renewal.

- Containment jib cranes
- Containment building equipment hatch hoists
- Secondary shield wall area jib crane
- Diesel generator under-hung monorails and bridge cranes
- Fuel pool cooling pumps chain hoist
- Auxiliary feedwater pump monorails and hoists
- Component cooling water pump monorails and hoists
- Component cooling water surge tank area electrical hoists and monorails
- Centrifugal charging pump monorails and hoists
- Safety injection pump monorails and hoists
- RHR pump monorails and hoists
- Containment spray pump monorails and hoists
- Normal charging pump room equipment hoist
- Moderating heat exchanger monorail and hoist
- Main steam relief and isolation valve monorails and hoists
- Containment equipment hatch radiation and missile shield top rail 20 ton hand trolley

System Function

The safety related function of the cranes, hoists and elevators system provides support and restraint of the equipment hatch missile shield for containment to be operable. The reactor building houses and supports the reactor, reactor coolant piping, steam generators, pressurizer, reactor coolant pumps, accumulators, and the containment air coolers. It protects these SSCs from external hazards and provides containment of radioactive material subsequent to a design basis accident. The reactor building is required to prevent and mitigate the consequences of accidents that could result in potential off-site exposure.

The cranes, hoists and elevators system, however, is in the scope of license renewal as safety related based on the criteria of 10 CFR 54.4(a)(1). Portions of the cranes, hoists and elevators system are in the scope of license renewal as non-safety related components affecting safety related components based on the criterion of 10 CFR 54.4(a)(2). Thirty-two components of the cranes, hoists and elevators system have spatial interaction with safety related equipment in the diesel generator building, auxiliary building, fuel building and reactor building.

WCGS USAR References

Additional details of the cranes, hoists and elevators system are included in USAR Section 3.8.2.1.1.

License Renewal Drawings

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

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.3.3-19, Cranes, Hoists and Elevators System.

Table 2.3.3-19 Cranes, Hoists and Elevator Systems

Component Type	Intended Function
Crane	Nonsafety-related Structural Support
Hoist (including monorail)	Nonsafety-related Structural Support
Trolley	Structural Support

The aging management review results for these component types are provided in Table 3.3.2-19, Auxiliary Systems – Summary of Aging Management Evaluation - Cranes, Hoists and Elevator Systems.

2.3.3.20 Turbine Building HVAC System

System Description

The turbine building HVAC system consists of the following nine subsystems:

- Main building HVAC - provides outside air for ventilation and cooling of the turbine building. The main building ventilation includes the turbine building, the communications corridor, and the battery rooms.
- Lube oil room HVAC - provides outside air for ventilation and cooling/heating as required for equipment in the lube oil room.
- Computer room HVAC - provides a suitable environment for personnel and equipment.
- Instrument shop HVAC - provides a suitable environment for personnel and equipment.

- Condenser air removal filtration subsystem - Collects and processes the noncondensable gases from the condenser.
- Battery room HVAC - used for dilution of hydrogen emitted by the batteries.
- EHC cabinet A/C - room air-conditioning provides a suitable environment for equipment.
- Oxygen control and pH control chemical storage A/C subsystem - provides room cooling and exhausts air from fume hoods.
- Turbine deck office mezzanine room A/C - provides a suitable environment for personnel comfort.

System Function

The turbine building HVAC system serves no safety related function; however, components in the condenser air removal filtration subsystem are utilized to isolate the auxiliary building HVAC system upon receiving a safety injection signal, and as such are safety-related.

The turbine building HVAC system is within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1). Fire dampers located at the auxiliary building/turbine building boundary support fire protection requirements based upon the criteria of 10 CFR 54.4(a)(3). Additionally, portions of the turbine building HVAC system support environmental qualification requirements based upon the criteria of 10 CFR 54.4(a)(3).

WCGS USAR References

Additional details of the turbine building HVAC system are included in USAR Section 9.4.4.

License Renewal Drawings

The license renewal drawings for the turbine building HVAC system are listed below:

LR-WCGS-GE-M-12GE02
LR-WCGS-GE-M-12GE04

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.3.3-20, Turbine Building HVAC System.

Table 2.3.3-20 Turbine Building HVAC System

Component Type	Intended Function
Closure Bolting	Leakage Boundary (spatial) Pressure Boundary
Damper	Fire Barrier Pressure Boundary
Ductwork	Pressure Boundary
Flex Connector	Pressure Boundary

The aging management review results for these component types are provided in Table 3.3.2-20, Auxiliary Systems – Summary of Aging Management Evaluation - Turbine Building HVAC System.

2.3.3.21 Miscellaneous Auxiliary Systems in-scope ONLY for Criterion 10 CFR 54.4(a)(2)

Auxiliary systems within the scope of license renewal based upon the criterion of 10CFR54.4(a)(2) were identified using the methods described in section 2.1.2.2. A review of each mechanical system 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 auxiliary systems are within the scope of license renewal only based on the criterion of 10 CFR 54.4(a)(2):

- Service water system
- Essential service water chemical addition system
- Chemical and detergent waste system
- Gaseous radwaste system
- Demineralized water makeup storage and transfer system
- Domestic water system
- Plant heating system

- Boron recycle system
- Central chilled water system
- Yard drainage system
- Secondary liquid waste system

System Descriptions/System Functions

Essential Service Water Chemical Addition System

The purpose of the essential service water chemical addition system is to provide for the chemical treatment of the essential service water system to prevent organic fouling. The essential service water chemical addition system consists of pumps, piping (including a connection to accommodate a temporary chemical source), valves, and associated controls and instrumentation.

The non-safety-related essential service water chemical addition system contains components that are within the scope of license renewal for providing structural integrity to attached safety-related essential service water piping

Service Water System

The purpose of the non-safety-related service water system is to provide cooling water to plant auxiliary equipment during normal plant operations and normal plant shutdown and transfer the heat to the circulating water system (CWS) and the ultimate heat sink (UHS). The service water system also provides cooling water to the safety-related essential service water (ESW) system during normal operation. The essential service water system is automatically isolated from the service water system in response to design basis events. The UHS then supplies cooling water to the ESW system by the safety-related ESW pumps that are part of the essential service water system. The service water system consists of piping, valves, and instrumentation. The water supply and motive force for the system is provided by the plant service water system.

The non-safety-related service 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 chemical and volume control system chiller area of the auxiliary building. The service water system also provides structural integrity (attached) to essential service water system piping in the control building.

Chemical and Detergent Waste System

The purpose of the chemical and detergent waste system is to collect chemical, washdown, and detergent waste from plant facilities and transfer the waste for processing and recycling.

The chemical and detergent waste system consists of a drain tank, pumps, piping, strainers, valves, and associated instrumentation and controls.

The non-safety related chemical and detergent waste system contains components whose failure could prevent the satisfactory accomplishment of a safety-related function for systems, structures, and components (spatial interaction) in the control building.

Gaseous Radwaste System

The purpose of the gaseous radwaste system is to control, collect, process, store and dispose of gaseous radioactive wastes generated as a result of normal operation, including anticipated operational occurrences. This system is composed of multiple compressors, valves, piping runs, tanks, gaseous recombiners and instruments.

The non-safety-related gaseous radwaste system contains components that are within the scope of license renewal for providing structural integrity to attached safety related equipment in the auxiliary building.

Demineralized Water Makeup Storage and Transfer System

The purpose of the demineralized water makeup storage and transfer system is to store water for use upon demand for makeup within the plant. This system is composed of multiple pumps, valves, tanks, piping runs, and vents.

The non-safety-related demineralized water makeup storage and transfer system contains components whose failure could prevent the satisfactory accomplishment of a safety-related function for systems, structures, and components (spatial interaction) in the diesel generator building, the auxiliary building and the fuel building.

Domestic Water System

The domestic water system includes the potable water system. The purpose of the non-safety related domestic water system is to provide chlorinated potable water for drinking, cooking, and for showers, laundry, and toilet facilities within the standardized power block. The domestic water system consists of tanks, pumps, piping, tubing, valves, and plumbing fixtures.

The non-safety 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.

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 composed of redundant hot-water pumps, a steam-to-water heat exchanger, and a supply and return piping system.

The non-safety-related plant heating 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 building and fuel building.

Boron Recycle System

The purpose of the boron recycle system is to receive reactor coolant effluent for the purpose of storage until it can either be reused or disposed of by processing it through the liquid radwaste system. The boron recycle system receives effluent from the volume control tank, the reactor coolant drain tank, the waste holdup tank and the pressure relief tank. This system is composed of multiple demineralizers, drains, tanks, pumps, valves and piping runs.

The non-safety-related boron recycle 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 building. The system also provides structural integrity (attached) to safety related equipment in the auxiliary building.

Central Chilled Water System

The central chilled water system provides cooling for air handling equipment so that plant ventilation can maintain a suitable environment for personnel and equipment.

The non-safety-related central chilled 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 building, fuel building, and control building.

Yard Drainage System

The purpose of the yard drainage system is to transfer accumulated water in-leakage from various below grade electrical manholes, the essential service water "B" train valve house, and the turbine building cable pit sump to the site storm drainage system. The yard drainage system consists of pumps, piping, valves, and associated instrumentation and controls.

The non-safety related yard drainage system contains components whose failure could prevent the satisfactory accomplishment of a safety-related function for systems, structures, and components (spatial interaction) in the essential service water "B" train valve house.

Secondary Liquid Waste System

The purpose of the secondary liquid waste system is to process and recycle the recyclable turbine building waste and condensate demineralizer regeneration waste products back to the condenser or discharge the waste to the environment if within the limits of release. The secondary liquid waste system includes cross-connections with the steam generator blowdown system to provide improved reliability by providing back-up demineralization capability.

The non-safety-related secondary liquid waste 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 building.

WCGS USAR References

Additional details of the service water system are included in USAR Sections 9.2.1.1 and 9.2.1.2.

Additional details of the essential service water chemical addition system are included in USAR Section 9.2.1.2.

Additional details of the chemical and detergent waste system are included in USAR Section 9.3.3.2.1.1.

Additional details of the gaseous radwaste system are included in USAR Section 11.3.

Additional details of the demineralized water storage makeup and transfer system are included in USAR Section 9.2.3.

Additional details of the domestic water system are included in USAR Section 9.2.4.

Additional details of the plant heating system are provided in USAR Section 9.4.9.

Additional details of the boron recycle system are included in USAR Section 9.3.6.

Additional details of the central chilled water system are included in USAR Section 9.4.10.

The yard drainage system is not discussed in the USAR.

Additional details of the secondary liquid waste system are included in USAR Section 10.4.10.

License Renewal Drawings

The license renewal drawing for the service water system is listed below:

LR-WCGS-EA-M-12EA01

The license renewal drawing for the essential service water chemical addition system is listed below:

LR-WCGS-KT-M-K2KT01

The license renewal drawing for the chemical and detergent waste system is listed below:

LR-WCGS-LD-M-12LD01

The license renewal drawings for the gaseous radwaste system are listed below:

LR-WCGS-HA-M-12HA01
LR-WCGS-HA-M-12HA03

The license renewal drawing for the demineralized water makeup storage and transfer system is listed below:

LR-WCGS-AN-M-12AN01

The license renewal drawings for the domestic water system are listed below:

LR-WCGS-KD-M-12KD01
LR-WCGS-KD-M-12KD02

The license renewal drawing for the plant heating system is listed below:

LR-WCGS-GA-M-12GA02

The license renewal drawings for the boron recycle system are listed below:

LR-WCGS-HE-M-12HE01
LR-WCGS-HE-M-12HE03

The license renewal drawing for the central chilled water system is listed below:

LR- WCGS-GB-M-12GB01

The license renewal drawing for the yard drainage system is listed below:

LR-WCGS-LC-M-12LC01

The license renewal drawings for secondary liquid waste system are listed below:

LR-WCGS-HF-M-12HF01
LR-WCGS-HF-M-12HF02
LR-WCGS-HF-M-12HF03

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.3.3-21, Miscellaneous Auxiliary Systems In-Scope ONLY based on Criterion 10 CFR 54.4(a)(2).

Table 2.3.3-21 Miscellaneous Auxiliary Systems In-Scope ONLY based on Criterion 10 CFR 54.4(a)(2)

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

The aging management review results for these component types are provided in Table 3.3.2-21, Auxiliary Systems – Summary of Aging Management Evaluation - Miscellaneous Auxiliary Systems In-Scope ONLY based on Criterion 10 CFR 54.4(a)(2).

2.3.4 Steam and Power Conversion Systems

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

- Main turbine system
- Main steam system
- Feedwater system
- Condensate system
- Steam generator blowdown system
- Auxiliary feedwater system

2.3.4.1 Main Turbine System

System Description

The purpose of the main turbine system is to convert steam thermal energy from the main steam system to mechanical energy to drive the main generator. The 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, and associated piping, valves, and instrumentation for monitoring and turbine trip purposes.

System Function

The main turbine system is in the scope of license renewal to support fire protection requirements and ATWS requirements based on the criteria of 10 CFR 54.4(a)(3).

WCGS USAR References

Additional details of the main turbine system can be found in USAR Sections 10.2 and 7.2.

License Renewal Drawings

The license renewal drawing for the main turbine system is listed below:

LR-WCGS-AC-M-12AC01

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
Valve	Pressure Boundary

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

2.3.4.2 Main Steam System

System Description

The main steam system includes the auxiliary steam sub-system and the auxiliary turbines sub-system. The main steam system consists of the piping systems that convey steam from the steam generators to the turbine-generator system, the branches that supply steam to the main feedwater pump turbines, auxiliary feedwater pump turbine, reheaters, and main turbine gland seals. Each main steam line is equipped with one power-operated atmospheric relief valves (ARV), five spring-loaded safety valves, one main steam isolation valves (MSIV) and its bypass, a cross-tie header downstream of the MSIVs, and the associated vent/drain valves. The steam piping system from the MSIVs to the main turbine is evaluated with the main turbine system. The steam to the main turbine gland seals is evaluated in turbine/generator auxiliaries.

The turbine bypass system, also called the steam dump system, is part of the main steam 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, and load reduction.

The auxiliary steam sub-system 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. The auxiliary turbines sub-system consists of the branches downstream of the isolation valves that supply steam to the main feedwater pump turbines and auxiliary feedwater pump turbine.

System Function

The main steam system provides heat removal from the reactor coolant system for controlled cooldown during normal, accident and post accident conditions. Portions of the main steam system provide containment isolation and overpressure protection for the secondary side of the steam generators and the main steam piping. The auxiliary turbines sub-system of the main steam system also provides steam as a motive force to support the operation of the turbine-driven feedwater pump and auxiliary feedwater pumps.

The auxiliary steam sub-system is designed to provide the steam required for plant heating and operation of the waste evaporator. It has no safety function. In the event of fire in some fire areas, non-safety-related isolation valves that interface with main steam lines are relied on to prevent uncontrolled reactor coolant system cooldown from steam flow.

Portions of the main steam system, including steam supply to the auxiliary feedwater pump drive turbine, are in the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1). Portions are in scope as non-safety related components affecting safety related components for structural integrity and spatial interaction based on the criterion of 10 CFR 54.4(a)(2). Portions of the main steam system support fire protection, station blackout and environmental qualification requirements based on the criteria of 10 CFR 54.4(a)(3).

WCGS USAR References

Additional details of the main steam system can be found in USAR Sections 10.3, 10.4.4, 7.3.8, 7.4 and 9.5.9.

License Renewal Drawings

The license renewal drawings for the main steam system are listed below:

LR-WCGS-AB-M-12AB01
LR-WCGS-AB-M-12AB02
LR-WCGS-AB-M-12AB03
LR-WCGS-AB-M-12FB01
LR-WCGS-AB-M-12FB02
LR-WCGS-AB-M-12FC02
LR-WCGS-AB-M-12FC03
LR-WCGS-AB-M-12FC04

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.3.4-2, Main Steam System.

Table 2.3.4-2 Main Steam System

Component Type	Intended Function
Closure Bolting	Leakage Boundary (spatial) Pressure Boundary
Insulation	Insulate
Orifice	Pressure Boundary Throttle
Piping	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)
Strainer	Filter Pressure Boundary
Trap	Leakage Boundary (spatial) Pressure Boundary
Tubing	Pressure Boundary
Turbine	Pressure Boundary
Valve	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)

The aging management review results for these component types are provided in Table 3.4.2-2, Steam and Power Conversion System – Summary of Aging Management Evaluation - Main Steam System.

2.3.4.3 Feedwater System

System Description

The purpose of the feedwater system is to receive condensate from the condensate system and deliver feedwater at required pressure and temperature to the four steam generators. The system is made up of two interconnected trains with turbine-driven feedwater pumps for normal power operation, a motor-driven feedwater pump for startup operation, three stages of high-pressure feedwater heaters in two parallel trains, and four lines connecting to the four steam generators. Each line contains a feedwater control valve, feedwater isolation valve, and an auxiliary feedwater connection. The feedwater system also includes the steam generator level monitoring components that monitor the steam generator level for power operations and safe plant shutdown.

Also included in the evaluation of feedwater system is the condensate and feedwater chemical addition system. The condensate and feedwater chemical addition system is provided to inject an oxygen control chemical and the pH control chemical into the condensate at pump discharge and the feedwater lines at steam generator inlet to minimize corrosion in the condensate system and the steam generators. It consists of chemical supply tanks, lay-up mixture solution tank, chemical addition pumps, piping and valves.

The steam supply to the feedwater pump drive turbines is part of the auxiliary turbines system and is included in the evaluation of main steam system, Section 2.3.4.2.

System Function

The safety-related portions of the feedwater system, from the steam generators to the isolation valves, provide flow paths for the auxiliary feedwater to the steam generators and isolate feedwater flow to the steam generators during a main steam or feedwater line break event or a containment overpressure event. The portions inside the containment also serve as the containment barrier against fission product release to the environment.

The feedwater system is in the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1). Portions of the feedwater chemical addition system are used to provide seismic supports for the attached safety-related feedwater piping. They are in scope as non-safety-related affecting the structural integrity of safety-related components based on the criterion of 10 CFR 54.4(a)(2). Portions of the feedwater system support fire protection, station blackout, ATWS and environmental qualification requirements based on the criteria of 10 CFR 54.4(a)(3).

WCGS USAR References

Additional details of the feedwater system can be found in USAR Sections 6.2.4 and 10.4.7.

License Renewal Drawings

The license renewal drawings for the feedwater system are listed below:

LR-WCGS-AE-M-12AE01
LR-WCGS-AE-M-12AE02
LR-WCGS-AE-M-12AQ02

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.3.4-3, Feedwater System.

Table 2.3.4-3 Feedwater System

Component Type	Intended Function
Closure Bolting	Pressure Boundary
Flow Element	Pressure Boundary
Heat Exchanger Tube Side High Pressure Feedwater Heater Head (HX # 151) High Pressure Feedwater Heater Tube Sheet (HX # 152) High Pressure Feedwater Heater Tubes (HX # 153)	Pressure Boundary
Heat Exchanger Shell Side High Pressure Feedwater Heater Shell (HX # 158)	Nonsafety-related Structural Support
Insulation	Insulate
Orifice	Pressure Boundary
Piping	Pressure Boundary Structural Integrity (attached)
Thermowell	Pressure Boundary
Tubing	Pressure Boundary
Valve	Pressure Boundary Structural Integrity (attached)

The aging management review results for these component types are provided in Table 3.4.2-3, Steam and Power Conversion System – Summary of Aging Management Evaluation - Feedwater System.

2.3.4.4 Condensate System

System Description

The purpose of the condensate system is to deliver deaerated water from the main condenser hotwells to the suction of the main feedwater pumps. Together with the feedwater system, the feedwater is delivered to the steam generators at required pressure and temperature. The condensate storage and transfer system stores water in the condensate storage tank (CST) to provide makeup and surge capacity to compensate for changes in plant systems inventory.

The condensate pumps take suction from the condenser hotwell and discharge through, or bypass, the condensate demineralizers if desired. The condensate demineralizers are evaluated in the condensate demineralizer system. At the condensate pump discharge the condensate system interfaces with the condensate and feedwater chemical addition system for oxygen and pH control, which is evaluated with the feedwater system. Downstream of the condensate demineralizers are the low-pressure feedwater heaters, which join together at a common header for the suction of the main feedwater pumps. The CST serves as a reservoir to supply or receive condensate, as required by the condenser hotwell level control system.

System Function

Portions of condensate system are credited for seismic support of main steam system piping. Portions of the condensate storage and transfer system are located in auxiliary building and have potential spatial interaction with surrounding safety related components. These are included in scope as non-safety related affecting safety related components based on criterion 10 CFR 54.4(a)(2). Portions of the condensate storage and transfer system and portions of the condensate system support fire protection and station blackout requirements based on the criteria of 10 CFR 54.4(a)(3).

WCGS USAR References

Additional details of the condensate system can be found in USAR Section 10.4.7 and 9.2.6.

License Renewal Drawings

The license renewal drawings for the condensate system are listed below:

LR-WCGS-AD-M-12AD01
LR-WCGS-AD-M-12AD06
LR-WCGS-AD-M-12AP01

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.3.4-4, Condensate System.

Table 2.3.4-4 Condensate System

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

The aging management review results for these component types are provided in Table 3.4.2-4, Steam and Power Conversion System – Summary of Aging Management Evaluation - Condensate System.

2.3.4.5 Steam Generator Blowdown System

System Description

The steam generator blowdown system (SGBS) provides continuous blowdown of water from the lower portion of each steam generator secondary side to remove solids and chemical contaminates that accumulate in the steam generators during normal operations. The blowdown from each steam generator flows under pressure to a blowdown flash tank. The discharge from the flash tank flows to a series of heat exchangers where the temperature is reduced prior to processing the effluent.

System Function

Portions of the SGBS provide steam generator isolation capability to maintain a heat sink for safe shutdown. Portions of the SGBS provide containment isolation for steam generator drain piping penetration P-78. Portions of the SGBS contain non-safety-related components that are spatially oriented such that their failure could prevent the satisfactory accomplishment of a safety-related function associated with a safety-related component. Portions of the SGBS attach to safety-related piping such that their structural failure could prevent satisfactory accomplishment of safety-related system functions.

The SGBS is in the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1). Portions are in scope as non-safety-related components affecting the structural integrity of safety-related components based on the criterion of 10 CFR 54.4(a)(2). Portions of the

SGBS support fire protection, environmental qualification, ATWS, and station blackout requirements based on the criteria of 10 CFR 54.4(a)(3).

WCGS USAR References

Additional details of the steam generator blowdown system are discussed in USAR Section 10.4.8.

License Renewal Drawings

The license renewal drawings for the steam generator blowdown system are listed below:

LR-WCGS-BM-M-12BM01
LR-WCGS-BM-M-12BM02
LR-WCGS-BM-M-12BM03

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.3.4-5, Steam Generator Blowdown System.

Table 2.3.4-5 Steam Generator Blowdown System

Component Type	Intended Function
Closure Bolting	Leakage Boundary (spatial) Pressure Boundary
Instrument Bellows	Leakage Boundary (spatial)
Insulation	Insulate
Piping	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)
Pump	Leakage Boundary (spatial)
Strainer	Structural Integrity (attached)
Tank	Structural Integrity (attached)
Tubing	Pressure Boundary
Valve	Leakage Boundary (spatial) Pressure Boundary Structural Integrity (attached)

The aging management review results for these component types are provided in Table 3.4.2-5, Steam and Power Conversion System – Summary of Aging Management Evaluation - Steam Generator Blowdown System.

2.3.4.6 Auxiliary Feedwater System

System Description

The purpose of the auxiliary feedwater system is to supply feedwater to the steam generators during startup, cooldown, and emergency conditions. The auxiliary feedwater system takes feedwater from the condensate storage tank (CST) through the auxiliary feedwater pumps that discharge to the feedwater system piping and steam generators. Auxiliary feedwater automatically transfers from the CST to the essential service water system on low CST suction pressure to maintain a source of feedwater for decay heat removal. The CST is in the condensate storage and transfer system and is included in condensate system evaluation in Section 2.3.4.4. Two motor-driven auxiliary feedwater pumps and one turbine-driven pump are available to ensure the required feedwater flow to the steam generators is available. The steam turbine drive for the turbine-driven auxiliary feedwater pump is evaluated with the main steam system in Section 2.3.4.2.

System Function

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. The auxiliary feedwater system is in the scope of license renewal based on the criteria of 10CFR54.4(a)(1). Portions of auxiliary feedwater support fire protection, station blackout, and ATWS requirements based on the criteria of 10CFR54.4(a)(3).

WCGS USAR References

Additional details of the auxiliary feedwater system are included in USAR Sections 10.4.9, 7.3.6, and 9.2.6.

License Renewal Drawings

The license renewal drawing for the auxiliary feedwater system is listed below:

LR-WCGS-AL-M-12AL01

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.3.4-6, Auxiliary Feedwater System.

Table 2.3.4-6 Auxiliary Feedwater System

Component Type	Intended Function
Closure Bolting	Pressure Boundary
Filter	Filter Pressure Boundary
Heat Exchanger Shell Side Auxiliary Feed Pump Turbine Lube Oil Cooler Shell (HX # 154)	Pressure Boundary
Heat Exchanger Tube Side AF Pump Turbine Lube Oil Cooler Head (HX # 155) AF Pump Turbine Lube Oil Cooler Tube Sheet (HX # 156) AF Pump Turbine Lube Oil Cooler Tubes (HX # 157)	Heat Transfer Pressure Boundary
Orifice	Pressure Boundary Throttle
Piping	Pressure Boundary Structural Integrity (attached)
Pump	Pressure Boundary
Tubing	Pressure Boundary
Turbine	Pressure Boundary
Valve	Pressure Boundary Structural Integrity (attached)

The aging management review results for these component types are provided in Table 3.4.2-6, Steam and Power Conversion System – Summary of Aging Management Evaluation - Auxiliary Feedwater System.

2.4 SCOPING AND SCREENING RESULTS: STRUCTURES

The components, 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 single license renewal drawing (LR-WCGS-STR-C-KG1202) 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 USAR 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 USAR 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 group:

- Reactor building
- Control building

- Diesel generator building
- Turbine building
- Auxiliary building
- Radwaste building
- Emergency fuel oil tank access vaults
- Essential service water electrical duct banks and manways
- Communications corridor
- Transmission towers
- Essential service water access vaults
- Fuel building
- Essential service water pumphouse building
- Circulating water screenhouse
- Ultimate heat sink
- Essential service water discharge structure
- Main dam and auxiliary spillway
- Essential service water valve house
- Refueling water storage tank foundation and valve house
- Condensate water storage tank foundation and valve house
- Concrete support structures for station transformers
- Supports

2.4.1 Reactor Building

Structure Description

The reactor building is a seismic Category I structure that houses the reactor, the reactor coolant system, the steam generators and portions of the auxiliary and engineered safety features systems. 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. The base slab is placed on compacted soil above bedrock. Interaction between the containment shell and other structures, both internal and external, is minimized by a specified isolation gap. A continuous peripheral tendon access gallery below the base slab is provided for the installation and inspection of the vertical post-tensioning system. The vertical tendons are actually inverted-U-shaped, extending up through the basemat, through the full height of the cylindrical walls and over the dome. Horizontal circumferential (hoop) tendons are anchored into external buttresses from the basemat to about the 45-degree elevation of the dome.

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 that transfer loads through the liner plate to the concrete structure. Major structural attachments include polar crane brackets, floor beam brackets, and pipe support brackets. Leak chase channels and angles are also attached at seam welds where the welds are inaccessible to nondestructive examination after construction.

The major structural components of the reactor building are the steel liner plate, penetrations, and reactor building internal structures.

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 then covered with concrete. The liner plate 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.

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 process pipe or cable feed-through assembly passes through the sleeve and is seal welded to the sleeve via an appropriate adapter.

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. Expansion joint bellows provide for relative movement between the two structures. The fuel transfer tube and containment bellows are evaluated with the fuel pool cooling and cleanup system in Section 2.3.3.2.

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.

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.

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 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.

The containment bellows (i.e. expansion joints) and connecting penetration piping for the containment spray and RHR containment valve isolation tanks are evaluated with the containment spray and RHR systems in Sections 2.3.2.2 and 2.3.2.11.

The bellows for the containment pressure transmitters are evaluated with the containment cooling system in Section 2.3.3.5.

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.

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. During operation, a steel plate that is integral with the reactor head assembly, provides missile and biological shielding.

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.

The steel provides support for various safety related and non safety-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.

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.

The reactor missile shield is attached to the reactor vessel head lifting device. This carbon steel structure replaced the concrete missile barrier that was originally designed for the reactor building. The reactor missile shield and the reactor cavity seal ring have both been evaluated as part of fuel handling - fuel storage and handling system in Section 2.3.3.1.

Structure Function

The purpose of the reactor building is to limit the release of radioactive fission products following an accident to limit the dose to the public and the control room operators. The reactor building also provides physical support for itself, the reactor coolant system, engineered safety features, and other systems and equipment within the structure. The exterior walls and dome provide shelter and protection for the reactor vessel and other safety-related SSCs from external events.

The reactor building is within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1). The reactor building is required to support fire protection, station blackout, and ATWS requirements based on the criteria of 10 CFR 54.4(a)(3).

WCGS USAR References

Additional details of the reactor building are included in USAR Sections 3.8.1, 3.8.2.1, 3.8.3.1, and 3.8.5.1.1.

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
Caulking/sealant	Shelter, Protection
Compressible Joints/seals	Expansion/Separation Shelter, Protection Structural Pressure Boundary
Concrete Elements	Fire Barrier Flood Barrier HELB Shielding Missile Barrier Pipe Whip Restraint Shelter, Protection Shielding Structural Pressure Boundary Structural Support
Fire Barrier Coatings/wrappings	Fire Barrier
Fire Barrier Doors	Fire Barrier Shelter, Protection
Fire Barrier Seals	Fire Barrier Shelter, Protection
Hatch	Fire Barrier Missile Barrier Shelter, Protection Shielding Structural Pressure Boundary Structural Support
Hatches/plugs	Missile Barrier Structural Support
Liner Containment	Shelter, Protection Shielding Structural Pressure Boundary

Table 2.4-1 Reactor Building (Continued)

Component Type	Intended Function
Liner, Refueling	Shelter, Protection
Penetration	Flood Barrier Structural Pressure Boundary Structural Support
Penetrations Electrical	Flood Barrier Structural Pressure Boundary Structural Support
Pipe Whip Restraints and Jet Shields	HELB Shielding Missile Barrier Pipe Whip Restraint Structural Support
Stairs/platforms/grates	Nonsafety-related Structural Support
Structural Steel	Nonsafety-related Structural Support Structural Support

The aging management review 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 control building is a rectangular, seven story, structural steel and reinforced concrete structure housing the main control room, the computer, Class 1E switchgear, Class 1E battery rooms, access control data, cable spreading rooms and portions of the main control room emergency ventilation systems. The control building shares a common base slab and a wall with the auxiliary building, and has been founded on undisturbed soil.

The roof and the intermediate floors of the control building are supported by composite design of reinforced concrete slabs on structural steel beams and girders. The roof and floor framing is supported by interior steel columns and by the reinforced concrete exterior walls.

Structure Function

The function of the control building is to physically support and protect the safety-related systems within it, and to provide a pressurized habitable environment to the operators during all postulated events.

The control building is within the scope of license renewal based on the criteria in 10 CFR 54.4(a)(1). Portions of the control building support fire protection, ATWS, and station blackout requirements, based on the criteria of 10 CFR 54.4(a)(3).

WCGS USAR References

Additional details of the control building are included in USAR Sections 3.8.4.1.3, 3.8.5, and 6.4.2.

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
Caulking/sealant	Flood Barrier Structural Pressure Boundary
Compressible Joints/seals	Expansion/Separation Shelter, Protection
Concrete Block (masonry walls)	Fire Barrier Nonsafety-related Structural Support
Concrete Elements	Fire Barrier Flood Barrier Missile Barrier Shelter, Protection Structural Pressure Boundary Structural Support
Doors	Shelter, Protection Structural Pressure Boundary

Table 2.4-2 Control Building (Continued)

Component Type	Intended Function
Fire Barrier Coatings/wraps	Fire Barrier
Fire Barrier Doors	Fire Barrier Missile Barrier Structural Pressure Boundary
Fire Barrier Seals	Fire Barrier
Instrument Panels and Racks	Shelter, Protection Structural Support
Penetration Boot Seals	Flood Barrier
Penetrations Electrical	Structural Pressure Boundary Structural Support
Penetrations Mechanical	Structural Pressure Boundary Structural Support
Roofing Membrane	Shelter, Protection
Stairs/platforms/grates	Structural Support
Structural Steel	Structural Support

The aging management review 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 Diesel Generator Building

Structure Description

The diesel generator building is a seismic Category I, single story, rectangular, structural steel and reinforced concrete structure that houses the emergency diesel engines, fuel oil day tanks, exhaust silencers, and exhaust stacks. The building is supported by a reinforced concrete base mat founded on structural fill. The roof has a reinforced concrete penthouse that houses the intake and exhaust louvers. The roof 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 two-foot-thick reinforced barrier wall separates the two emergency diesel engines and diesel auxiliaries.

Structure Function

The diesel generator building provides physical support, shelter and protection for the diesel generators, associated systems and components which are relied upon to provide the capability to shutdown the reactor and maintain it in a safe shutdown condition.

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 support fire protection requirements based on the criteria of 10 CFR 54.4(a)(3).

WCGS USAR References

Additional details of the diesel generator building are included in USAR Sections 3.8.4.1.4, 3.8.4.4.3, 3.8.5.1.4, and Figures 3.8-108 and 3.8-109.

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.4-3, Diesel Generator Building.

Table 2.4-3 Diesel Generator Building

Component Type	Intended Function
Caulking/sealant	Shelter, Protection
Compressible joints/seals	Expansion/Separation Shelter, Protection
Concrete Elements	Fire Barrier Flood Barrier Missile Barrier Shelter, Protection Structural Support
Doors	Missile Barrier Shelter, Protection
Fire Barrier Coatings/wraps	Fire Barrier
Fire Barrier Seal	Fire Barrier
Hatches/plugs	Shelter, Protection
Instrument Panels and Racks	Nonsafety-related Structural Support Shelter, Protection Structural Support

Table 2.4-3 Diesel Generator Building (Continued)

Component Type	Intended Function
Penetrations Electrical	Flood Barrier Structural Support
Penetrations Mechanical	Flood Barrier Structural Support
Roofing Membrane	Shelter, Protection
Stairs/platforms/grates	Nonsafety-related Structural Support Structural Support
Structural Steel	Structural Support

The aging management review results for these component types are provided in Table 3.5.2-3, Containments, Structures, and Component Supports - Summary of Aging Management Evaluation - Diesel Generator Building.

2.4.4 Turbine Building

Structure Description

The turbine building is a rectangular, three story, steel-framed structure enclosed with steel siding, housing the turbine generator, condensers and associated equipment.

The eight foot thick reinforced concrete basemat and individual footings are founded on undisturbed soil. South of the turbine building is the auxiliary building. West of the turbine building is the communications corridor.

Structure Function

The primary structural framing of this non-Category I structure is designed to preclude gross collapse that could affect external safety-related structures or components under loads imposed by a design basis tornado. Structural features are provided to protect safety-related components in other buildings from flooding due to water passing out of the turbine building. Therefore, the turbine building is within the scope of license renewal based on the criterion of 10 CFR 54.4(a)(2). The turbine generator, condensers and associated equipment are not safety-related and not in-scope for license renewal.

The turbine building protects systems and components that support fire protection and ATWS requirements based on the criteria of 10 CFR 54.4(a)(3).

WCGS USAR References

Additional details of the turbine building are included in USAR Sections 3.3.2.3, 10.2 and Appendix 9.5B.

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
Compressible Joints/seals	Expansion/Separation Shelter, Protection
Concrete Block (masonry walls)	Fire Barrier Shelter, Protection
Concrete Elements	Fire Barrier Flood Barrier Nonsafety-related Structural Support Shelter, Protection
Fire Barrier Coatings/wraps	Fire Barrier
Fire Barrier Doors	Fire Barrier Missile Barrier
Fire Barrier Seals	Fire Barrier
Instrument Panels and Racks	Nonsafety-related Structural Support Shelter, Protection
Metal Siding	Shelter, Protection
Penetration	Shelter, Protection
Roofing Membrane	Shelter, Protection
Structural Steel	Nonsafety-related Structural Support Shelter, Protection

The aging management review 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 Auxiliary Building

Structure Description

The auxiliary building is a multistory, structural steel and reinforced concrete seismic Category I structure which houses 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 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 roof slab and exterior walls are designed to prevent penetration by tornado generated missiles.

Concrete plugs provided in the roof for equipment removal are designed to resist tornado missiles. These plugs and additional concrete plugs and removable hatches provided for servicing equipment within the building are adequately anchored or keyed into slabs to prevent displacement during a seismic event.

Blockouts are provided in the interior walls for equipment removal and servicing. These blockouts are closed with multiwythes of solid concrete blocks, laid such that the vertical and horizontal joints are not continuous. The blocks are seismically restrained on both faces. Concrete block walls are reinforced to withstand seismic loadings.

Structure Functions

The auxiliary building is a safety related, seismic Category I structure that provides support, shelter, and protection to engineered safety features and nuclear auxiliary systems equipment. In the event of a safe shutdown earthquake or post-fire accident that renders the control building uninhabitable and incapable of performing its necessary functions, the auxiliary panel located in the auxiliary building ensures that the plant is able to reach a safe shutdown and maintain a safe condition.

The auxiliary building is within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1). The auxiliary building supports fire protection, ATWS and station blackout requirements based on the criteria of 10 CFR 54.4(a)(3).

WCGS USAR References

Additional details of the auxiliary building are included in USAR Sections 3.8.4.1.1 and 3.8.5.1.2.

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.4-5, Auxiliary Building.

Table 2.4-5 Auxiliary Building

Component Type	Intended Function
Caulking/sealant	Flood Barrier Shelter, Protection
Compressible Joints/seals	Expansion/Separation Shelter, Protection
Concrete Block (masonry walls)	Fire Barrier Nonsafety-related Structural Support Shelter, Protection
Concrete Elements	Fire Barrier Flood Barrier Missile Barrier Shelter, Protection Structural Support
Doors	Flood Barrier Missile Barrier Shelter, Protection
Fire Barrier Coatings/wraps	Fire Barrier
Fire Barrier Doors	Fire Barrier Flood Barrier Missile Barrier Shelter, Protection Structural Pressure Boundary
Fire Barrier Seals	Fire Barrier
Hatches/plugs	Shelter, Protection Structural Support
Penetration	Flood Barrier Shielding Structural Pressure Boundary Structural Support
Penetration Boot Seal	Flood Barrier
Penetration Electrical	Structural Support
Penetration Mechanical	Flood Barrier Shielding Structural Pressure Boundary Structural Support

Table 2.4-5 Auxiliary Building (Continued)

Component Type	Intended Function
Roofing Membrane	Shelter, Protection
Stairs/platforms/grates	Nonsafety-related Structural Support
Structural Steel	Shelter, Protection Structural Support

The aging management review results for these component types are provided in Table 3.5.2-5, Containments, Structures, and Component Supports - Summary of Aging Management Evaluation - Auxiliary Building.

2.4.6 Radwaste Building

Structure Description

The radwaste building is a rectangular, multistory, structural steel and reinforced concrete structure which houses radioactive waste treatment facilities, tanks, filters, and other miscellaneous equipment. The building extends below plant grade and is supported on a reinforced concrete mat foundation constructed on compacted earth fill. The building has a built-up roof supported by structural steel beams and girders. 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. The tunnel provides access and carries electrical cable trays and piping between the auxiliary building and the radwaste building.

With the exception of the radwaste tunnel, the radwaste building is physically separated from the rest of the power block by at least 20 feet. The radwaste tunnel is separated from the connected auxiliary building by a fire barrier wall. The fire barrier wall and associated penetrations between the radwaste tunnel and the auxiliary building are evaluated with the auxiliary building.

Structure Function

The radwaste building shelters and protects an automatic sprinkler system over the dry waste compactor and an automatic fire detection system. It also shelters and protects four switches required for post fire safe shutdown. The switches are located in the radwaste control room, and the associated cables run through the building, through the tunnel, and into the auxiliary building.

Portions of the radwaste building support fire protection requirements based on the criteria of 10 CFR 54.4(a)(3).

WCGS USAR References

The radwaste building is described in USAR Section 3.8.6 and Table 9.5A-1.

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.4-6, Radwaste Building.

Table 2.4-6 Radwaste Building

Component Type	Intended Function
Caulking/sealant	Shelter, Protection
Concrete Block (masonry walls)	Nonsafety-related Structural Support Shelter, Protection
Concrete Elements	Nonsafety-related Structural Support Shelter, Protection
Doors	Shelter, Protection
Metal Siding	Shelter, Protection
Penetration	Shelter, Protection
Roofing Membrane	Shelter, Protection
Structural Steel	Nonsafety-related Structural Support Shelter, Protection
Tunnel	Shelter, Protection

The aging management review results for these component types are provided in Table 3.5.2-6, Containments, Structures, and Component Supports - Summary of Aging Management Evaluation - Radwaste Building.

2.4.7 Emergency Fuel Oil Tank Access Vaults

Structure Description

The emergency fuel oil tank access vaults are seismic Category I rectangular reinforced concrete vaults. The foundation is located 4' - 6" above each emergency fuel oil storage tank. The emergency fuel oil tank access vault floors are set on stabilized fill and have penetrations to allow for mechanical and electrical interface with the buried emergency fuel oil tank. The top slab is at grade and has a removable concrete cover. A manway provides access to each tank manhole, pump, discharge piping, conduits, level transmitter, and sample line. Buried pipe and electrical duct banks connect the emergency fuel oil storage tanks to the diesel generator building.

Structure Function

The emergency fuel oil tank access vaults provide access to the emergency fuel oil storage tanks. The emergency fuel oil tank access vaults provide structural support, shelter, and protection of components relied upon to provide the capability to shutdown the reactor and maintain it in a safe shutdown condition. They are also required to prevent non-safety related systems, structures, and components from hindering the accomplishment safety related functions.

The emergency fuel oil tank access vaults are within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1) and 10 CFR 54.4(a)(2).

WCGS USAR References

Additional details of the emergency fuel oil tank access vaults are included in USAR Sections 3.8.4.1.6, 9.5.4.2.2 and Figure 3.8-114.

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.4-7, Emergency Fuel Oil Tank Access Vaults.

Table 2.4-7 Emergency Fuel Oil Tank Access Vaults

Component Type	Intended Function
Compressible joints/seals	Flood Barrier
Concrete Elements	Flood Barrier Shelter, Protection Structural Support
Duct Banks and Manholes	Flood Barrier Shelter, Protection
Hatches/plugs	Flood Barrier Shelter, Protection
Penetration Boot Seal	Flood Barrier

The aging management review results for these component types are provided in Table 3.5.2-7, Containments, Structures, and Component Supports - Summary of Aging Management Evaluation - Emergency Fuel Oil Tank Vaults.

2.4.8 Essential Service Water Electrical Duct Banks and Manways

Structure Description

The seismic Category I essential service water system (ESW) electrical duct banks are located a minimum of four feet below grade and consist of a number of PVC conduits encased in a reinforced concrete beam. Safety-related electrical cables are housed in the conduits. The ESW electrical duct banks exit the control building and traverse south and east to the ESW valve house and to the ESW pumphouse.

Electrical manholes (sometimes called manways) are reinforced concrete underground chambers used for installing electrical cables in the ductbanks. There are five ESW electrical manholes located at duct bank changes in direction and at distances dependent on cable installation requirements.

Structure Function

The ESW electrical duct banks and manholes protect electrical raceways required to operate the ESW system. The ESW removes heat from plant components which require cooling for safe shutdown of the reactor. The ESWS also provides emergency makeup to the fuel storage pool and component cooling water systems and is the backup water supply to the auxiliary feedwater system.

The ESW duct banks and manholes are within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1).

WCGS USAR References

Additional details of the essential service water electrical duct banks and manways are included in USAR Sections 3.8.4.1.11 and 3.8.5.1.8.

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.4-8, Essential Service Water Electrical Duct Banks and Manways.

Table 2.4-8 Essential Service Water Electrical Duct Banks and Manways

Component Type	Intended Function
Caulking/sealant	Shelter, Protection
Compressible joints/seals	Shelter, Protection
Concrete Elements	Missile Barrier Shelter, Protection Structural Support
Duct Banks and Manholes	Shelter, Protection
Hatches/plugs	Missile Barrier Shelter, Protection
Structural Steel	Structural Support

The aging management review results for these component types are provided in Table 3.5.2-8, Containments, Structures, and Component Supports - Summary of Aging Management Evaluation - Essential Service Water Electrical Duct Banks and Manways.

2.4.9 Communications Corridor

Structure Description

The communications corridor is a steel-framed structure enclosed with steel siding. It is attached to the west side of the turbine building and is separated from the north side of the control and auxiliary buildings by a three inch isolation gap. It is supported by a reinforced concrete basemat founded on compacted soil. The communications corridor provides routing space for mechanical and electrical systems and access to adjacent buildings.

Structure Function

The framing of this non-seismic Category I structure is designed to preclude gross collapse that could affect safety-related structures or components under loads imposed by a design basis tornado. Structural features are provided to protect safety-related components from flooding. Therefore, the communications corridor is within the scope of license renewal based on the criterion of 10 CFR 54.4(a)(2).

Portions of the communication corridor support fire protection requirements based on the criteria of 10CFR54.4(a)(3).

WCGS USAR References

Additional details of the communications corridor are included in USAR Sections 3.3.2.3, and 3B.4.3.

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.4-9, Communications Corridor.

Table 2.4-9 Communications Corridor

Component Type	Intended Function
Concrete Block (masonry walls)	Fire barrier
Concrete Elements	Direct Flow Fire Barrier Nonsafety-related Structural Support
Fire Barrier Coatings/wraps	Fire Barrier
Fire Barrier Door	Fire Barrier
Fire Barrier Seal	Fire Barrier
Penetrations Electrical	Shelter, Protection
Penetrations Mechanical	Shelter, Protection
Structural Steel	Nonsafety-related Structural Support

The aging management review results for these component types are provided in Table 3.5.2-9, Containments, Structures, and Component Supports - Summary of Aging Management Evaluation - Communications Corridor.

2.4.10 Transmission Towers

Structure Description

The transmission tower structures support two independent and structurally separated overhead transmission power lines. The first transmission power line connects the main transformer to the 345-kV switchyard and consists of two deadend structures, a steel transmission tower, and a wooden H-frame structure. The second transmission power line connects the 345-kV switchyard to the start-up transformer and consists of two deadend structures, a steel transmission tower, and a wooden H-frame structure. Both lines run approximately 700 feet due north of the turbine building then make a right angle turn into the 345-kV switchyard.

Structure Function

The transmission tower structures provide structural support and suspension of overhead transmission power lines that connect the station power block to the 345-kV switchyard.

Transmission tower structures are required for station blackout recovery. They are within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(3).

WCGS USAR References

Additional details of the transmission tower structures are included in USAR Section 8.2.1.2.

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.4-10, Transmission Towers.

Table 2.4-10 Transmission Towers

Component Type	Intended Function
Concrete Elements	Nonsafety-related Structural Support
Transmission Tower	Nonsafety-related Structural Support

The aging management review results for these component types are provided in Table 3.5.2-10, Containments, Structures, and Component Supports - Summary of Aging Management Evaluation - Transmission Towers.

2.4.11 Essential Service Water Access Vaults

Structure Description

The four seismic Category I essential service water (ESW) access vaults are rectangular reinforced concrete structures housing the ESW supply and discharge piping. The ESW access vaults are located below grade and include provisions for personnel and equipment access from the top. The four access vaults are independent of each other.

Structure Function

The ESW access vaults provide access to portions of the underground ESW piping, while protecting them from tornado generated missiles. The ESWS removes heat from plant components that require cooling for safe shutdown of the reactor. The ESWS also provides emergency makeup to the fuel storage pool and component cooling water systems and is the backup water supply to the auxiliary feedwater system.

The ESW access vaults are within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1).

WCGS USAR References

Additional details of the essential service water access vaults are included in USAR Section 3.8.4.1.14 and 3.8.5.1.11.

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.4-11, Essential Service Water Access Vaults.

Table 2.4-11 Essential Service Water Access Vaults

Component Type	Intended Function
Caulking/sealant	Shelter, Protection
Compressible Joints/seals	Shelter, Protection
Concrete Elements	Flood Barrier Missile Barrier Shelter, Protection Structural Support
Hatches/plugs	Missile Barrier Shelter, Protection Structural Support
Structural Steel	Structural Support

The aging management review 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 Access Vaults.

2.4.12 Fuel Building

Structure Description

The fuel building contains the spent fuel pool, transfer canal, cask loading pool and cask 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. 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 seismic Category I rectangular, structural steel, reinforced concrete structure supported on a two-way, reinforced concrete base slab founded on structural fill.

The exterior walls have integral reinforced concrete pilasters. The elevated floors and roof are reinforced concrete and supported by reinforced concrete bearing walls.

The spent fuel storage racks, new fuel storage racks, fuel handling equipment, the spent fuel pool bridge crane, and the cask handling crane are evaluated in the fuel handling - fuel storage and handling system.

Structure Function

The fuel building provides structural support, shelter, and protection for systems, structures, and components used in the handling and storage of spent fuel.

The fuel building is within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1). Portions of the fuel building are required for the support of fire protection requirements based on the criteria of 10 CFR 54.4(a)(3).

WCGS USAR References

Additional details of the fuel building are included in USAR Sections 3.8.4.1.2, 3.8.5.1.3, and Figures 3.4-1, 3.8-94, 3.8-95, 3.8-96, 3.8-97 and 3.8-98.

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.4-12, Fuel Building.

Table 2.4-12 Fuel Building

Component Type	Intended Function
Caulking/sealant	Shelter, Protection
Compressible joints/seals	Expansion/Separation Shelter, Protection
Concrete Elements	Fire Barrier Missile Barrier Shelter, Protection Shielding Structural Support

Table 2.4-12 Fuel Building (Continued)

Component Type	Intended Function
Doors	Shelter, Protection Shielding
Fire Barrier Coatings/wraps	Fire Barrier Shelter, Protection
Fire Barrier Doors	Fire Barrier Shelter, Protection
Fire Barrier Seals	Fire Barrier
Instrument Panels and Racks	Nonsafety-related Structural Support Shelter, Protection Structural Support
Liner, Spent Fuel Pool	Structural Pressure Boundary Structural Support
Penetrations Electrical	Structural Support
Penetrations Mechanical	Structural Support
Roofing Membrane	Shelter, Protection
Stairs/platforms/grates	Structural Support
Structural Steel	Structural Support

The aging management review results for these component types are provided in Table 3.5.2-12, Containments, Structures, and Component Supports - Summary of Aging Management Evaluation - Fuel Building.

2.4.13 Essential Service Water Pumphouse

Structure Description

The seismic Category I essential service water (ESW) pumphouse is a tornado-resistant, rectangular, conventionally reinforced-concrete structure. Separate redundant operating floors and separate forebays support the ESW pumps and associated piping systems. 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.

The ESW pumphouse is founded partially on bedrock and partly on granular backfill. The ESW pumphouse is supported on a concrete floor slab at grade, a concrete pit slab below grade, grade beams with varying depths below grade, and a forebay apron slab below grade. The forebay apron slab is attached to the pumphouse and extends into the ultimate heat sink intake channel.

Structure Function

The ESW pumphouse provides structural support, shelter, and protection for the ESW system. The ESWS removes heat from plant components that require cooling for safe shutdown of the reactor. The ESWS also provides emergency makeup to the fuel storage pool and component cooling water systems and is the backup water supply to the auxiliary feedwater system.

The ESW pumphouse is within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1). Portions of the ESW pumphouse support fire protection requirements based upon the criteria of 10 CFR 54.4(a)(3).

WCGS USAR References

Additional details of the essential service water pumphouse are included in USAR Section 3.8.4.1.8 and 3.8.5.1.6.

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.4-13, Essential Service Water Pumphouse.

Table 2.4-13 Essential Service Water Pumphouse

Component Type	Intended Function
Caulking/sealant	Shelter, Protection
Compressible Joints/seals	Shelter, Protection
Concrete Elements	Direct Flow Fire Barrier Missile Barrier Shelter, Protection Structural Support
Doors	Shelter, Protection
Hatches/plugs	Shelter, Protection Structural Support

Table 2.4-13 Essential Service Water Pumphouse (Continued)

Component Type	Intended Function
Penetration Boot Seal	Flood Barrier
Penetrations Electrical	Structural Support
Penetrations Mechanical	Structural Support
Stairs/platforms/grates	Nonsafety-related Structural Support
Structural Steel	Nonsafety-related Structural Support Shelter, Protection Structural Support

The aging management review results for these component types are provided in Table 3.5.2-13, Containments, Structures, and Component Supports - Summary of Aging Management Evaluation - Essential Service Water Pumphouse Building.

2.4.14 Circulating Water Screenhouse

Structure Description

The circulating water screenhouse is a metal siding structure that houses traveling screens, pumps and strainers for the service water system, chlorinator room, circulating water pumps, and the fire pumps. The circulating water screenhouse is founded on compacted soil and rock. The diesel driven fire pump, its diesel oil fuel tank, and controllers are separated from the rest of the screenhouse by a fire wall. A series of duct banks and manholes provide a path for the electrical cable supplying power from the Turbine Building to the Circulating Water Screenhouse. The electrical equipment room in the screenhouse is also separated from the rest of the screenhouse by a firewall. The site utilizes a large cooling lake for its source of circulating water and cooling mechanism. The circulating water screenhouse is located on the east side of this lake.

Structure Function

Portions of the circulating water screenhouse provide non-safety related structural support, shelter and protection for the motor driven fire pump, diesel driven fire pump, and jockey pump relied upon for the fire protection system. The duct banks and manholes provide shelter/protection for the electrical cable supplying power to these fire protection components.

The circulating water screenhouse is within the scope of license renewal to support fire protection requirements based on the criteria of 10 CFR 54.4(a)(3).

WCGS USAR References

Additional details of the circulating water screenhouse are included in USAR Sections 2.4.1.1 and 9.5.1.2.2.1.

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.4-14, Circulating Water Screenhouse.

Table 2.4-14 Circulating Water Screenhouse

Component Type	Intended Function
Compressible joints/seals	Shelter, Protection
Concrete Block (masonry walls)	Fire Barrier
Concrete Elements	Direct Flow Fire Barrier Nonsafety-related Structural Support Shelter, Protection
Doors	Shelter, Protection
Duct Banks and Manholes	Shelter, Protection
Fire Barrier Coatings/wraps	Fire Barrier
Fire Barrier Doors	Fire Barrier
Fire Barrier Seals	Fire Barrier
Metal Siding	Shelter, Protection
Penetrations Electrical	Nonsafety-related Structural Support
Penetrations Mechanical	Nonsafety-related Structural Support
Roofing Membrane	Shelter, Protection
Structural Steel	Nonsafety-related Structural Support

The aging management review results for these component types are provided in Table 3.5.2-14, Containments, Structures, and Component Supports - Summary of Aging Management Evaluation - Circulating Water Screenhouse.

2.4.15 Ultimate Heat Sink

Structure Description

The UHS consists of a normally submerged seismic Category I cooling pond. The UHS is formed by providing a volume of 455 acre-feet with no sedimentation behind a seismic Category I dam built in one finger of the main cooling lake. The UHS dam is an earthfill dam approximately 1,700 feet in length and 18 feet in height above the Leavenworth Limestone foundation rock. Predominantly clayey soils were utilized to build the UHS Dam. The downstream slope was designed for instantaneous drawdown of the cooling lake. The rock slope protection for the UHS dam is designed for scour and embankment erosion potential during the hypothetical main dam and baffle dike break.

Structure Function

The UHS provides a reliable source of cooling water to the essential service water system to dissipate the heat of a design basis event safely and to achieve and maintain safe shutdown following a design basis event. The UHS supplies emergency makeup water via the emergency service water system to the fuel storage pool and component cooling water systems, and is the backup water supply for the auxiliary feedwater system.

The ultimate heat sink is within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1).

WCGS USAR References

Additional details of the ultimate heat sink are included in USAR Sections 2.5.6 and 9.2.5.

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.4-15, Ultimate Heat Sink.

Table 2.4-15 Ultimate Heat Sink

Component Type	Intended Function
Dams/dikes	Heat Sink

The aging management review results for these component types are provided in Table 3.5.2-15, Containments, Structures, and Component Supports - Summary of Aging Management Evaluation - Ultimate Heat Sink.

2.4.16 Essential Service Water Discharge Structure

Structure Description

The essential service water (ESW) discharge structure is a seismic Category I structure that consists of a 2-foot-thick reinforced concrete slab below grade in the slope of the ultimate heat sink, ESW discharge structure wing walls and an ESW discharge structure head wall.

Structure Function

The ESW discharge structure provides structural support for the ESWS discharge lines and provides the ESW discharge path into the ultimate heat sink. The ESWS removes heat from plant components that require cooling for safe shutdown of the reactor. The ESWS also provides emergency makeup to the fuel storage pool and component cooling water systems and is the backup water supply to the auxiliary feedwater system.

The ESW discharge structure is within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1).

WCGS USAR References

Additional details of the essential service water system discharge structure are included in USAR Sections 3.8.4.1.12, 3.8.4.4.8, 3.8.5.1.9 and Figure 3.8-142.

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.4-16, Essential Service Water Discharge Structure.

Table 2.4-16 Essential Service Water Discharge Structure

Component Type	Intended Function
Concrete Elements	Direct Flow Shelter, Protection Structural Support
Penetrations Mechanical	Shelter, Protection Structural Support

The aging management review results for these component types are provided in Table 3.5.2-16, Containments, Structures, and Component Supports - Summary of Aging Management Evaluation - Essential Service Water Discharge Structure.

2.4.17 Main Dam and Auxiliary Spillway

Structure Description

To provide cooling water required for the plant operation, a lake was created by constructing an earth dam (main dam) across Wolf Creek at a point about 3 miles south of the plant.

A service spillway and an auxiliary spillway, both lined with concrete, are provided on the east abutment of the main dam. The auxiliary (emergency) spillway is located approximately 1500 feet east of the service spillway. The service spillway is required for all floods up to the 100-year flood. For floods greater than the 100-year flood, up to the probable maximum flood (PMF), both the service spillway and the auxiliary spillway are required. The ability of the spillways to pass the PMF is the only function of the main dam that is in-scope for license renewal.

The Ultimate Heat Sink (UHS) is a submerged earth dam within the cooling lake designed to retain a sufficient volume and surface area of water to provide cooling for post-accident and post-fire safe shutdown of the plant, even in the event of a loss of the main cooling lake. The UHS is evaluated separately in Section 2.4.15.

Structure Function

The auxiliary spillway and the service spillway are required to pass the Probable Maximum Flood. Therefore, they protect safety-related structures during flooding design basis events.

The auxiliary spillway and the service spillway are within the scope of license renewal based on the criterion of 10 CFR 54(a)(2).

WCGS USAR References

Additional details of the main dam and auxiliary spillway are included in USAR Sections 2.4.8.2.2 and 2.5.6,

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.4-17, Main Dam and Auxiliary Spillway.

Table 2.4-17 Main Dam and Auxiliary Spillway

Component Type	Intended Function
Dams/dikes	Flood Barrier

The aging management review results for these component types are provided in Table 3.5.2-17, Containments, Structures, and Component Supports - Summary of Aging Management Evaluation - Main Dam and Auxiliary Spillway.

2.4.18 Essential Service Water Valve House

Structure Description

The essential service water (ESW) valve house is a rectangular, reinforced concrete structure housing redundant ESW supply and discharge piping and valves. The valve house is located below grade and includes provisions for personnel and equipment access from the top.

Structure Function

The ESW valve house provides access to portions of underground ESW piping and valves. It shelters and protects the ESW components. The ESW removes heat from plant components that require cooling for safe shutdown of the reactor and also provides emergency makeup to the fuel storage pool and component cooling water systems and is the backup water supply for the auxiliary feedwater system.

The ESW valve house is within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1).

WCGS USAR References

Additional details of the essential service water valve house are included in USAR Sections 3.8.4.1.10 and 3.8.5.1.7.

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.4-18, Essential Service Water Valve House.

Table 2.4-18 Essential Service Water Valve House

Component Type	Intended Function
Caulking/sealant	Shelter, Protection
Compressible Joints/seals	Shelter, Protection
Concrete Elements	Flood Barrier Missile Barrier Shelter, Protection Structural Support
Hatches/Plugs	Missile Barrier Shelter/Protection Structural Support
Penetration Boot Seal	Flood Barrier
Penetrations Mechanical	Structural Support
Structural Steel	Nonsafety-related Structural Support Structural Support

The aging management review results for these component types are provided in Table 3.5.2-18, Containments, Structures, and Component Supports - Summary of Aging Management Evaluation - Essential Service Water Valve House.

2.4.19 Refueling Water Storage Tank Foundation and Valve House

Structure Description

The refueling water storage tank (RWST) is a 419,000 gallon tank supported on a reinforced concrete slab located on backfilled and compacted grade. The RWST foundation scope includes the RWST slab foundation, the integral sump, and the RWST valve house and duct banks associated with the RWST valve house. The RWST piping is routed to the fuel building and radwaste tunnel.

Structure Function

The primary function of the RWST foundation is to support the safety related RWST. The RWST valve house provides shelter and protection for mechanical and electrical components. The duct banks provide shelter and protection for the RWST electrical components.

The RWST foundation, RWST valve house and associated duct banks are within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1). These structures are also required to support fire protection requirements based on the criteria of 10CFR54.4(a)(3).

WCGS USAR References

Additional details of the refueling water storage tank foundation and valve house are included in USAR Sections 3.8.4.1.5, 3.8.5.1.5, and Figures 3.8-110 and 3.8-111.

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.4-19, Refueling Water Storage Tank Foundation and Valve House.

Table 2.4-19 Refueling Water Storage Tank Foundation and Valve House

Component Type	Intended Function
Caulking/sealant	Flood Barrier Shelter, Protection
Concrete Elements	Flood Barrier Shelter, Protection Structural Support
Doors	Shelter, Protection
Duct Banks and Manholes	Shelter, Protection
Hatches/plugs	Shelter, Protection
Penetration Boot Seal	Flood Barrier
Penetrations Electrical	Shelter, Protection Structural Support
Penetrations Mechanical	Shelter, Protection Structural Support
Roofing Membrane	Shelter, Protection
Structural Steel	Shelter, Protection Structural Support

The aging management review results for these component types are provided in Table 3.5.2-19, Containments, Structures, and Component Supports - Summary of Aging Management Evaluation - Refueling Water Storage Tank Foundation and Valve House.

2.4.20 Condensate Storage Tank Foundation and Valve House

Structure Description

The condensate storage tank (CST) is a 450,000 gallon tank supported on a reinforced concrete slab located on backfilled and compacted grade. The CST foundation includes the CST slab foundation, the integral sump, the CST pipe house, CST trench and all associated ladders, grating, gates and handrails. The piping is routed through the CST trench to the turbine building and auxiliary building.

Structure Function

The primary function of the condensate water storage tank foundation and valve house is to support the non-safety related CST. The CST pipe house and CST trench provide shelter and protection for mechanical and electrical components.

The CST foundation is required to support fire protection and station blackout requirements based on the criteria of 10 CFR 54.4(a)(3).

WCGS USAR References

Additional details of the condensate storage tank foundation and valve house are included in USAR Section 9.2.6.

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.4-20, Condensate Storage Tank Foundation and Valve House.

Table 2.4-20 Condensate Storage Tank Foundation and Valve House

Component Type	Intended Function
Compressible Joints/seals	Shelter, Protection
Concrete Block (masonry walls)	Nonsafety-related Structural Support Shelter, Protection
Concrete Elements	Nonsafety-related Structural Support Shelter, Protection
Doors	Shelter, Protection
Hatches/plugs	Shelter, Protection
Penetrations Mechanical	Nonsafety-related Structural Support Shelter, Protection
Roofing Membrane	Shelter, Protection
Structural Steel	Nonsafety-related Structural Support Shelter, Protection

The aging management review results for these component types are provided in Table 3.5.2-20, Containments, Structures, and Component Supports - Summary of Aging Management Evaluation - Condensate Storage Tank Foundation and Valve House.

2.4.21 Concrete Support Structures for Station Transformers

Structure Description

The concrete support structures for station transformers (ESF, startup, main, unit auxiliary, and station service) are reinforced concrete pads founded on structural fill. 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. Buried concrete duct banks connect the ESF transformers to the turbine building and to the switchyard. Manholes are provided along these duct banks for cable installation and access.

Structure Function

The concrete support structures for the station transformers (ESF, Startup, Main, Unit Auxiliary, and Station Service) provide structural support of the ESF, Startup, Main, Unit Auxiliary, and Station Service station transformers and support equipment.

The concrete support structures for the ESF transformers and portions of the concrete support structures for station transformers (startup, main, unit auxiliary, and station service) are required for the support of fire protection and station blackout recovery. They are within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(3).

WCGS USAR References

Additional details of the concrete support structures for the station transformers are included in USAR Section 8.1.2.

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.4-21, Concrete Support Structures for the Station Transformers.

Table 2.4-21 Concrete Support Structures for the Station Transformers

Component Type	Intended Function
Caulking/sealant	Shelter, Protection
Concrete Elements	Nonsafety-related Structural Support
Duct Banks and Manholes	Shelter, Protection
Penetrations Electrical	Shelter, Protection
Structural Steel	Nonsafety-related Structural Support

The aging management review results for these component types are provided in Table 3.5.2-21, Containments, Structures, and Component Supports - Summary of Aging Management Evaluation - Concrete Support Structures for Station Transformers.

2.4.22 Supports

Structure Description

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

Structural support evaluation boundaries are based upon the following:

- High strength bolts for Class 1 NSSS supports are evaluated as part of the "Bolting Integrity" program. A separate component for these bolts has been included in the scope of this package.
- All other pins, bolting, and other removable hardware that are part of the connection to the component integral attachment have been evaluated with the structural support.
- Exposed portions of the embedded components (i.e., end portion of the threaded anchor and nut) are evaluated with the component support, except high strength bolts for Class 1 NSSS supports, as noted above.
- Concrete supporting structure (including the embedded portion of the threaded anchor) is evaluated with the structure. This package includes a separate component for the supporting concrete around anchorages for in-scope mechanical and electrical components in each building.

- Integral attachments for the component are evaluated with the specific component (pipe, pump, heat exchanger, etc.).

The following electrical components and supports are addressed:

- Cable Trays and Supports
- Conduit and Supports
- Electrical Panels and Enclosures

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 consists of a horizontal top plate that receives loads from the reactor vessel shoe, a horizontal bottom plate that transfers loads to the primary shield wall concrete, and connecting vertical plates that bear against an embedded support. The reactor vessel support includes self lubricating sliding/wear plates.

Pressurizer Supports

The pressurizer is skirt mounted to a steel ring that is supported by the operating floor concrete slab. Horizontal support restraint is provided by an upper lateral support consisting of struts cantilevered off the compartment walls that bear against the seismic lugs provided on the pressurizer. The pressurizer is also restrained by a lower lateral support.

Steam Generators

For 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. 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. Upper lateral support is provided by a ring band at the operating deck. One-way acting compression struts restrain sudden seismic or blowdown induced motion, but permit essentially unrestrained thermal movement of the steam generator. Movement perpendicular to the thermal growth direction of the steam generator is prevented by struts.

Reactor Coolant Pump Supports

Three individual columns provide the vertical support for each pump. Lateral support for seismic and blowdown loading is provided by three lateral tension tie bars.

Table 2.4-23, Component Types Assigned to Building/Structures is provided to identify support component types by building/structure.

Structure Functions

Structural supports are in the scope of license renewal because they support and protect components that are within the scope of license renewal. Safety related supports meet the criteria of 10 CFR 54.4(a)(1). Non-safety related supports meet the criterion of 10 CFR 54.4(a)(2) when they prevent interaction between safety-related and non-safety related components. Other supports meet the criteria of 10 CFR 54.4(a)(3) because they provide support for components credited for fire protection, station blackout, or pressurized thermal shock.

WCGS USAR References

Additional details of supports are included in USAR Section 5.4.14.2.

Component-Function Relationship Table

The component types subject to aging management review are indicated in Table 2.4-22, Supports.

Table 2.4-22 Supports

Component Type	Intended Function
Cable Trays and Supports	Nonsafety-related Structural Support Structural Support
Conduit and Supports	Nonsafety-related Structural Support Shelter, Protection Structural Support
Electrical Panels and Enclosures	Nonsafety-related Structural Support Shelter, Protection Structural Support
High Strength Bolting	Structural Support
Spring Hangers	Structural Support
Supports ASME 1	Structural Support

Table 2.4-22 Supports (Continued)

Component Type	Intended Function
Supports ASME 2 and 3	Nonsafety-related Structural Support Structural Support
Supports HVAC Duct	Structural Support
Supports, Instrument	Nonsafety-related Structural Support Structural Support
Supports, Mechanical Equipment Class 1	Structural Support
Supports, Mechanical Equipment Class 2 and 3	Nonsafety-related Structural Support Structural Support
Supports, Mechanical Equipment Non-ASME	Nonsafety-related Structural Support Structural Support
Supports, Non-ASME	Expansion/Separation Nonsafety-related Structural Support Structural Support

The aging management review results for these component types are provided in Table 3.5.2-22, Containments, Structures, and Component Supports - Summary of Aging Management Evaluation – Supports.

Table 2.4-23 Component Types Assigned to Supports by Building/Structure

	Electrical Components			**Mechanical Components**						
Component Types Assigned to Supports	**Cable Trays and Supports**	**Conduits and Supports**	**Electrical Panels and Enclosures**	**ASME Class 1 Pipe Supports**	**ASME Class 2 and 3 Pipe Supports**	**Non-ASME Pipe Supports**	**Mechanical Equipment Code Supports**	**Mechanical Equipment Non-Code Supports**	**HVAC Duct Supports**	**Instrument Supports**
Reactor Building	X	X	X	X	X	X	X	X	X	X
Control Building	X	X	X		X	X		X	X	X
Diesel Generator Bldg	X	X	X		X	X	X		X	X
Turbine Building	X	X	X			X		X		X
Radwaste Building	X	X	X			X				
Auxiliary Building	X	X	X		X	X	X	X	X	X
Emer. Fuel Oil Tank Access Vaults		X	X							X
ESW Elec. Ductbanks and Manways	X									
Communications Corridor										
Transmission Towers										
ESW Access Vaults										
Fuel Building	X	X	X		X	X	X	X	X	X
ESW Pumphouse	X	X	X		X	X	X		X	X
CW Screenhouse	X	X	X			X		X		X
Ultimate Heat Sink										
Main Dam/Aux Spillway										
ESW Valve House		X	X					X		X
Refueling Water Storage Tank Fnd		X	X							X
Condensate Water Storage Tank Fnd		X	X			X				X
Concrete Supports for Station Transformers	X	X	X							

2.5 SCOPING AND SCREENING RESULTS: ELECTRICAL AND INSTRUMENTATION AND CONTROL SYSTEMS

The scoping and screening results for electrical and instrument and control (I&C) system components consist of a list (Refer to Table 2.5-1, Electrical and Instrumentation and Control Component Types Requiring Aging Management Review) of component types that require aging management review.

Using the "plant spaces" approach all electrical and I&C 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 types that require aging management review. This methodology is discussed in Section 2.1.4.3 and is consistent with the guidance in NEI 95-10.

The interface of electrical and instrument 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.

The following electrical component types were evaluated:

- Cable connections (metallic parts)
- Connectors
- High voltage insulators
- Insulated cables and connections (includes the following)
    - Electrical cables and connections not subject to 10 CFR 50.49 EQ requirements
    - Electrical cables and connections used in instrumentation circuits not subject to 10 CFR 50.49 EQ requirements that are sensitive to reduction in conductor insulation resistance
    - Inaccessible Medium-Voltage Electrical Cables not subject to 10 CFR 50.49 EQ requirements
- Penetrations electrical

- Switchyard bus and connections
- Terminal blocks
- Transmission conductors and connections
- Electrical equipment subject to 10CFR50.49 environmental qualification (EQ) requirements
- Fuse Holders (Not Part of a Larger Assembly)
- Grounding conductors
- Metal enclosed bus

Two license renewal drawings (LR-WCGS-ELEC-E-11010 and LRWGS-ELEC-KD-7496) were created based on the electrical one line diagram and the DC main single line diagram.

2.5.1 Electrical Component Types

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 connector component type includes the connector contacts for electrical connectors exposed to borated water leakage.

The function of the connectors 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 Cables and Connections

All 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 containing cables that feed electrical components that perform license renewal functions are in the scope of license renewal. Electrical cables not routed with in-scope cables were excluded from aging management if they were identified as feeding an electrical component that performed no license renewal intended function.

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, 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.

2.5.1.5 Penetrations Electrical

All primary containment electrical penetrations are within the scope of license renewal. The electrical continuity of the environmental qualified penetrations is managed under the Environmental Qualification (EQ) Program which is evaluated as a time-limited aging analysis. The electrical continuity of the non-environmental qualified penetrations is managed under the Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program. The pressure boundary function of all electrical penetrations is evaluated in Section 2.4.1, Reactor Building."

The functions of the primary containment electrical penetrations are to perform the function of primary containment boundary (structural pressure boundary) and electrical continuity across the primary containment boundary.

2.5.1.6 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 disconnects.

The function of the switchyard buses is to electrically connect specified sections of an electrical circuit to deliver voltage and current.

2.5.1.7 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.

2.5.1.8 Transmission Conductors and Connections

The high voltage conductors and 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 high voltage conductors and connectors is to supply offsite power to various plant systems.

2.5.1.9 Electrical Equipment Subject to 10CFR50.49 Environmental Qualification (EQ) Requirements

Electrical equipment subject to 10 CFR 50.49 environmental qualification (EQ) requirements is evaluated as a time-limited aging analysis and is managed under the environmental qualification (EQ) program.

2.5.1.10 Fuse Holders (Not Part of a Larger Assembly)

All fuse holders including the fuses installed for electrical penetration protection are part of larger assemblies and are managed as part of the active component.

2.5.1.11 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 non-safety 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 safety 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.

Insulated ground conductors are evaluated as cable in Section 2.5.1.4, Insulated Cables and Connections.

2.5.1.12 Metal Enclosed Bus

Electrical phase bus is bus that is enclosed and not part of an active component such as switchgear, load centers or motor control centers. There are typically three types of phase bus:

- Isolated Phase Bus
- Non-Segregated Phase Bus
- Segregated Phase Bus

The isolated phase bus is not within the scope of license renewal. The isolated phase bus performs no intended function that meets the criteria of 10 CFR 54.4(a) and WCGS does not use segregated or non-segregated phase bus.

2.5.2 Electrical Component Types Subject to Aging Management Review

The electrical and instrument and control component types requiring aging management review and their intended functions are indicated in Table 2.5-1, Electrical and Instrument and Control Component Types Requiring Aging Management Review.

Table 2.5-1 Electrical and Instrument and Control Component Types Requiring Aging Management Review

Component Type	Intended Function
Cable Connections (Metallic Parts)	Electrical Continuity
Connector	Electrical Continuity
High Voltage Insulator	Insulate (electrical), Non-safety related support
Insulated Cable and Connections	Electrical Continuity Insulate (electrical)
Penetrations Electrical	Electrical Continuity Insulate (electrical)
Switchyard Bus and Connections	Electrical Continuity
Terminal Block	Insulate (electrical)
Transmission Conductors and Connections	Electrical Continuity

The aging management review results for these component types are provided in Table 3.6.2-1, Electrical and Instrument and Controls – Summary of Aging Management Evaluation – Electrical Components.

CHAPTER 3

AGING MANAGEMENT REVIEW RESULTS

3.0 AGING MANAGEMENT REVIEW RESULTS

Chapter 3 provides the results of the aging management review for those structures and component types identified in Chapter 2 as being subject to aging management review. Organization of this chapter is based on Tables 1 through 6 of Volume 1 of NUREG-1801, Generic Aging Lessons Learned (GALL), dated September 2005 and Chapter 3, Aging Management Review Results, of NUREG-1800, Standard Review Plan for the Review of License Renewal Applications for Nuclear Power Plants (SRP-LR), Revision 1, dated September 2005.

The major sections of this chapter are:

- 3.1 Aging Management of Reactor Vessel, Internals, and Reactor Coolant System
- 3.2 Aging Management of Engineered Safety Features
- 3.3 Aging Management of Auxiliary Systems
- 3.4 Aging Management of Steam and Power Conversion System
- 3.5 Aging Management of Containments, Structures, and Component Supports
- 3.6 Aging Management of Electrical and Instrument and Controls

Descriptions of the internal and external service environments which were used in the aging management review 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 Environments. The environments used in the aging management reviews are listed in the Evaluated Environment column.

The aging management review results in Chapter 3 are presented in the following two 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 Coolant System subsection, this table would be number 3.1.1. For ease of discussion, this table will hereafter be referred to in this Section 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 3.1.2-1 and for the Reactor Coolant System, it would be Table 3.1.2-2. For the Nuclear Sampling System, within the Engineered Safety Features subsection, this Table would be 3.2.2-1. This table will hereafter be referred to in this section as "Table 2."

TABLE DESCRIPTION

NUREG-1801 contains the staff's 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 WCGS aligns with the corresponding tables of NUREG-1801, Volume 1. The table is essentially the same as Tables 1 through 6 provided in NUREG-1801, Volume 1, except that the "Type" column and the “Unique Item” column are not included. The “ID” column has been replaced by an "Item Number" column and the "Related Generic Item" column has 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 by the applicant 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 program being used.
- Exceptions to the NUREG-1801 assumptions
- A discussion of how the line is consistent with the corresponding line item in NUREG-1801, Volume 1
- A discussion of how the item is different than the corresponding line item in NUREG-1801, Volume 1, 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, Volume 1)

The format of Table 1 provides the reviewer with a means of aligning a specific Table 1 row with the corresponding NUREG-1801, Volume 1 table row, thereby allowing for the ease of review.

Table 2

Table 2 provides the detailed results of the aging management reviews for those component types identified in Chapter 2 as being subject to aging management review. There will be a Table 2 for each of the systems and structures identified in Chapter 2.

Table 2 consists of the following nine columns:

- Component Type
- Intended Function
- Material
- Environment
- Aging Effect Requiring Management
- Aging Management Program
- NUREG-1801 Volume 2 Item
- Table 1 Item
- Notes

Component Type

The first column identifies all of the component types from Chapter 2 that are subject to aging management review. 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 2.0-1, Intended Functions – Abbreviations and Definitions.

Material

The third column lists the particular materials of construction for the component types.

Environment

The fourth column lists the environments to which the component types are exposed. Internal and external service 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 Instrument and Control Environments.

Aging Effect Requiring Management

As part of the aging management review 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 Vol. 2 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, Volume 2 with consideration given to the standard notes, to identify consistencies. When they are identified, they are documented by noting the appropriate NUREG-1801, Volume 2 item number in column seven of Table 2. If there is no corresponding item number in NUREG-1801, Volume 2, this row in column seven is marked “none.” That way, a reviewer can readily identify where there is correspondence between the plant specific tables and the NUREG-1801, Volume 2 tables.

Table 1 Item

Each combination of component, material, environment, aging effect requiring management, and aging management program that has an identified NUREG-1801 Volume 2 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, Volume 1, this row in column eight is left blank. That way, the information from the two tables can be correlated.

Notes

In order to realize the full benefit of NUREG-1801, a series of notes is established to identify how the information in Table 2 aligns with the information in NUREG-1801, Volume 2. All note references with letters are standard notes that will be the same from application to application throughout the industry. Any notes the plant requires which are in addition to the standard notes will be identified by a number and deemed plant specific.

TABLE USAGE

Table 1

The reviewer evaluates each row 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-1801, Volume 1, 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 will be given information necessary to determine, in summary, how the WCGS evaluations and programs align with NUREG-1801, Volume 1. 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 Aging Management Review 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, Volume 2, this will be identified by a referenced item number in column seven, NUREG-1801, Volume 2 Item. The reviewer can refer to the item number in NUREG-1801, Volume 2, if desired, to verify the correlation. If the column is blank, the corresponding combination in NUREG-1801, Volume 2 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 row 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 aging management review 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 1.6.

Table 3.0-1 Mechanical Environments

Mechanical Environments		
Evaluated Environment	**NUREG-1801 Environment**	**Description**
	Internal	
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 Aging Management Program and depending on the system; demineralized water may require additional processing.
Treated Borated Water	Treated Borated Water	Treated water with boric acid that is monitored for quality under the Water Chemistry Aging Management Program.
	Treated Borated Water >60 ° C (140 ° F) [SCC Threshold for Stainless Steel]	
	Treated Borated Water >250 ° C (482 ° F) [CASS in ECCS Systems]	

Table 3.0-1 Mechanical Environments (Continued)

Mechanical Environments		
Evaluated Environment	**NUREG-1801 Environment**	**Description**
Reactor Coolant	Reactor Coolant	Water in reactor coolant systems at or near full operating temperature that is treated and monitored for quality under the Water Chemistry Aging Management Program.
	Reactor Coolant >250 ° C (>482 ° F) [CASS]	
	Reactor Coolant and Neutron Flux [Neutron Irradiation Embrittlement]	
	Reactor Coolant >250 ° C (>482 ° F) and Neutron Flux [CASS and Neutron Irradiation Embrittlement]	
	Reactor Coolant and Secondary Feedwater/Steam [TLAA IV.D1-21]	
	Reactor Coolant/Steam [RCS Piping IV.C2-13 and Pressurizer IV. C2-24]	
Secondary Water	Steam	Steam generator secondary systems water (including condensate, feedwater and steam) that is treated and monitored for quality under the Water Chemistry Aging Management Program and controlled for protection of steam generators.
	Treated Water	
	Treated Water >60 ° C (140 ° F) [SCC Threshold for Stainless Steel]	
	Secondary Feedwater/Steam	
	Secondary Feedwater	
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 Aging Management Program.
	Closed Cycle Cooling Water >60 ° C (140 ° F) [SCC Threshold for Stainless Steel]	
	Treated Water	

Table 3.0-1 Mechanical Environments (Continued)

Mechanical Environments		
Evaluated Environment	**NUREG-1801 Environment**	**Description**
Raw Water	Raw Water	Water from the site cooling water lake or ultimate heat sink for use in open-cycle cooling systems. Floor drains and building sumps may be exposed to a variety of untreated water that is classified as raw water for the determination of aging effects. Raw water may contain contaminants, including oil and boric acid, as well as originally treated water that is not monitored by a chemistry program.
Lubricating Oil	Lubricating Oil	Lubricating oils are low-to-medium viscosity hydrocarbons, with the possibility of containing contaminants and/or moisture, used for bearing, gear, and engine lubrication. Lube oil is monitored for the possibility of water by the Lube Oil Analysis Aging Management Program.
Fuel Oil	Fuel Oil	Diesel fuel oil or liquid hydrocarbons used to fuel diesel engines. Fuel oil is monitored for the possibility of water by the Fuel Oil Chemistry Aging Management Program.
Dry Gas	Dried Air [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 or Freon.
	Gas [Common Miscellaneous Material/Environments]	
Diesel Exhaust	Diesel Exhaust[VII H2-1 & H2-2]	Gases, fluids, particles present in diesel engine exhaust.
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.
	Condensation (Internal)	
	Air – Indoor Uncontrolled (Internal/External)	
	Air – Indoor Controlled (external)	

Table 3.0-1 Mechanical Environments (Continued)

Mechanical Environments		
Evaluated Environment	**NUREG-1801 Environment**	**Description**
Wetted Gas	Condensation (Internal)	Non-dried compressed air or gas, may contain moisture. Air with enough moisture to facilitate loss of material in steel caused by general, pitting, and crevice corrosion. Moist air in the absence of condensation is also potentially aggressive, e.g., under conditions where hydroscopic surface contaminants are present.
	Air [Glass Piping Elements VII.J-7 and VIII.I-4]	
	Moist Air or Condensation [Diesel Piping Components VII.H2-21]	
Potable Water	This Environment is Not in NUREG-1801	Water treated for drinking or other personnel uses.
Sodium Hydroxide	This Environment is Not in NUREG-1801	30 weight percent (nominal) sodium hydroxide.
Silicone Fluid	This Environment is Not in NUREG-1801	Silicon based fluid that is thermally stable, resists oxidation, and is chemically inert. It is used as the internal fluid on the containment pressure transmitters.
External		
Plant Indoor Air	Air – Indoor Uncontrolled (External)	The environment to which the internal and external surface of the component is exposed. Indoor air on 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.
	Air – Indoor Uncontrolled (Internal/External)	
	Air Indoor	
	Air – Indoor Controlled (External) [VII.J-1 and VIII.I-13]	
	Air With Leaking Secondary Side Water and/or Steam [Steam Generator (Once Through) – IV.D2-5]	
	Air With Steam or Water Leakage [Closure Bolting]	
	Condensation (External)	
Borated Water Leakage	Air With Reactor Coolant 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).
	Air With Borated Water Leakage.	
	Air With Reactor Coolant Leakage (Internal) (RPV Leak Detection Line IV.A2-5)	
	Air With Metal Temperature up to 288 ° C (550 ° F) [Pressurizer Integral Support - IV.C2-16]	

Table 3.0-1 Mechanical Environments (Continued)

Mechanical Environments		
Evaluated Environment	**NUREG-1801 Environment**	**Description**
	System Temperature up to 340 º C (644 º F) [Steam Generator Closure Bolting and TLAA]	
Atmosphere /weather	Air – Outdoor Air – Outdoor (External) Air – Indoor and Outdoor	The atmosphere/weather environment consists of moist, ambient temperatures, humidity, and exposure to weather, including precipitation and wind. The component is exposed to air and local weather conditions. Temperature extremes range from -27°F to 117°F. There is no exposure to salt spray or other aggressive contaminants.
Buried	Soil	Components/equipment 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. External environment for components exposed to soil (including air/soil interface) or buried in the soil, including groundwater in the soil. The ground water has been determined to be non-aggressive.
Submerged (Note: Use 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, EHC, etc.) The environment for submerged components will be identified using one of the internal environments previously identified.
Encased in Concrete	Concrete	Piping or components that are encased in concrete.

Table 3.0-2 Structural Environments

Structural Environments		
Evaluated Environment	**NUREG-1801 Environment**	**Description**
Plant Indoor Air	Any [Reaction With Aggregates]	Structures are subject to the same conditions covered in Plant Indoor Air External 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. Condensation on the surfaces of structures with temperatures below the dew point is considered raw water due to the potential for surface contamination.
	Air - Indoor Uncontrolled	
	Soil [Cracks and Distortion Due to Increased Stress Levels From Settlement]	
	Various [Elastomers III A6-12]	
Atmosphere/ Weather	Any [Reaction With Aggregates]	Structures are subject to the same conditions covered in Atmosphere/Weather External Mechanical Environment. The atmosphere/weather environment consists of moist, ambient temperatures, humidity, and exposure to weather, including precipitation and wind. The component is exposed to air and local weather conditions. Temperature extremes range from -27°F to 117°F.
	Air – Outdoor	
	Soil [Cracks and Distortion Due to Increased Stress Levels From Settlement]	
	Water - Flowing[Leaching of Calcium Hydroxide]	
	Various [Elastomers III A6-12]	
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).

Table 3.0-2 Structural Environments (Continued)

Structural Environments		
Evaluated Environment	**NUREG-1801 Environment**	**Description**
Encased in Concrete	Not a NUREG-1801 Structural Environment: See NUREG-1801 Mechanical Item	Components that are encased in concrete.
Buried	Any [Reaction With Aggregates]	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 • Soft soil and settlement issues • An aggressive environment caused by contaminants in the soil
	Groundwater/Soil	
	Soil [Cracks and Distortion Due to Increased Stress Levels From Settlement]	
	Water - Flowing [Leaching of Calcium Hydroxide]	
	Air – Outdoor [Freeze Thaw]	
	Water - Flowing Under Foundation [Porous Concrete Sub-foundation]	
	Various [Elastomers III A6-12]	
Submerged (Note: Use Appropriate Internal Mechanical Environment	Water – Standing [Tanks, Earthen Water Control Structures, and Water Control Structures Metal Components]	Structures that are completely or partially covered, or structures that are partially filled (such as tanks, sumps, etc.) with: • Water (operating or process fluid) • Oil/fluids (lube, fuel, EHC, etc.) Structures that are exposed to flowing water conditions potentially causing: • Abrasion • Cavitation • Leaching The environment for submerged components will be identified using one of the mechanical environments previously identified.
	Water - Flowing [Abrasion/Cavitation (concrete), Earthen Water Control Structures, and Water Control Structures Metal Components]	
	Treated Water or Treated Borated Water [Fuel Pool Liner]	
	Treated Water <60 ° F (<140 ° F) [Supports]	

Table 3.0-3 Electrical and Instrument and Controls Environments

Electrical Environments		
Evaluated Environment	**NUREG-1801 Environment**	**Description**
Plant Indoor Air	Air Indoor	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.
Atmosphere/Weather	Air Outdoors	The atmosphere/weather environment consists of moist, ambient temperatures, humidity, and exposure to weather, including precipitation and wind. The component is exposed to air and local weather conditions. Temperature extremes range from -27°F to 117°F. There is no exposure to salt spray, industry air pollution or other aggressive contaminants.
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).
Adverse Localized Environment	Adverse localized environment caused by heat, radiation, or moisture in the presence of oxygen	Adverse localized environments can be due to any of the following: (1) exposure to moisture and voltage (2) heat, radiation, or moisture, in the presence of oxygen (3) heat, radiation, or moisture, in the presence of oxygen or >60-year service limiting temperature, or (4) adverse localized environment caused by heat, radiation, oxygen, moisture, or voltage. The term “>60-year service limiting temperature” refers to that temperature that exceeds the temperature below which the material has a 60-year or greater service lifetime.
	Adverse localized environment caused by exposure to moisture and voltage	

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 aging management review. 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)
- Steam Generators (Section 2.3.1.3)

Table 3.1.1, Summary of Aging Management Evaluations 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 3.x.1 (Table 1) described in Section 3.0.

3.1.2 Results

The following tables summarize the results of the aging management review 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 – Steam Generators

These tables use the format of Table 2 discussed in Section 3.0.

3.1.2.1 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 systems in the following subsections.

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
- Plant Indoor Air
- Reactor Coolant

Aging Effects Requiring Management

The following reactor vessel and internals aging effects require management:

- Changes in dimensions
- Cracking
- Loss of fracture toughness
- Loss of material
- Loss of preload

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)
- Flux Thimble Tube Inspection (B2.1.21)
- Reactor Coolant System Supplement (B2.1.35)

- Nickel Alloy Aging Management Program (B2.1.34)
- Nickel-Alloy Penetration Nozzles Welded To The Upper Reactor Vessel Closure Heads Of Pressurized Water Reactors (B2.1.5)
- Reactor Head Closure Studs (B2.1.3)
- Reactor Vessel Surveillance (B2.1.15)
- 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
- Carbon Steel with Stainless Steel Cladding
- Copper-Nickel
- Nickel Alloys
- 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
- 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

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 (B2.1.7)
- Boric Acid Corrosion (B2.1.4)
- Closed-Cycle Cooling Water System (B2.1.10)
- External Surfaces Monitoring Program (B2.1.20)
- Lubricating Oil Analysis (B2.1.23)
- Nickel Alloy Aging Management (B2.1.34)
- One-Time Inspection (B2.1.16)
- One-Time Inspection Of ASME Code Class 1 Small-Bore Piping (B2.1.19)
- Water Chemistry (B2.1.2)
- Reactor Coolant System Supplement (B2.1.35)

3.1.2.1.3 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
- Denting
- 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 (B2.1.7)
- Boric Acid Corrosion (B2.1.4)
- External Surfaces Monitoring Program (B2.1.20)
- Flow-Accelerated Corrosion (B2.1.6)
- Nickel Alloy Aging Management (B2.1.34)
- Steam Generator Tube Integrity (B2.1.8)
- 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 LRA. For the reactor vessel, internals, and reactor coolant system, those evaluations are addressed in the following subsections.

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).

The following discussion is detailed to each specific line in Table 3.1.1 that requires a further evaluation for cumulative fatigue damage. Table 3.1.1 item numbers are provided in brackets.

[3.1.1.05] WCGS reactor vessel internals are designed to ASME Section III Subsection NG, some with a fatigue analysis. Section 4.3.3 describes the evaluation of these TLAAs.

[3.1.1.06] Nickel alloy tubes and sleeves in the reactor coolant, and in the feedwater environment within the steam generator, are designed to ASME Section III Class 1, with a fatigue analysis.

Section 4.3.2.1 describes the evaluation of these TLAAs for reactor vessel penetration sleeves, instrument nozzles, dissimilar-metal welds, and safe end butters. Section 4.3.2.4 describes the evaluation of these TLAAs for pressurizer heater sleeves, dissimilar-metal welds, and safe end butters. Section 4.3.2.5 describes the evaluation of these TLAAs for steam generator tubes, dissimilar-metal welds, and safe end butters. Section 4.3.2.7 describes the evaluation of these TLAAs for piping, piping nozzles, dissimilar-metal welds, and safe end butters.

Fatigue in nickel alloy components in the reactor vessel, pressurizer, steam generator locations (except tubes), piping, and piping nozzles are addressed only within the analysis of the parent component, which identifies usage factors of limiting subcomponents, but does not treat nickel alloy parts separately. Fatigue usage in the steam generator tubes is identified separately.

TLAAs support design of any other non-austenitic nickel alloy sleeves and tubes at WCGS.

[3.1.1.07] Reactor coolant pressure boundary closure bolting (RPV head studs, pump, valve, and pressurizer and steam generator manway and port bolting) and vessel support skirts and attachment welds are designed to ASME Section III Class 1, with a fatigue analysis.

Both the steam generator primary and secondary shells, integral supports, nozzles, and bolting have a Class 1 fatigue analysis. The pressurizer relief tank is not an ASME Section III Class 1 component, nor is it designed to other fatigue or cyclic design rules, and therefore has no fatigue TLAA.

Section 4.3.2.1 describes the evaluation of these TLAAs for reactor vessel closure bolting and welded attachments. Section 4.3.2.3 describes the evaluation of these TLAAs for the reactor coolant pump, its closure bolting, and its integral supports. Section 4.3.2.4 describes the evaluation of these TLAAs for pressurizer closure bolting, its support skirt, and welded attachments. Section 4.3.2.5 describes the evaluation of these TLAAs for steam generator primary and secondary-side pressure boundaries, feedwater nozzles, closure bolting and welded attachments. Section 4.3.2.6 describes the evaluation of these TLAAs for Class 1 valves, including their bolting. Section 4.3.2.7 describes the evaluation of these TLAAs for piping and piping components.

[3.1.1.08] Reactor coolant pressure boundary piping and the pressurizer are designed to ASME Section III Class 1, with fatigue analyses.

Section 4.3.2.4 describes the evaluation of these TLAAs for the pressurizer vessel, heater sleeves, closures, nozzles, and safe ends. Section 4.3.2.7 describes the evaluation of these TLAAs for piping, piping nozzles, safe ends, and other piping components.

[3.1.1.09] The reactor vessel pressure boundary is designed to ASME Section III Class 1, with fatigue analyses. Section 4.3.2.1 describes the evaluation of these TLAAs for the reactor vessel, including the shell, heads, flanges, penetrations, welds, nozzles, and safe end butters. Section 4.3.2.2 describes the evaluation of these TLAAs for the control rod drive motor housings and canopy seals.

[3.1.1.10] The steam generator primary and secondary pressure boundaries are designed respectively to ASME Section III Class 1 and 2, but both the steam generator primary and secondary shells and nozzles have a Class 1 fatigue analysis.

Section 4.3.2.5 describes the evaluation of these TLAAs for steam generator primary and secondary-side pressure boundaries including the heads, feedwater nozzles, other nozzles and safe end butters, and closures.

3.1.2.2.2 Loss of Material due to General, Pitting, and Crevice Corrosion

3.1.2.2.2.1 PWR steam generator shell assembly exposed to feedwater and steam

Not applicable. WCGS has recirculating steam generators, not once-through steam generators, so the applicable NUREG-1801 line was not used.

3.1.2.2.2.2 BWR isolation condenser components exposed to reactor coolant

Not applicable to WCGS, applicable to BWR only.

3.1.2.2.2.3 Reactor vessel components exposed to reactor coolant

Not applicable to WCGS, applicable to BWR only.

3.1.2.2.2.4 Steam generator shell and transition cone exposed to secondary feedwater and steam

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 WCGS are Model F, so the augmented inspection is not applicable.

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

Evaluation of loss of fracture toughness is a TLAA as defined in 10 CFR 54.3. TLAAs are evaluated in accordance with 10 CFR 54.21(c)(1).

The last coupons examined were exposed to a fluence of approximately equal to 54 effective full power years, the projected fluence through the period of extended operation. The examination of these coupons demonstrated that beltline materials will remain limiting, and that more than adequate adjusted reference temperature, upper shelf energy, and pressurized thermal shock screening temperature margin will remain at the end of a 60-year extended licensed operating period; and therefore that subsequent revisions to pressure-temperature limits will provide adequate operating margin, without the use of special methods.

Since beltline materials remain limiting, nozzles were not evaluated separately. Section 4.2 describes the evaluation of these neutron embrittlement TLAAs.

Loss of fracture toughness for the reactor pressure vessel shell and nozzles is managed with the Reactor Vessel Surveillance program (B2.1.15).

3.1.2.2.3.2 Loss of Fracture Toughness due to Neutron Irradiation Embrittlement – Reactor Vessel Surveillance program

The Reactor Vessel Surveillance program (B2.1.15) manages loss of fracture toughness due to neutron irradiation embrittlement of carbon steel components clad with stainless steel exposed to reactor coolant. The last coupons examined were exposed to a fluence approximately equal to 54 effective full power years, the projected fluence through the period of extended operation. The examination of these coupons demonstrated that beltline materials will remain limiting, and that more than adequate adjusted reference temperature, upper shelf energy, and pressurized thermal shock screening temperature margin will remain at the end of a 60-year extended licensed operating period; and therefore that subsequent revisions to pressure-temperature limits will provide adequate operating margin, without the use of special methods.

Since beltline materials remain limiting, nozzles were not evaluated separately.

All remaining capsules have been withdrawn from the WCGS vessel. These capsules have been exposed to a fluence slightly greater than that expected at 54 effective full power years. This withdrawal therefore 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.

WCGS has also installed an ex-vessel monitoring system to track neutron fluence during the period of extended operation. Section 4.2 describes the results of these examinations.

3.1.2.2.4 Cracking due to Stress Corrosion Cracking (SCC) and Intergranular Stress Corrosion Cracking (IGSCC)

3.1.2.2.4.1 BWR top head enclosure, vessel flange leak detection lines

Not applicable to WCGS, applicable to BWR only.

3.1.2.2.4.2 BWR isolation condenser components exposed to reactor coolant

Not applicable to WCGS, applicable to BWR only.

3.1.2.2.5 Cracking Growth due to Cyclic Loading

Analysis of underclad flaw growth in reactor vessel forgings due to cyclic loading, for the design life, would be a TLAA. TLAAs are evaluated in accordance with 10 CFR 54.21(c)(1). However, there are no analyses of underclad flaws in the reactor vessel, and therefore no such TLAAs.

The WCGS vessel does include some SA-508 Class 2 forgings clad using high heat input processes. To ensure that underclad cracking would not occur, these processes were subject to an evaluation of this question, and to a performance test as described in Regulatory Position C.2 of Regulatory Guide 1.43 in the WCGS USAR Sections 3A and 5.3.1.2.g.

The Westinghouse WCAP-15338-A evaluation of growth of possible underclad flaws in pressurized water reactors demonstrated that for a 60-year design life "…flaw growth is insignificant for any type flaw which might exist at the clad-base metal interface…." Since the evaluation was for the extended licensed operating period rather than for the current licensed operating period, this analysis is not a TLAA, by 10 CFR 54.3(a) criterion (3). It should also validate any existing TLAAs, within its analysis parameters, on this question.

However no underclad flaws have been detected or analyzed for the WCGS vessel, in the absence of which there are no other TLAAs of this sort. See Section 4.7.2.

3.1.2.2.6 Loss of Fracture Toughness due to Neutron Irradiation Embrittlement and Void Swelling

Loss of fracture toughness due to neutron irradiation embrittlement and void swelling for nickel alloy and stainless steel reactor internals components exposed to reactor coolant will be managed by (1) participating in the industry programs for investigating and managing aging effects on reactor internals; (2) evaluating and implementing the results of the industry programs as applicable to the reactor internals; and (3) upon completion of these programs, but not less than 24 months before entering the period of extended operation, submitting an inspection plan for reactor internals to the NRC for review and approval (See Reactor Coolant System Supplement (B2.1.35)).

3.1.2.2.7 Cracking due to Stress Corrosion Cracking

3.1.2.2.7.1 PWR stainless steel reactor vessel flange leak detection lines

For managing the aging of cracking due to stress corrosion cracking for stainless steel components exposed to reactor coolant, Water Chemistry (B2.1.2) will be augmented by ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) to ensure that adequate inspection methods ensure detection of cracks.

3.1.2.2.7.2 CASS reactor coolant system piping and components exposed to reactor coolant

For managing the aging of cracking due to stress corrosion cracking for cast austenitic stainless steel piping components exposed to reactor coolant, Water Chemistry (B2.1.2) program will be augmented by ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) to ensure that adequate inspection methods ensure detection of cracks. The CASS in the RCS piping at WCGS meets the NUREG-0313 requirements for ferrite content but not for carbon content.

A flaw evaluation methodology for CASS components is not necessary because WCGS CASS piping is not susceptible to thermal aging embrittlement. Based on a review of Certified Material Test Reports, the Mo and ferrite values for these components are below the industry accepted thermal aging embrittlement significance threshold (<0.5% Mo, <20% ferrite).

3.1.2.2.8 Cracking due to Cyclic Loading

3.1.2.2.8.1 BWR jet pump sensing lines

Not applicable to WCGS, applicable to BWR only.

3.1.2.2.8.2 BWR isolation condenser components exposed to reactor coolant

Not applicable to WCGS, applicable to BWR only.

3.1.2.2.9 Loss of Preload due to Stress Relaxation

Loss of preload due to stress relaxation for nickel alloy and stainless steel reactor internals components exposed to reactor coolant will be managed by (1) participating in the industry programs for investigating and managing aging effects on reactor internals; (2) evaluating and implementing the results of the industry programs as applicable to the reactor internals; and (3) upon completion of these programs, but not less than 24 months before entering the period of extended operation, submitting an inspection plan for reactor internals to the NRC for review and approval (See Reactor Coolant System Supplement (B2.1.35)).

3.1.2.2.10 Loss of Material due to Erosion

Not applicable. WCGS steam generator does not have an impingement plate.

3.1.2.2.11 Cracking due to Flow Induced Vibration

Not applicable to WCGS, applicable to BWR only.

3.1.2.2.12 Cracking due to Stress Corrosion Cracking and Irradiation-Assisted Stress Corrosion Cracking (IASCC)

For managing the aging of cracking due to stress corrosion cracking and irradiation-assisted stress corrosion cracking of stainless steel reactor internals components exposed to reactor coolant, water chemistry will be augmented by (1) participating in the industry programs for investigating and managing aging effects on reactor internals; (2) evaluating and implementing the results of the industry programs as applicable to the reactor internals; and (3) upon completion of these programs, but not less than 24 months before entering the period of extended operation, submitting an inspection plan for reactor internals to the NRC for review and approval (See Reactor Coolant System Supplement (B2.1.35)).

3.1.2.2.13 Cracking due to Primary Water Stress Corrosion Cracking (PWSCC)

For managing the aging of cracking due to primary water stress corrosion cracking of nickel alloy components exposed to reactor coolant, water chemistry and inservice inspection will be augmented by the plant-specific Nickel Alloy aging management program (B2.1.34) (pressure boundary components, reactor vessel core support lugs, and steam generator primary side internals only), and by implementing applicable (1) NRC Orders, Bulletins and Generic Letters associated with nickel alloys and (2) staff-accepted industry guidelines (See Reactor Coolant System Supplement (B2.1.35)).

3.1.2.2.14 Wall Thinning due to Flow-Accelerated Corrosion

Feedring wall thinning was described in NRC Information Notice 91-19. Evaluation of this condition is not applicable to WCGS and no action is required, however, the Water Chemistry program (B2.1.2) and the Steam Generator Tube Integrity program (B2.1.8) are conservatively credited to manage wall thinning due to flow-accelerated corrosion for the feedring.

3.1.2.2.15 Changes in dimensions due to Void Swelling

Changes in dimensions due to void swelling for nickel alloy and stainless steel reactor internals components exposed to reactor coolant will be managed by (1) participating in the industry programs for investigating and managing aging effects on reactor internals; (2) evaluating and implementing the results of the industry programs as applicable to the reactor internals; and (3) upon completion of these programs, but not less than 24 months before entering the period of extended operation, submitting an inspection plan for reactor internals to the NRC for review and approval (See Reactor Coolant System Supplement (B2.1.35)).

3.1.2.2.16 Cracking due to Stress Corrosion Cracking and Primary Water Stress Corrosion Cracking

3.1.2.2.16.1 Steam generator heads, tubesheets, and welds made or clad with stainless steel

These control rod drive mechanism and pressurizer components are stainless steel for WCGS, therefore no additional commitments or further evaluation is required.

3.1.2.2.16.2 Pressurizer spray head cracking

The Water Chemistry program (B2.1.2) and the One-Time Inspection program (B2.1.16) will manage cracking due to stress corrosion cracking and primary water stress corrosion cracking for stainless steel components exposed to reactor coolant. The one-time inspection will include selected components at susceptible locations where contaminants could accumulate (e.g. stagnant flow locations).

WCGS does not have nickel alloy pressurizer spray heads within the scope of license renewal.

3.1.2.2.17 Cracking due to Stress Corrosion Cracking, Primary Water Stress Corrosion Cracking, and Irradiation-Assisted Stress Corrosion Cracking

For managing the aging of cracking due to stress corrosion cracking, primary water stress corrosion cracking, and irradiation-assisted stress corrosion cracking of nickel alloy and stainless steel reactor internals components exposed to reactor coolant, water chemistry will be augmented by (1) participating in the industry programs for investigating and managing aging effects on reactor internals; (2) evaluating and implementing the results of the industry programs as applicable to the reactor internals; and (3) upon completion of these programs, but not less than 24 months before entering the period of extended operation, submitting an inspection plan for reactor internals to the NRC for review and approval (See Reactor Coolant System Supplement (B2.1.35)).

3.1.2.2.18 Quality Assurance for Aging Management of Nonsafety-Related Components

Quality Assurance Program and Administrative Controls are discussed in Section B1.3.

3.1.2.3 Time-Limited Aging Analysis

The Time-Limited Aging Analyses identified below are associated with the Reactor Vessel, Internals, and Reactor Coolant System components. The section of Chapter 4 that contains the TLAA review results is indicated in parenthesis.

- Cumulative Fatigue Damage (Section 4.3, Metal Fatigue Damage)
- Loss of Fracture Toughness due to Neutron Embrittlement (Section 4.2, Reactor Vessel Neutron Embrittlement Analysis)

3.1.3 Conclusions

The Reactor Vessel, Internals and Reactor Coolant System component types that are subject to aging management review 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, 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, 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 Evaluations 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
3.1.1.01	Steel pressure vessel support skirt and attachment welds	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes, TLAA	This is a Westinghouse vessel with no support skirt, so the applicable NUREG-1801 line was not used.
3.1.1.02					Not applicable - BWR only
3.1.1.03					Not applicable - BWR only
3.1.1.04					Not applicable - BWR only
3.1.1.05	Stainless steel and nickel alloy reactor vessel internals components	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes, TLAA	Fatigue of metal components is a TLAA. See further evaluation in subsection 3.1.2.2.1.
3.1.1.06	Nickel Alloy tubes and sleeves in a reactor coolant and secondary feedwater/steam environment	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes, TLAA	Cumulative fatigue damage of steam generator tubes is not a TLAA as defined in 10 CFR 54.3. See further evaluation 3.1.2.2.1

Table 3.1.1 Summary of Aging Management Evaluations 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
3.1.1.07	Steel and stainless steel reactor coolant pressure boundary closure bolting, head closure studs, support skirts and attachment welds, pressurizer relief tank components, steam generator components, piping and components external surfaces and bolting	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes, TLAA	Fatigue of metal components is a TLAA. However the pressurizer relief tank components and all other Class 2, 3, and Quality Group D components (except piping) have no fatigue or cyclic design TLAAs. See further evaluation in subsection 3.1.2.2.1.
3.1.1.08	Steel; stainless steel; and nickel-alloy reactor coolant pressure boundary piping, piping components, piping elements; flanges; nozzles and safe ends; pressurizer vessel shell heads and welds; heater sheaths and sleeves; penetrations; and thermal sleeves	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c) and environmental effects are to be addressed for Class 1 components	Yes, TLAA	Fatigue of metal components is a TLAA. See further evaluation in subsection 3.1.2.2.1.

Table 3.1.1 Summary of Aging Management Evaluations 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
3.1.1.09	Steel; stainless steel; steel with nickel-alloy or stainless steel cladding; nickel-alloy reactor vessel components: flanges; nozzles; penetrations; pressure housings; safe ends; thermal sleeves; vessel shells, heads and welds	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c) and environmental effects are to be addressed for Class 1 components	Yes, TLAA	Fatigue of metal components is a TLAA. See further evaluation in subsection 3.1.2.2.1.
3.1.1.10	Steel; stainless steel; steel with nickel-alloy or stainless steel cladding; nickel-alloy steam generator components (flanges; penetrations; nozzles; safe ends, lower heads and welds)	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c) and environmental effects are to be addressed for Class 1 components	Yes, TLAA	Fatigue of metal components is a TLAA. See further evaluation in subsection 3.1.2.2.1.
3.1.1.11					Not applicable - BWR only
3.1.1.12	Steel steam generator shell assembly exposed to secondary feedwater and steam	Loss of material due to general, pitting and crevice corrosion	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	Yes	Not applicable. WCGS has a recirculating steam generator, not a once-through steam generator, so the applicable NUREG-1801 line was not used.
3.1.1.13					Not applicable - BWR only
3.1.1.14					Not applicable - BWR only
3.1.1.15					Not applicable - BWR only

Table 3.1.1 Summary of Aging Management Evaluations 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
3.1.1.16	Steel steam generator upper and lower shell and transition cone exposed to secondary feedwater and steam	Loss of material due to general, pitting and crevice corrosion	Inservice Inspection (IWB, IWC, and IWD) (B2.1.1), and Water Chemistry (B2.1.2) and, for Westinghouse Model 44 and 51 S/G, if general and pitting corrosion of the shell is known to exist, additional inspection procedures are to be developed.	Yes	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1), Water Chemistry (B2.1.2). See further evaluation in subsection 3.1.2.2.2.4.
3.1.1.17	Steel (with or without stainless steel cladding) reactor vessel beltline shell, nozzles, and welds	Loss of fracture toughness due to neutron irradiation embrittlement	TLAA, 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	Predicted loss of fracture toughness due to neutron irradiation embrittlement is a TLAA. See further evaluation in subsection 3.1.2.2.3.1.
3.1.1.18	Steel (with or without stainless steel cladding) reactor vessel beltline shell, nozzles, and welds; safety injection nozzles	Loss of fracture toughness due to neutron irradiation embrittlement	Reactor Vessel Surveillance (B2.1.15)	Yes	Consistent with NUREG-1801. See further evaluation in subsection 3.1.2.2.3.2.

Table 3.1.1 Summary of Aging Management Evaluations 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
3.1.1.19					Not applicable - BWR only
3.1.1.20					Not applicable - BWR only
3.1.1.21	Reactor vessel shell fabricated of SA508-Cl 2 forgings clad with stainless steel using a high-heat-input welding process	Crack growth due to cyclic loading	TLAA	Yes, TLAA	Crack growth due to cyclic loading is a TLAA. See further evaluation in subsection 3.1.2.2.5.
3.1.1.22	Stainless steel and nickel alloy reactor vessel internals components exposed to reactor coolant and neutron flux	Loss of fracture toughness due to neutron irradiation embrittlement, void swelling	FSAR commitment to (1) participate in industry RVI aging programs (2) implement applicable results (3) submit for NRC approval > 24 months before the extended period an RVI inspection plan based on industry recommendation. (B2.1.35)	No	Consistent with NUREG-1801. See further evaluation in subsection 3.1.2.2.6.

Table 3.1.1 Summary of Aging Management Evaluations 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
3.1.1.23	Stainless steel reactor vessel closure head flange leak detection line and bottom-mounted instrument guide tubes	Cracking due to stress corrosion cracking	A plant-specific aging management program is to be evaluated.	Yes	Consistent with NUREG-1801. The plant-specific aging management program(s) used to manage the aging include: ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD for Class 1 components (B2.1.1) and Water Chemistry (B2.1.2). See further evaluation in subsection 3.1.2.2.7.1.

Table 3.1.1 Summary of Aging Management Evaluations 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
3.1.1.24	Class 1 cast austenitic stainless steel 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	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Water Chemistry (B2.1.2). Water Chemistry (B2.1.2) will be augmented with ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) because the CASS in the reactor coolant system piping at WCGS meets the NUREG-0313 requirements for ferrite content but not for carbon content. See further evaluation in subsection 3.1.2.2.7.2.
3.1.1.25					Not applicable - BWR only
3.1.1.26					Not applicable - BWR only

Table 3.1.1 Summary of Aging Management Evaluations 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
3.1.1.27	Stainless steel and nickel alloy reactor vessel internals screws, bolts, tie rods, and hold-down springs	Loss of preload due to stress relaxation	FSAR supplement commitment to (1) participate in industry RVI aging programs (2) implement applicable results (3) submit for NRC approval > 24 months before the extended period an RVI inspection plan based on industry recommendation. (B2.1.35)	No	Consistent with NUREG-1801. See further evaluation in subsection 3.1.2.2.9.
3.1.1.28	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	Not applicable. WCGS steam generator does not have an impingement plate, so the applicable NUREG-1801 line was not used.
3.1.1.29					Not applicable - BWR only

Table 3.1.1 Summary of Aging Management Evaluations 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
3.1.1.30	Stainless steel reactor vessel internals components (e.g., Upper internals assembly, RCCA guide tube assemblies, Baffle/former assembly, Lower internal assembly, shroud assemblies, Plenum cover and plenum cylinder, Upper grid assembly, Control rod guide tube (CRGT) assembly, Core support shield assembly, Core barrel assembly, Lower grid assembly, Flow distributor assembly, Thermal shield, Instrumentation support structures)	Cracking due to stress corrosion cracking, irradiation-assisted stress corrosion cracking	Water Chemistry (B2.1.2) and FSAR supplement commitment to (1) participate in industry RVI aging programs (2) implement applicable results (3) submit for NRC approval > 24 months before the extended period an RVI inspection plan based on industry recommendation. (B2.1.35).	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Water Chemistry (B2.1.2). See further evaluation in subsection 3.1.2.2.12.

Table 3.1.1 Summary of Aging Management Evaluations 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
3.1.1.31	Nickel alloy and steel with nickel-alloy cladding piping, piping component, piping elements, penetrations, nozzles, safe ends, and welds (other than reactor vessel head); pressurizer heater sheaths, sleeves, diaphragm plate, manways and flanges; core support pads/core guide lugs	Cracking due to primary water stress corrosion cracking	Inservice Inspection (IWB, IWC, and IWD) (B2.1.1) and Water Chemistry (B2.1.2) and for nickel alloy, comply with applicable NRC Orders and provide a commitment in the FSAR supplement to implement applicable (1) Bulletins and Generic Letters and (2) staff-accepted industry guidelines. (B2.1.35).	No	Consistent with NUREG-1801 ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD for Class 1 components (B2.1.1), Water Chemistry (B2.1.2), and Comply with applicable NRC Orders and FSAR Commitment (B2.1.35) are credited and augmented by Nickel Alloy Aging Management (B2.1.34) for nickel components. See further evaluation in subsection 3.1.2.2.13.
3.1.1.32	Steel steam generator feedwater inlet ring and supports	Wall thinning due to flow-accelerated corrosion	A plant-specific aging management program is to be evaluated.	Yes	Consistent with NUREG-1801. The plant-specific aging management program(s) used to manage the aging include: Steam Generator Tube Integrity (B2.1.8) and Water Chemistry (B2.1.2). See further evaluation in subsection 3.1.2.2.14.

Table 3.1.1 Summary of Aging Management Evaluations 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
3.1.1.33	Stainless steel and nickel alloy reactor vessel internals components	Changes in dimensions due to void swelling	FSAR supplement commitment to (1) participate in industry RVI aging programs (2) implement applicable results (3) submit for NRC approval > 24 months before the extended period an RVI inspection plan based on industry recommendation. (B2.1.35).	No	Consistent with NUREG-1801. See further evaluation in subsection 3.1.2.2.15.
3.1.1.34	Stainless steel and nickel alloy reactor control rod drive head penetration pressure housings	Cracking due to stress corrosion cracking and primary water stress corrosion cracking	Inservice Inspection (IWB, IWC, and IWD) (B2.1.1) and Water Chemistry (B2.1.2) and for nickel alloy, comply with applicable NRC Orders and provide a commitment in the FSAR supplement to implement applicable (1) Bulletins and Generic Letters and (2) staff-accepted industry guidelines. (B2.1.35).	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1), Water Chemistry (B2.1.2). See further evaluation in subsection 3.1.2.2.16.1.

Table 3.1.1 Summary of Aging Management Evaluations 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
3.1.1.35	Steel with stainless steel or nickel alloy cladding primary side components; steam generator upper and lower heads, tubesheets and tube-to-tube sheet welds	Cracking due to stress corrosion cracking and primary water stress corrosion cracking	Inservice Inspection (IWB, IWC, and IWD) (B2.1.1) and Water Chemistry (B2.1.2) and for nickel alloy, comply with applicable NRC Orders and provide a commitment in the FSAR supplement to implement applicable (1) Bulletins and Generic Letters and (2) staff-accepted industry guidelines.	No	Not applicable. WCGS has a recirculating steam generator, not a once-through steam generator, so the applicable NUREG-1801 line was not used.
3.1.1.36	Nickel alloy, stainless steel pressurizer spray head	Cracking due to stress corrosion cracking and primary water stress corrosion cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16) and, for nickel alloy welded spray heads, comply with applicable NRC Orders and provide a commitment in the FSAR supplement to implement applicable (1) Bulletins and Generic Letters and (2) staff-accepted industry guidelines. (B2.1.35).	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Water Chemistry (B2.1.2). See further evaluation in subsection 3.1.2.2.16.2.

Table 3.1.1 Summary of Aging Management Evaluations 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
3.1.1.37	Stainless steel and nickel alloy reactor vessel internals components (e.g., Upper internals assembly, RCCA guide tube assemblies, Lower internal assembly, CEA shroud assemblies, Core shroud assembly, Core support shield assembly, Core barrel assembly, Lower grid assembly, Flow distributor assembly)	Cracking due to stress corrosion cracking, primary water stress corrosion cracking, irradiation-assisted stress corrosion cracking	Water Chemistry (B2.1.2) and FSAR supplement commitment to (1) participate in industry RVI aging programs (2) implement applicable results (3) submit for NRC approval > 24 months before the extended period an RVI inspection plan based on industry recommendation. (B2.1.35).	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Water Chemistry (B2.1.2). See further evaluation in subsection 3.1.2.2.17.
3.1.1.38					Not applicable - BWR only
3.1.1.39					Not applicable - BWR only
3.1.1.40					Not applicable - BWR only
3.1.1.41					Not applicable - BWR only
3.1.1.42					Not applicable - BWR only
3.1.1.43					Not applicable - BWR only
3.1.1.44					Not applicable - BWR only
3.1.1.45					Not applicable - BWR only
3.1.1.46					Not applicable - BWR only
3.1.1.47					Not applicable - BWR only
3.1.1.48					Not applicable - BWR only
3.1.1.49					Not applicable - BWR only
3.1.1.50					Not applicable - BWR only
3.1.1.51					Not applicable - BWR only

Table 3.1.1 Summary of Aging Management Evaluations 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
3.1.1.52	Steel and stainless steel reactor coolant pressure boundary (RCPB) pump and valve closure bolting, manway and holding bolting, flange bolting, and closure bolting in high-pressure and high-temperature systems	Cracking due to stress corrosion cracking, loss of material due to wear, loss of preload due to thermal effects, gasket creep, and self-loosening	Bolting Integrity (B2.1.7)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Bolting Integrity (B2.1.7).
3.1.1.53	Steel piping, piping components, and piping elements exposed to closed cycle cooling water	Loss of material due to general, pitting and crevice corrosion	Closed-Cycle Cooling Water System (B2.1.10)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Closed-Cycle Cooling Water System (B2.1.10).
3.1.1.54	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-Cycle Cooling Water System (B2.1.10)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Closed-Cycle Cooling Water System (B2.1.10).

Table 3.1.1 Summary of Aging Management Evaluations 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
3.1.1.55	Cast austenitic stainless steel Class 1 pump casings, and valve bodies and bonnets exposed to reactor coolant >250°C (>482°F)	Loss of fracture toughness due to thermal aging embrittlement	Inservice inspection (IWB, IWC, and IWD) (B2.1.1). Thermal aging susceptibility screening is not necessary, inservice inspection requirements are sufficient for managing these aging effects. ASME Code Case N-481 also provides an alternative for pump casings.	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1).
3.1.1.56	Copper alloy >15% Zn piping, piping components, and piping elements exposed to closed cycle cooling water	Loss of material due to selective leaching	Selective Leaching of Materials (B2.1.17)	No	Not applicable. WCGS has no in scope copper alloy >15% Zn components exposed to closed cycle cooling water in the reactor coolant system, so the applicable NUREG-1801 line was not used.
3.1.1.57	Cast austenitic stainless steel Class 1 piping, piping component, and piping elements and control rod drive pressure housings exposed to reactor coolant >250°C (>482°F)	Loss of fracture toughness due to thermal aging embrittlement	Thermal Aging Embrittlement of CASS	No	Exception to NUREG-1801. Aging effect in NUREG-1801 for this material and environment combination is not applicable because the Mo and ferrite values for these components are below the industry accepted thermal aging embrittlement significance threshold (<0.5% Mo, <20% ferrite).

Table 3.1.1 Summary of Aging Management Evaluations 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
3.1.1.58	Steel reactor coolant pressure boundary external surfaces 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.
3.1.1.59	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 (B2.1.6)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Flow-Accelerated Corrosion (B2.1.6).
3.1.1.60	Stainless steel flux thimble tubes (with or without chrome plating)	Loss of material due to Wear	Flux Thimble Tube Inspection (B2.1.21)	No	Consistent with NUREG-1801.
3.1.1.61	Stainless steel, steel pressurizer integral support exposed to air with metal temperature up to 288°C (550°F)	Cracking due to cyclic loading	Inservice Inspection (IWB, IWC, and IWD) (B2.1.1)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1).

Table 3.1.1 Summary of Aging Management Evaluations 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
3.1.1.62	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	Inservice Inspection (IWB, IWC, and IWD) (B2.1.1)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1).
3.1.1.63	Steel reactor vessel flange, stainless steel and nickel alloy reactor vessel internals exposed to reactor coolant (e.g., upper and lower internals assembly, CEA shroud assembly, core support barrel, upper grid assembly, core support shield assembly, lower grid assembly)	Loss of material due to Wear	Inservice Inspection (IWB, IWC, and IWD) (B2.1.1)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1).

Table 3.1.1 Summary of Aging Management Evaluations 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
3.1.1.64	Stainless steel and steel with stainless steel or nickel alloy cladding pressurizer components	Cracking due to stress corrosion cracking, primary water stress corrosion cracking	Inservice Inspection (IWB, IWC, and IWD) (B2.1.1), and Water Chemistry (B2.1.2)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1), Water Chemistry (B2.1.2).
3.1.1.65	Nickel alloy reactor vessel upper head and control rod drive penetration nozzles, instrument tubes, head vent pipe (top head), and welds	Cracking due to primary water stress corrosion cracking	Inservice Inspection (IWB, IWC, and IWD) (B2.1.1) and Water Chemistry (B2.1.2) and Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactors (B2.1.5)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1), Water Chemistry (B2.1.2).
3.1.1.66	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	Inservice Inspection (IWB, IWC, and IWD) for Class 2 components (B2.1.1)	No	Not applicable. WCGS has a recirculating steam generator, not a once-through steam generator, so the applicable NUREG-1801 line was not used.

Table 3.1.1 Summary of Aging Management Evaluations 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
3.1.1.67	Steel with stainless steel or nickel alloy cladding; or stainless steel pressurizer components exposed to reactor coolant	Cracking due to cyclic loading	Inservice Inspection (IWB, IWC, and IWD) (B2.1.1), and Water Chemistry (B2.1.2)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1), Water Chemistry (B2.1.2).

Table 3.1.1 Summary of Aging Management Evaluations 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
3.1.1.68	Stainless steel, steel with stainless steel cladding Class 1 piping, fittings, pump casings, valve bodies, nozzles, safe ends, manways, flanges, CRD housing; pressurizer heater sheaths, sleeves, diaphragm plate; pressurizer relief tank components, reactor coolant system cold leg, hot leg, surge line, and spray line piping and fittings	Cracking due to stress corrosion cracking	Inservice Inspection (IWB, IWC, and IWD) (B2.1.1), and Water Chemistry (B2.1.2)	No	Consistent with NUREG-1801 with aging management program exceptions for ASME Section XI stainless steel components in reactor coolant. The aging management program(s) with exceptions to NUREG-1801 include: ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1), Water Chemistry (B2.1.2). Consistent with NUREG-1801 except a different aging management program, Water Chemistry (B2.1.2) only, is credited for non-ASME Section XI components associated with the pressurizer relief tank. ASME Section XI Inservice Inspection will not be used to manage aging because the components associated with the pressurizer relief tank are non-ASME components and are not subject to ASME Section XI Inservice Inspection requirements.

Table 3.1.1 Summary of Aging Management Evaluations 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
3.1.1.69	Stainless steel, nickel alloy safety injection nozzles, safe ends, and associated welds and buttering exposed to reactor coolant	Cracking due to stress corrosion cracking, primary water stress corrosion cracking	Inservice Inspection (IWB, IWC, and IWD) (B2.1.1), and Water Chemistry (B2.1.2)	No	Consistent with NUREG-1801 with aging management program exceptions for stainless steel components in reactor coolant. The aging management program(s) with exceptions to NUREG-1801 include: ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1), Water Chemistry (B2.1.2). Consistent with NUREG-1801 except a different aging management program, Nickel Alloy Aging Management (B2.1.34), ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) for Class 1 components, Water Chemistry (B2.1.2), and Comply with applicable NRC Orders and FSAR Commitment (B2.1.35), is credited for nickel alloy components in reactor coolant. The plant-specific Nickel Alloy Aging Management program is also credited for primary water stress corrosion cracking.

Table 3.1.1 Summary of Aging Management Evaluations 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
3.1.1.70	Stainless steel; steel with stainless steel cladding Class 1 piping, fittings and branch connections < NPS 4 exposed to reactor coolant	Cracking due to stress corrosion cracking, thermal and mechanical loading	Inservice Inspection (IWB, IWC, and IWD) (B2.1.1), Water chemistry (B2.1.2), and One-Time Inspection of ASME Code Class 1 Small-bore Piping (B2.1.19)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1), Water Chemistry (B2.1.2), One-Time Inspection Of ASME Code Class 1 Small-Bore Piping (B2.1.19).
3.1.1.71	High-strength low alloy steel closure head stud assembly exposed to air with reactor coolant leakage	Cracking due to stress corrosion cracking; loss of material due to wear	Reactor Head Closure Studs(B2.1.3)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Reactor Head Closure Studs (B2.1.3).
3.1.1.72	Nickel alloy steam generator tubes and sleeves exposed to secondary feedwater/ steam	Cracking due to OD stress corrosion cracking and intergranular attack, loss of material due to fretting and wear	Steam Generator Tube Integrity (B2.1.8) and Water Chemistry (B2.1.2)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Water Chemistry (B2.1.2), Steam Generator Tube Integrity (B2.1.8).

Table 3.1.1 Summary of Aging Management Evaluations 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
3.1.1.73	Nickel alloy steam generator tubes, repair sleeves, and tube plugs exposed to reactor coolant	Cracking due to primary water stress corrosion cracking	Steam Generator Tube Integrity (B2.1.8) and Water Chemistry (B2.1.2)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Water Chemistry (B2.1.2), Steam Generator Tube Integrity (B2.1.8).
3.1.1.74	Chrome plated steel, stainless steel, nickel alloy steam generator anti-vibration bars exposed to secondary feedwater/ steam	Cracking due to stress corrosion cracking, loss of material due to crevice corrosion and fretting	Steam Generator Tube Integrity (B2.1.8) and Water Chemistry (B2.1.2)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Water Chemistry (B2.1.2), Steam Generator Tube Integrity (B2.1.8).
3.1.1.75	Nickel alloy once-through steam generator tubes exposed to secondary feedwater/ steam	Denting due to corrosion of carbon steel tube support plate	Steam Generator Tube Integrity (B2.1.8) and Water Chemistry (B2.1.2)	No	Not applicable. WCGS has a recirculating steam generator, not a once-through steam generator, so the applicable NUREG-1801 line was not used.

Table 3.1.1 Summary of Aging Management Evaluations 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
3.1.1.76	Steel steam generator tube support plate, tube bundle wrapper exposed to secondary feedwater/steam	Loss of material due to erosion, general, pitting, and crevice corrosion, ligament cracking due to corrosion	Steam Generator Tube Integrity (B2.1.8) and Water Chemistry (B2.1.2)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Water Chemistry (B2.1.2), Steam Generator Tube Integrity (B2.1.8).
3.1.1.77	Nickel alloy steam generator tubes and sleeves exposed to phosphate chemistry in secondary feedwater/ steam	Loss of material due to wastage and pitting corrosion	Steam Generator Tube Integrity (B2.1.8) and Water Chemistry (B2.1.2)	No	Not applicable. WCGS does not use phosphate chemistry, so the applicable NUREG-1801 line was not used.
3.1.1.78	Steel steam generator tube support lattice bars exposed to secondary feedwater/ steam	Wall thinning due to flow-accelerated corrosion	Steam Generator Tube Integrity (B2.1.8) and Water Chemistry (B2.1.2)	No	Not applicable. WCGS steam generator does not contain lattice bars, so the applicable NUREG-1801 line was not used.

Table 3.1.1 Summary of Aging Management Evaluations 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
3.1.1.79	Nickel alloy steam generator tubes exposed to secondary feedwater/ steam	Denting due to corrosion of steel tube support plate	Steam Generator Tube Integrity (B2.1.8); Water Chemistry (B2.1.2) and, for plants that could experience denting at the upper support plates, evaluate potential for rapidly propagating cracks and then develop and take corrective actions consistent with Bulletin 88-02.	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Water Chemistry (B2.1.2), Steam Generator Tube Integrity (B2.1.8). WCGS has not experienced operationally induced denting and does not expect to. The use of ferritic stainless steel support plates is expected to prevent denting for the life of the steam generator.
3.1.1.80	Cast austenitic stainless steel reactor vessel internals (e.g., upper internals assembly, lower internal assembly, CEA shroud assemblies, control rod guide tube assembly, core support shield assembly, lower grid assembly)	Loss of fracture toughness due to thermal aging and neutron irradiation embrittlement	Thermal Aging and Neutron Irradiation Embrittlement of CASS	No	Not applicable. WCGS reactor vessel internals are forged stainless steel not cast austenitic stainless steel. WCGS reactor vessel and internals are Westinghouse, not CE or B&W design, so the applicable NUREG-1801 lines were not used.

Table 3.1.1 Summary of Aging Management Evaluations 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
3.1.1.81	Nickel alloy or nickel-alloy clad steam generator divider plate exposed to reactor coolant	Cracking due to primary water stress corrosion cracking	Water Chemistry (B2.1.2)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Water Chemistry (B2.1.2).
3.1.1.82	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. WCGS primary side divider plate is made of nickel alloy, so the applicable NUREG-1801 line was not used.
3.1.1.83	Stainless steel; steel with nickel-alloy or stainless steel cladding; and nickel-alloy reactor vessel internals and 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 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Water Chemistry (B2.1.2).
3.1.1.84	Nickel alloy steam generator components such as, secondary side nozzles (vent, drain, and instrumentation) exposed to secondary feedwater/ steam	Cracking due to stress corrosion cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16) or Inservice Inspection (IWB, IWC, and IWD) (B2.1.1).	No	Not applicable. WCGS has recirculating steam generators, not once-through steam generators, so the applicable NUREG-1801 line was not used.

Table 3.1.1 Summary of Aging Management Evaluations 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
3.1.1.85	Nickel alloy piping, piping components, and piping elements exposed to air – indoor uncontrolled (external)	None	None	NA	Consistent with NUREG-1801.
3.1.1.86	Stainless steel piping, piping components, and piping elements exposed to air – indoor uncontrolled (External); air with borated water leakage; concrete; gas	None	None	NA	Consistent with NUREG-1801.
3.1.1.87	Steel piping, piping components, and piping elements in concrete	None	None	NA	Not applicable. WCGS has no in scope components in concrete in the reactor vessel, internals, and reactor coolant systems, so the applicable NUREG-1801 line was not used.

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 Vol. 2 Item	Table 1 Item	Notes
Closure Bolting	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.A2-4	3.1.1.07	A
RV Closure Head (Refueling seal ledge, lifting lugs, ventilation shroud support ring)	PB, SS	Carbon Steel	Borated Water Leakage (Ext)	Loss of material	Boric Acid Corrosion (B2.1.4)	IV.A2-13	3.1.1.58	A
RV Closure Head (Closure studs, nuts, washers)	PB	High Strength Low Alloy Steel (Bolting)	Borated Water Leakage (Ext)	Cracking	Reactor Head Closure Studs (B2.1.3)	IV.A2-2	3.1.1.71	B
RV Closure Head (Closure studs, nuts, washers)	PB	High Strength Low Alloy Steel (Bolting)	Borated Water Leakage (Ext)	Loss of material	Reactor Head Closure Studs (B2.1.3)	IV.A2-3	3.1.1.71	B
RV Closure Head (Closure studs, nuts, washers)	PB	High Strength Low Alloy Steel (Bolting)	Borated Water Leakage (Ext)	Loss of material	Boric Acid Corrosion (B2.1.4)	IV.A2-13	3.1.1.58	A
RV Closure Head (O-Ring leak monitoring tubes)`	PB	Nickel Alloys	Plant Indoor Air (Ext)	None	None	IV.E-1	3.1.1.85	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 Vol. 2 Item	Table 1 Item	Notes
RV Closure Head (O-Ring leak monitoring tubes)`	PB	Nickel Alloys	Reactor Coolant (Int)	Loss of material	Water Chemistry (B2.1.2)	IV.A2-14	3.1.1.83	B
RV Closure Head (O-Ring leak monitoring tubes)`	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 XI.M11-A, Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactors (B2.1.5)	IV.A2-18	3.1.1.65	D
RV Control Rod Drive Head Penetration (CRDM tubes)	PB	Nickel Alloys	Plant Indoor Air (Ext)	None	None	IV.E-1	3.1.1.85	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 Vol. 2 Item	Table 1 Item	Notes
RV Control Rod Drive Head Penetration (CRDM tubes)	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 XI.M11-A, Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactors (B2.1.5)	IV.A2-9	3.1.1.65	B
RV Control Rod Drive Head Penetration (CRDM tubes)	PB	Nickel Alloys	Reactor Coolant (Int)	Loss of material	Water Chemistry (B2.1.2)	IV.A2-14	3.1.1.83	B
RV Control Rod Drive Head Penetration (CRDM tubes)	PB	Nickel Alloys	Reactor Coolant (Int)	Cumulative fatigue damage	Time Limited Aging Analysis evaluated for the period of extended operation.	IV.A2-21	3.1.1.09	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 Vol. 2 Item	Table 1 Item	Notes
RV Control Rod Drive Head Penetration (CRDM flange, CRDM cap, CRDM latch housing, CRDM rod travel housing)	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	IV.E-2	3.1.1.86	A
RV Control Rod Drive Head Penetration (CRDM flange, CRDM cap, CRDM latch housing, CRDM rod travel housing)	PB	Stainless Steel	Reactor Coolant (Int)	Cracking	Water Chemistry (B2.1.2) and ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.A2-11	3.1.1.34	B
RV Control Rod Drive Head Penetration (CRDM flange, CRDM cap, CRDM latch housing, CRDM rod travel housing)	PB	Stainless Steel	Reactor Coolant (Int)	Loss of material	Water Chemistry (B2.1.2)	IV.A2-14	3.1.1.83	B

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 Vol. 2 Item	Table 1 Item	Notes
RV Control Rod Drive Head Penetration (CRDM flange, CRDM cap, CRDM latch housing, CRDM rod travel housing)	PB	Stainless Steel	Reactor Coolant (Int)	Cumulative fatigue damage	Time Limited Aging Analysis evaluated for the period of extended operation.	IV.A2-21	3.1.1.09	A
RV Core Support Pads (Core support pads)	SS	Nickel Alloys	Reactor Coolant (Ext)	Cracking	Nickel Alloy Aging Management (B2.1.34), ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) for Class 1 components, Water Chemistry (B2.1.2), and Comply with applicable NRC Orders and FSAR Commitment. (B2.1.35)	IV.A2-12	3.1.1.31	E, 1
RV Core Support Pads (Core support pads)	SS	Nickel Alloys	Reactor Coolant (Ext)	Loss of material	Water Chemistry (B2.1.2)	IV.A2-14	3.1.1.83	D

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 Vol. 2 Item	Table 1 Item	Notes
RV Nozzle Safe Ends and Welds (Inlet nozzle safe end welds, outlet nozzle safe end welds)	PB	Nickel Alloys	Plant Indoor Air (Ext)	None	None	IV.E-1	3.1.1.85	A
RV Nozzle Safe Ends and Welds (Inlet nozzle safe end welds, outlet nozzle safe end welds)	PB	Nickel Alloys	Reactor Coolant (Int)	Loss of material	Water Chemistry (B2.1.2)	IV.A2-14	3.1.1.83	B
RV Nozzle Safe Ends and Welds (Inlet nozzle safe end welds, outlet nozzle safe end welds)	PB	Nickel Alloys	Reactor Coolant (Int)	Cracking	Nickel Alloy Aging Management (B2.1.34), ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) for Class 1 components, Water Chemistry (B2.1.2), and Comply with applicable NRC Orders and FSAR Commitment (B2.1.35)	IV.A2-15	3.1.1.69	E, 1

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 Vol. 2 Item	Table 1 Item	Notes
RV Nozzle Safe Ends and Welds (Inlet nozzle safe end welds, outlet nozzle safe end welds)	PB	Nickel Alloys	Reactor Coolant (Int)	Cumulative fatigue damage	Time Limited Aging Analysis evaluated for the period of extended operation.	IV.A2-21	3.1.1.09	A
RV Nozzle Safe Ends and Welds (Inlet nozzle safe ends, outlet nozzle safe ends)	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	IV.E-2	3.1.1.86	A
RV Nozzle Safe Ends and Welds (Inlet nozzle safe ends, outlet nozzle safe ends)	PB	Stainless Steel	Reactor Coolant (Int)	Loss of material	Water Chemistry (B2.1.2)	IV.A2-14	3.1.1.83	B
RV Nozzle Safe Ends and Welds (Inlet nozzle safe ends, outlet nozzle safe ends)	PB	Stainless Steel	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD for Class 1 components (B2.1.1) and Water Chemistry (B2.1.2)	IV.A2-15	3.1.1.69	B

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 Vol. 2 Item	Table 1 Item	Notes
RV Nozzle Safe Ends and Welds (Inlet nozzle safe ends, outlet nozzle safe ends)	PB	Stainless Steel	Reactor Coolant (Int)	Cumulative fatigue damage	Time Limited Aging Analysis evaluated for the period of extended operation.	IV.A2-21	3.1.1.09	A
RV Nozzles (Inlet nozzles, outlet nozzles)	PB	Carbon Steel with Stainless Steel Cladding	Borated Water Leakage (Ext)	Loss of material	Boric Acid Corrosion (B2.1.4)	IV.A2-13	3.1.1.58	A
RV Nozzles (Inlet nozzles, outlet nozzles)	PB	Carbon Steel with Stainless Steel Cladding	Reactor Coolant (Both)	Crack growth	Time Limited Aging Analysis evaluated for the period of extended operation.	IV.A2-22	3.1.1.21	I, 2
RV Nozzles (Inlet nozzles, outlet nozzles)	PB	Carbon Steel with Stainless Steel Cladding	Reactor Coolant (Int)	Loss of material	Water Chemistry (B2.1.2)	IV.A2-14	3.1.1.83	B
RV Nozzles (Inlet nozzles, 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.A2-16	3.1.1.17	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 Vol. 2 Item	Table 1 Item	Notes
RV Nozzles (Inlet nozzles, outlet nozzles)	PB	Carbon Steel with Stainless Steel Cladding	Reactor Coolant (Int)	Loss of fracture toughness	Reactor Vessel Surveillance (B2.1.15)	IV.A2-17	3.1.1.18	A
RV Nozzles (Inlet nozzles, 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.A2-21	3.1.1.09	A
RV Penetrations (Head vent pipe, flux thimble guide tubes penetration)	PB	Nickel Alloys	Plant Indoor Air (Ext)	None	None	IV.E-1	3.1.1.85	A
RV Penetrations (Head vent pipe, flux thimble guide tubes penetration)	PB	Nickel Alloys	Reactor Coolant (Int)	Loss of material	Water Chemistry (B2.1.2)	IV.A2-14	3.1.1.83	B

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 Vol. 2 Item	Table 1 Item	Notes
RV Penetrations (Head vent pipe)	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 XI.M11-A, Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactors (B2.1.5)	IV.A2-18	3.1.1.65	B
RV Penetrations (Flux thimble guide tubes penetration)	PB	Nickel Alloys	Reactor Coolant (Int)	Cracking	Nickel Alloy Aging Management (B2.1.34), ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) for Class 1 components, Water Chemistry (B2.1.2), and Comply with applicable NRC Orders and FSAR Commitment (B2.1.35)	IV.A2-19	3.1.1.31	E, 1

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 Vol. 2 Item	Table 1 Item	Notes
RV Penetrations (Head vent pipe, flux thimble guide tubes penetration)	PB	Nickel Alloys	Reactor Coolant (Int)	Cumulative fatigue damage	Time Limited Aging Analysis evaluated for the period of extended operation.	IV.A2-21	3.1.1.09	A
RV Penetrations (Instrument tubes (top head), high pressure conduits)	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	IV.E-2	3.1.1.86	A
RV Penetrations (Instrument tubes (top head), high pressure conduits)	PB	Stainless Steel	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD for Class 1 components (B2.1.1) and Water Chemistry (B2.1.2)	IV.A2-1	3.1.1.23	E
RV Penetrations (Instrument tubes (top head), high pressure conduits)	PB	Stainless Steel	Reactor Coolant (Int)	Loss of material	Water Chemistry (B2.1.2)	IV.A2-14	3.1.1.83	B
RV Penetrations (Instrument tubes (top head), high pressure conduits)	PB	Stainless Steel	Reactor Coolant (Int)	Cumulative fatigue damage	Time Limited Aging Analysis evaluated for the period of extended operation.	IV.A2-21	3.1.1.09	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 Vol. 2 Item	Table 1 Item	Notes
RV Shell (Bottom head dome, vessel shell – upper, vessel shell – intermediate, vessel shell – lower, vessel flange)	PB	Carbon Steel with Stainless Steel Cladding	Borated Water Leakage (Ext)	Loss of material	Boric Acid Corrosion (B2.1.4)	IV.A2-13	3.1.1.58	A
RV Shell (Bottom head dome, vessel shell – upper, vessel shell – intermediate, vessel shell – lower, vessel flange)	PB	Carbon Steel with Stainless Steel Cladding	Reactor Coolant (Both)	Crack growth	Time Limited Aging Analysis evaluated for the period of extended operation.	IV.A2-22	3.1.1.21	I, 2
RV Shell (Bottom head dome, vessel shell – upper, vessel shell – intermediate, vessel shell – lower, vessel flange)	PB	Carbon Steel with Stainless Steel Cladding	Reactor Coolant (Int)	Loss of material	Water Chemistry (B2.1.2)	IV.A2-14	3.1.1.83	B

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 Vol. 2 Item	Table 1 Item	Notes
RV Shell (Bottom head dome, vessel shell – upper, vessel shell – intermediate, vessel shell – lower, vessel flange)	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.A2-21	3.1.1.09	A
RV Shell (Bottom head dome, vessel shell – upper, vessel shell – intermediate, vessel shell – lower, vessel flange)	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.A2-23	3.1.1.17	A
RV Shell (Bottom head dome, vessel shell – upper, vessel shell – intermediate, vessel shell – lower, vessel flange)	PB	Carbon Steel with Stainless Steel Cladding	Reactor Coolant (Int)	Loss of fracture toughness	Reactor Vessel Surveillance (B2.1.15)	IV.A2-24	3.1.1.18	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 Vol. 2 Item	Table 1 Item	Notes
RV Shell (Bottom head dome, vessel shell – upper, vessel shell – intermediate, vessel shell – lower, 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)	IV.A2-25	3.1.1.63	B
RV Shell Head (Closure head dome, closure head flange)	PB	Carbon Steel with Stainless Steel Cladding	Borated Water Leakage (Ext)	Loss of material	Boric Acid Corrosion (B2.1.4)	IV.A2-13	3.1.1.58	A
RV Shell Head (Closure head dome, closure head flange)	PB	Carbon Steel with Stainless Steel Cladding	Reactor Coolant (Both)	Crack growth	Time Limited Aging Analysis evaluated for the period of extended operation.	IV.A2-22	3.1.1.21	I, 2
RV Shell Head (Closure head dome, closure head flange)	PB	Carbon Steel with Stainless Steel Cladding	Reactor Coolant (Int)	Loss of material	Water Chemistry (B2.1.2)	IV.A2-14	3.1.1.83	B
RV Shell Head (Closure head dome, closure head flange)	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.A2-21	3.1.1.09	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 Vol. 2 Item	Table 1 Item	Notes
RV Shell Head (Closure head dome, closure head flange)	PB	Carbon Steel with Stainless Steel Cladding	Reactor Coolant (Int)	Loss of fracture toughness	Reactor Vessel Surveillance (B2.1.15)	IV.A2-24	3.1.1.18	C
RV Shell Head (Closure head dome, closure head 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)	IV.A2-25	3.1.1.63	B
RVI Baffle/Former Assembly (Baffle plates, former plates)	DF, SLD, SS	Stainless Steel	Reactor Coolant (Ext)	Changes in dimensions	FSAR Commitment (B2.1.35)	IV.B2-1	3.1.1.33	A
RVI Baffle/Former Assembly (Baffle plates, former plates)	DF, SLD, SS	Stainless Steel	Reactor Coolant (Ext)	Cracking	Water Chemistry (B2.1.2) and FSAR Commitment (B2.1.35)	IV.B2-2	3.1.1.30	B
RVI Baffle/Former Assembly (Baffle plates, former plates)	DF, SLD, SS	Stainless Steel	Reactor Coolant (Ext)	Loss of fracture toughness	FSAR Commitment (B2.1.35)	IV.B2-3	3.1.1.22	A
RVI Baffle/Former Assembly (Baffle/former bolts)	SS	Stainless Steel	Reactor Coolant (Ext)	Changes in dimensions	FSAR Commitment (B2.1.35)	IV.B2-4	3.1.1.33	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 Vol. 2 Item	Table 1 Item	Notes
RVI Baffle/Former Assembly (Baffle/former bolts)	SS	Stainless Steel	Reactor Coolant (Ext)	Loss of preload	FSAR Commitment (B2.1.35)	IV.B2-5	3.1.1.27	A
RVI Baffle/Former Assembly (Baffle/former bolts)	SS	Stainless Steel	Reactor Coolant (Ext)	Loss of fracture toughness	FSAR Commitment (B2.1.35)	IV.B2-6	3.1.1.22	A
RVI Baffle/Former Assembly (Baffle/former bolts)	SS	Stainless Steel	Reactor Coolant (Ext)	Cracking	Water Chemistry (B2.1.2) and FSAR Commitment (B2.1.35)	IV.B2-10	3.1.1.30	B
RVI Baffle/Former Assembly (Baffle plates, former plates)	DF, SLD, SS	Stainless Steel	Reactor Coolant (Ext)	Loss of material	Water Chemistry (B2.1.2)	IV.B2-32	3.1.1.83	B
RVI Control Rod Guide Tube Assembly (Control rod guide tube bolts, control rod guide tube support pins)	SS	Stainless Steel	Reactor Coolant (Ext)	Changes in dimensions	FSAR Commitment (B2.1.35)	IV.B2-27	3.1.1.33	A
RVI Control Rod Guide Tube Assembly (Control rod guide tube bolts, control rod guide tube support pins)	SS	Stainless Steel	Reactor Coolant (Ext)	Cracking	Water Chemistry (B2.1.2) and FSAR Commitment (B2.1.35)	IV.B2-28	3.1.1.37	B

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 Vol. 2 Item	Table 1 Item	Notes
RVI Control Rod Guide Tube Assembly (Control rod guide tubes)	SS	Stainless Steel	Reactor Coolant (Ext)	Changes in dimensions	FSAR Commitment (B2.1.35)	IV.B2-29	3.1.1.33	A
RVI Control Rod Guide Tube Assembly (Control rod guide tubes)	SS	Stainless Steel	Reactor Coolant (Ext)	Cracking	Water Chemistry (B2.1.2) and FSAR Commitment (B2.1.35)	IV.B2-30	3.1.1.30	B
RVI Control Rod Guide Tube Assembly (Control rod guide tube bolts, control rod guide tube support pins, control rod guide tubes)	SS	Stainless Steel	Reactor Coolant (Ext)	Loss of material	Water Chemistry (B2.1.2)	IV.B2-32	3.1.1.83	B
RVI Core Barrel Assembly (Core barrel, core barrel flange, core barrel outlet nozzles, neutron panel)	DF, SLD, SS	Stainless Steel	Reactor Coolant (Ext)	Changes in dimensions	FSAR Commitment (B2.1.35)	IV.B2-7	3.1.1.33	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 Vol. 2 Item	Table 1 Item	Notes
RVI Core Barrel Assembly (Core barrel, core barrel flange, core barrel outlet nozzles, neutron panel)	DF, SLD, SS	Stainless Steel	Reactor Coolant (Ext)	Cracking	Water Chemistry (B2.1.2) and FSAR Commitment (B2.1.35)	IV.B2-8	3.1.1.30	B
RVI Core Barrel Assembly (Core barrel, core barrel flange, core barrel outlet nozzles, neutron panel)	DF, SLD, SS	Stainless Steel	Reactor Coolant (Ext)	Loss of fracture toughness	FSAR Commitment (B2.1.35)	IV.B2-9	3.1.1.22	A
RVI Core Barrel Assembly (Core barrel, core barrel flange, core barrel outlet nozzles, neutron panel)	DF, SLD, SS	Stainless Steel	Reactor Coolant (Ext)	Loss of material	Water Chemistry (B2.1.2)	IV.B2-32	3.1.1.83	B
RVI Instrumentation Support Structures (Flux thimble tubes)	PB	Stainless Steel	Borated Water Leakage (Int)	None	None	IV.E-3	3.1.1.86	A
RVI Instrumentation Support Structures (Seal fittings, seal table)	PB, SS	Stainless Steel	Plant Indoor Air (Ext)	None	None	IV.E-2	3.1.1.86	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 Vol. 2 Item	Table 1 Item	Notes
RVI Instrumentation Support Structures (Flux thimble guide tubes, upper instrumentation columns)	PB, SS	Stainless Steel	Reactor Coolant (Ext)	Changes in dimensions	FSAR Commitment (B2.1.35)	IV.B2-11	3.1.1.33	A
RVI Instrumentation Support Structures (Flux thimble guide tubes, upper instrumentation columns)	PB, SS	Stainless Steel	Reactor Coolant (Ext)	Cracking	Water Chemistry (B2.1.2) and FSAR Commitment (B2.1.35)	IV.B2-12	3.1.1.30	B
RVI Instrumentation Support Structures (Flux thimble tubes)	PB	Stainless Steel	Reactor Coolant (Ext)	Loss of material	Flux Thimble Tube Inspection (B2.1.21)	IV.B2-13	3.1.1.60	A
RVI Instrumentation Support Structures (Flux thimble guide tubes, upper instrumentation columns)	PB, SS	Stainless Steel	Reactor Coolant (Ext)	Loss of material	Water Chemistry (B2.1.2)	IV.B2-32	3.1.1.83	B
RVI Instrumentation Support Structures (Seal fittings)	PB	Stainless Steel	Reactor Coolant (Int)	Loss of material	Water Chemistry (B2.1.2)	IV.B2-32	3.1.1.83	D

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 Vol. 2 Item	Table 1 Item	Notes
RVI Internals (TLAA)	DF, PB, SLD, SS	Stainless Steel	Reactor Coolant (Ext)	Cumulative fatigue damage	Time Limited Aging Analysis evaluated for the period of extended operation.	IV.B2-31	3.1.1.05	A
RVI Lower Internals Assembly (Clevis insert bolts, radial keys, clevis inserts)	SS	Nickel Alloys	Reactor Coolant (Ext)	Loss of preload	FSAR Commitment (B2.1.35)	IV.B2-14	3.1.1.27	A
RVI Lower Internals Assembly (Clevis insert bolts, radial keys, clevis inserts)	SS	Nickel Alloys	Reactor Coolant (Ext)	Changes in dimensions	FSAR Commitment (B2.1.35)	IV.B2-15	3.1.1.33	A
RVI Lower Internals Assembly (Clevis insert bolts, radial keys, clevis inserts)	SS	Nickel Alloys	Reactor Coolant (Ext)	Cracking	Water Chemistry (B2.1.2) and FSAR Commitment (B2.1.35)	IV.B2-16	3.1.1.37	B
RVI Lower Internals Assembly (Clevis insert bolts, radial keys, clevis inserts)	SS	Nickel Alloys	Reactor Coolant (Ext)	Loss of fracture toughness	FSAR Commitment (B2.1.35)	IV.B2-17	3.1.1.22	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 Vol. 2 Item	Table 1 Item	Notes
RVI Lower Internals Assembly (Clevis insert bolts, radial keys, clevis inserts)	SS	Nickel Alloys	Reactor Coolant (Ext)	Cumulative fatigue damage	Time Limited Aging Analysis evaluated for the period of extended operation.	IV.B2-31	3.1.1.05	A
RVI Lower Internals Assembly (Clevis insert bolts, radial keys, clevis inserts)	SS	Nickel Alloys	Reactor Coolant (Ext)	Loss of material	Water Chemistry (B2.1.2)	IV.B2-32	3.1.1.83	B
RVI Lower Internals Assembly (Fuel alignment pins, lower support forging, lower support columns, lower support column bolts, secondary core support, energy absorbers, lower tie plate, upper tie plate, manway cover, support ring)	SS	Stainless Steel	Reactor Coolant (Ext)	Changes in dimensions	FSAR Commitment (B2.1.35)	IV.B2-15	3.1.1.33	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 Vol. 2 Item	Table 1 Item	Notes
RVI Lower Internals Assembly (Fuel alignment pins, lower support forging, lower support columns, lower support column bolts, secondary core support, energy absorbers, lower tie plate, upper tie plate, manway cover, support ring)	SS	Stainless Steel	Reactor Coolant (Ext)	Cracking	Water Chemistry (B2.1.2) and FSAR Commitment (B2.1.35)	IV.B2-16	3.1.1.37	B

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 Vol. 2 Item	Table 1 Item	Notes
RVI Lower Internals Assembly (Fuel alignment pins, lower support forging, lower support columns, lower support column bolts, secondary core support, energy absorbers, lower tie plate, upper tie plate, manway cover, support ring)	SS	Stainless Steel	Reactor Coolant (Ext)	Loss of fracture toughness	FSAR Commitment (B2.1.35)	IV.B2-17	3.1.1.22	A
RVI Lower Internals Assembly (Lower core plate)	DF, SS	Stainless Steel	Reactor Coolant (Ext)	Loss of fracture toughness	FSAR Commitment (B2.1.35)	IV.B2-18	3.1.1.22	A
RVI Lower Internals Assembly (Lower core plate)	DF, SS	Stainless Steel	Reactor Coolant (Ext)	Changes in dimensions	FSAR Commitment (B2.1.35)	IV.B2-19	3.1.1.33	A
RVI Lower Internals Assembly (Lower core plate)	DF, SS	Stainless Steel	Reactor Coolant (Ext)	Cracking	Water Chemistry (B2.1.2) and FSAR Commitment (B2.1.35)	IV.B2-20	3.1.1.37	B

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 Vol. 2 Item	Table 1 Item	Notes
RVI Lower Internals Assembly (Fuel alignment pins, lower support forging, lower support columns, lower support column bolts, secondary core support, energy absorbers, lower tie plate, upper tie plate, manway cover, support ring)	SS	Stainless Steel	Reactor Coolant (Ext)	Loss of fracture toughness	FSAR Commitment (B2.1.35)	IV.B2-22	3.1.1.22	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 Vol. 2 Item	Table 1 Item	Notes
RVI Lower Internals Assembly (Fuel alignment pins, lower support forging, lower support columns, lower support column bolts, secondary core support, energy absorbers, lower tie plate, upper tie plate, manway cover, support ring)	SS	Stainless Steel	Reactor Coolant (Ext)	Changes in dimensions	FSAR Commitment (B2.1.35)	IV.B2-23	3.1.1.33	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 Vol. 2 Item	Table 1 Item	Notes
RVI Lower Internals Assembly (Fuel alignment pins, lower support forging, lower support columns, lower support column bolts, secondary core support, energy absorbers, lower tie plate, upper tie plate, manway cover, support ring)	SS	Stainless Steel	Reactor Coolant (Ext)	Cracking	Water Chemistry (B2.1.2) and FSAR Commitment (B2.1.35)	IV.B2-24	3.1.1.30	B

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 Vol. 2 Item	Table 1 Item	Notes
RVI Lower Internals Assembly (Fuel alignment pins, lower support forging, lower support columns, lower support column bolts, secondary core support, energy absorbers, lower tie plate, upper tie plate, manway cover, support ring)	SS	Stainless Steel	Reactor Coolant (Ext)	Loss of preload	FSAR Commitment (B2.1.35)	IV.B2-25	3.1.1.27	A
RVI Lower Internals Assembly (Lower core plate)	DF, SS	Stainless Steel	Reactor Coolant (Ext)	Loss of material	Water Chemistry (B2.1.2)	IV.B2-32	3.1.1.83	B
RVI Upper Internals Assembly (Head cooling spray nozzles)	DF	Stainless Steel	Reactor Coolant (Ext)	Loss of material	Water Chemistry (B2.1.2)	IV.B2-32	3.1.1.83	B
RVI Upper Internals Assembly (Upper support columns)	SS	Stainless Steel	Reactor Coolant (Ext)	Loss of preload	FSAR Commitment (B2.1.35)	IV.B2-33	3.1.1.27	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 Vol. 2 Item	Table 1 Item	Notes
RVI Upper Internals Assembly (Upper support columns)	SS	Stainless Steel	Reactor Coolant (Ext)	Loss of material	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.B2-34	3.1.1.63	B
RVI Upper Internals Assembly (Upper support columns)	SS	Stainless Steel	Reactor Coolant (Ext)	Changes in dimensions	FSAR Commitment (B2.1.35)	IV.B2-35	3.1.1.33	A
RVI Upper Internals Assembly (Head cooling spray nozzles)	DF	Stainless Steel	Reactor Coolant (Ext)	Cracking	Water Chemistry (B2.1.2) and FSAR Commitment (B2.1.35)	IV.B2-36	3.1.1.30	D
RVI Upper Internals Assembly (Upper support columns)	SS	Stainless Steel	Reactor Coolant (Ext)	Cracking	Water Chemistry (B2.1.2) and FSAR Commitment (B2.1.35)	IV.B2-36	3.1.1.30	B
RVI Upper Internals Assembly (Upper support column bolts)	SS	Stainless Steel	Reactor Coolant (Ext)	Loss of preload	FSAR Commitment (B2.1.35)	IV.B2-38	3.1.1.27	A
RVI Upper Internals Assembly (Upper support column bolts, upper core plate alignment pins, head/vessel alignment pins)	SS	Stainless Steel	Reactor Coolant (Ext)	Changes in dimensions	FSAR Commitment (B2.1.35)	IV.B2-39	3.1.1.33	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 Vol. 2 Item	Table 1 Item	Notes
RVI Upper Internals Assembly (Upper support column bolts, upper core plate alignment pins, head/vessel alignment pins)	SS	Stainless Steel	Reactor Coolant (Ext)	Cracking	Water Chemistry (B2.1.2) and FSAR Commitment (B2.1.35)	IV.B2-40	3.1.1.37	B
RVI Upper Internals Assembly (Upper support plate, upper core plate, holddown spring)	SS	Stainless Steel	Reactor Coolant (Ext)	Changes in dimensions	FSAR Commitment (B2.1.35)	IV.B2-41	3.1.1.33	A
RVI Upper Internals Assembly (Upper support plate, upper core plate, holddown spring)	SS	Stainless Steel	Reactor Coolant (Ext)	Cracking	Water Chemistry (B2.1.2) and FSAR Commitment (B2.1.35)	IV.B2-42	3.1.1.30	B
RVI Upper Internals Assembly (Head cooling spray nozzles)	DF	Stainless Steel	Reactor Coolant (Int)	Loss of material	Water Chemistry (B2.1.2)	IV.B2-32	3.1.1.83	B
RVI Upper Internals Assembly (Head cooling spray nozzles)	DF	Stainless Steel	Reactor Coolant (Int)	Cracking	Water Chemistry (B2.1.2) and FSAR Commitment (B2.1.35)	IV.B2-36	3.1.1.30	D

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.

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 Note E was used to include the plant specific Nickel Alloy Aging Management Program (B2.1.34).

2 Analysis of underclad crack growth is not a TLAA for WCGS as defined in 10 CFR 54.3. See further evaluation 3.1.2.2.5.

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 Vol. 2 Item	Table 1 Item	Notes
Class 1 Piping <= 4in	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	IV.E-2	3.1.1.86	A
Class 1 Piping <= 4in	PB	Stainless Steel	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD for Class 1 components (B2.1.1) and Water Chemistry (B2.1.2) and One-Time Inspection Of ASME Code Class 1 Small-Bore Piping (B2.1.19)	IV.C2-1	3.1.1.70	B
Class 1 Piping <= 4in	PB	Stainless Steel	Reactor Coolant (Int)	Loss of material	Water Chemistry (B2.1.2)	IV.C2-15	3.1.1.83	B
Class 1 Piping <= 4in	PB	Stainless Steel	Reactor Coolant (Int)	Cumulative fatigue damage	Time Limited Aging Analysis evaluated for the period of extended operation.	IV.C2-25	3.1.1.08	A
Closure Bolting	PB	Carbon Steel	Borated Water Leakage (Ext)	Loss of preload	Bolting Integrity (B2.1.7)	IV.C2-8	3.1.1.52	B
Closure Bolting	PB	Carbon Steel	Borated Water Leakage (Ext)	Loss of material	Boric Acid Corrosion (B2.1.4)	IV.C2-09	3.1.1.58	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 Vol. 2 Item	Table 1 Item	Notes
Closure Bolting	PB	Carbon Steel	Borated Water Leakage (Ext)	Cumulative fatigue damage	Time Limited Aging Analysis evaluated for the period of extended operation.	IV.C2-10	3.1.1.07	A
Closure Bolting	PB	Nickel Alloys	Borated Water Leakage (Ext)	Cumulative fatigue damage	Time Limited Aging Analysis evaluated for the period of extended operation.	IV.C2-10	3.1.1.07	F
Closure Bolting	PB	Nickel Alloys	Borated Water Leakage (Ext)	Loss of preload	Bolting Integrity (B2.1.7)	None	None	F, 6
Closure Bolting	PB	Stainless Steel	Borated Water Leakage (Ext)	Cracking	Bolting Integrity (B2.1.7)	IV.C2-7	3.1.1.52	B
Closure Bolting	PB	Stainless Steel	Borated Water Leakage (Ext)	Loss of preload	Bolting Integrity (B2.1.7)	IV.C2-8	3.1.1.52	B
Closure Bolting	PB	Stainless Steel	Borated Water Leakage (Ext)	Cumulative fatigue damage	Time Limited Aging Analysis evaluated for the period of extended operation.	IV.C2-10	3.1.1.07	A
Flow Element	PB	Stainless Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.C2-10	3.3.1.50	B
Flow Element	LBS, PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	IV.E-2	3.1.1.86	A
Flow Element	LBS	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2)	IV.C2-22	3.1.1.68	E, 1

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 Vol. 2 Item	Table 1 Item	Notes
Flow Element	LBS	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2)	V.D1-30	3.2.1.49	B
Heat Exchanger Shell Side (HX # 1)	PB	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	IV.C2-14	3.1.1.53	D
Heat Exchanger Shell Side (HX # 1)	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	A
Heat Exchanger Tube Side (HX # 2, 5)	PB	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	IV.C2-14	3.1.1.53	D
Heat Exchanger Tube Side (HX # 2, 5)	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	A
Heat Exchanger Tube Side (HX # 3, 4, 6, 7, 8)	PB	Copper-Nickel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	IV.C2-11	3.1.1.54	D

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 Vol. 2 Item	Table 1 Item	Notes
Heat Exchanger Tube Side (HX # 3, 4, 6, 7)	PB	Copper-Nickel	Lubricating Oil (Ext)	Loss of material	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	VII.C2-5	3.3.1.26	D
Heat Exchanger Tube Side (HX # 8)	PB	Copper-Nickel	Plant Indoor Air (Ext)	None	None	V.F-3	3.2.1.53	C
Heat Exchanger Tube Side (HX # 9)	PB	Stainless Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.C2-10	3.3.1.50	D
Heat Exchanger Tube Side (HX # 9)	PB	Stainless Steel	Reactor Coolant (Ext)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD for Class 1 components (B2.1.1) and Water Chemistry (B2.1.2)	IV.C2-2	3.1.1.68	D
Heat Exchanger Tube Side (HX # 9)	PB	Stainless Steel	Reactor Coolant (Ext)	Loss of material	Water Chemistry (B2.1.2)	IV.C2-15	3.1.1.83	D
Instrument Bellows	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	IV.E-2	3.1.1.86	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 Vol. 2 Item	Table 1 Item	Notes
Instrument Bellows	PB	Stainless Steel	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD for Class 1 components (B2.1.1) and Water Chemistry (B2.1.2)	IV.C2-2	3.1.1.68	D
Instrument Bellows	PB	Stainless Steel	Reactor Coolant (Int)	Loss of material	Water Chemistry (B2.1.2)	IV.C2-15	3.1.1.83	B
Instrument Bellows	PB	Stainless Steel	Treated Borated Water (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD for Class 1 components (B2.1.1) and Water Chemistry (B2.1.2)	IV.C2-22	3.1.1.68	D
Instrument Bellows	PB	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2)	V.D1-30	3.2.1.49	B
Piping	PB, SIA	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	IV.C2-14	3.1.1.53	B
Piping	PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	A
Piping	LBS	Stainless Steel	Demineralized Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	None	None	G, 5

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 Vol. 2 Item	Table 1 Item	Notes
Piping	PB, SIA	Stainless Steel	Dry Gas (Int)	None	None	IV.E-5	3.1.1.86	A
Piping	LBS, PB, SIA	Stainless Steel	Plant Indoor Air (Ext)	None	None	IV.E-2	3.1.1.86	A
Piping	PB	Stainless Steel	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD for Class 1 components (B2.1.1) and Water Chemistry (B2.1.2)	IV.C2-2	3.1.1.68	D
Piping	PB, SIA	Stainless Steel	Reactor Coolant (Int)	Loss of material	Water Chemistry (B2.1.2)	IV.C2-15	3.1.1.83	B
Piping	SIA	Stainless Steel	Reactor Coolant (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	IV.C2-17	3.1.1.36	D
Piping	PB, SIA	Stainless Steel	Reactor Coolant (Int)	Cumulative fatigue damage	Time Limited Aging Analysis evaluated for the period of extended operation.	IV.C2-25	3.1.1.08	A
Piping	PB	Stainless Steel	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.C2-26	3.1.1.62	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 Vol. 2 Item	Table 1 Item	Notes
Piping	PB	Stainless Steel	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD for Class 1 components (B2.1.1) and Water Chemistry (B2.1.2)	IV.C2-27	3.1.1.68	B
Piping	PB	Stainless Steel	Treated Borated Water (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD for Class 1 components (B2.1.1) and Water Chemistry (B2.1.2)	IV.C2-22	3.1.1.68	D
Piping	SIA	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2)	IV.C2-22	3.1.1.68	E, 1
Piping	LBS	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2)	IV.C2-22	3.1.1.68	E, 1
Piping	LBS, PB, SIA	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2)	V.D1-30	3.2.1.49	B
Piping	PB	Stainless Steel Cast Austenitic	Plant Indoor Air (Ext)	None	None	IV.E-2	3.1.1.86	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 Vol. 2 Item	Table 1 Item	Notes
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.C2-3	3.1.1.24	E, 3
Piping	PB	Stainless Steel Cast Austenitic	Reactor Coolant (Int)	None	None	IV.C2-4	3.1.1.57	I, 2
Piping	PB	Stainless Steel Cast Austenitic	Reactor Coolant (Int)	Loss of material	Water Chemistry (B2.1.2)	IV.C2-15	3.1.1.83	B
Piping	PB	Stainless Steel Cast Austenitic	Reactor Coolant (Int)	Cumulative fatigue damage	Time Limited Aging Analysis evaluated for the period of extended operation.	IV.C2-25	3.1.1.08	A
Piping	PB	Stainless Steel Cast Austenitic	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.C2-26	3.1.1.62	B
Pressurizer Relief Tank	SIA	Stainless Steel	Plant Indoor Air (Ext)	None	None	IV.E-2	3.1.1.86	C
Pressurizer Relief Tank	SIA	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2)	IV.C2-22	3.1.1.68	E, 1

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 Vol. 2 Item	Table 1 Item	Notes
Pressurizer Relief Tank	SIA	Stainless Steel	Treated Borated Water (Int)	Cumulative fatigue damage	Time Limited Aging Analysis evaluated for the period of extended operation.	IV.C2-23	3.1.1.07	I, 7
Pressurizer Relief Tank	SIA	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2)	V.D1-30	3.2.1.49	B
Pump	PB	Stainless Steel Cast Austenitic	Plant Indoor Air (Ext)	None	None	IV.E-2	3.1.1.86	A
Pump	PB	Stainless Steel Cast Austenitic	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD for Class 1 components (B2.1.1) and Water Chemistry (B2.1.2)	IV.C2-5	3.1.1.68	B
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)	IV.C2-6	3.1.1.55	B
Pump	PB	Stainless Steel Cast Austenitic	Reactor Coolant (Int)	Loss of material	Water Chemistry (B2.1.2)	IV.C2-15	3.1.1.83	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 Vol. 2 Item	Table 1 Item	Notes
Pump	PB	Stainless Steel Cast Austenitic	Reactor Coolant (Int)	Cumulative fatigue damage	Time Limited Aging Analysis evaluated for the period of extended operation.	IV.C2-25	3.1.1.08	A
Pump	PB	Stainless Steel Cast Austenitic	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.C2-26	3.1.1.62	B
PZR Components (TLAA)	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.C2-25	3.1.1.08	A
PZR Components (TLAA)	PB	Stainless Steel	Reactor Coolant (Int)	Cumulative fatigue damage	Time Limited Aging Analysis evaluated for the period of extended operation.	IV.C2-25	3.1.1.08	A
PZR Heater Bundle Diaphragm Plate	SS	Stainless Steel	Reactor Coolant (Ext)	Loss of material	Water Chemistry (B2.1.2)	IV.C2-15	3.1.1.83	D

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 Vol. 2 Item	Table 1 Item	Notes
PZR Heater Bundle Diaphragm Plate	SS	Stainless Steel	Reactor Coolant (Ext)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD for Class 1 components (B2.1.1) and Water Chemistry (B2.1.2)	IV.C2-18	3.1.1.67	B
PZR Heater Bundle Diaphragm Plate	SS	Stainless Steel	Reactor Coolant (Ext)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD for Class 1 components (B2.1.1) and Water Chemistry (B2.1.2)	IV.C2-20	3.1.1.68	B
PZR Heater Sheaths and Sleeves	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	IV.E-2	3.1.1.86	C
PZR Heater Sheaths and Sleeves	PB	Stainless Steel	Reactor Coolant (Int)	Loss of material	Water Chemistry (B2.1.2)	IV.C2-15	3.1.1.83	B
PZR Heater Sheaths and Sleeves	PB	Stainless Steel	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD for Class 1 components (B2.1.1) and Water Chemistry (B2.1.2)	IV.C2-18	3.1.1.67	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 Vol. 2 Item	Table 1 Item	Notes
PZR Heater Sheaths and Sleeves	PB	Stainless Steel	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD for Class 1 components (B2.1.1) and Water Chemistry (B2.1.2)	IV.C2-20	3.1.1.68	B
PZR Instrument Penetrations	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	IV.E-2	3.1.1.86	A
PZR Instrument Penetrations	PB	Stainless Steel	Reactor Coolant (Int)	Loss of material	Water Chemistry (B2.1.2)	IV.C2-15	3.1.1.83	B
PZR Instrument Penetrations	PB	Stainless Steel	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD for Class 1 components (B2.1.1) and Water Chemistry (B2.1.2)	IV.C2-18	3.1.1.67	B
PZR Instrument Penetrations	PB	Stainless Steel	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD for Class 1 components (B2.1.1) and Water Chemistry (B2.1.2)	IV.C2-19	3.1.1.64	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 Vol. 2 Item	Table 1 Item	Notes
PZR Integral Support	SS	Carbon Steel	Borated Water Leakage (Ext)	Loss of material	Boric Acid Corrosion (B2.1.4)	IV.C2-09	3.1.1.58	A
PZR Integral Support	SS	Carbon Steel	Borated Water Leakage (Ext)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.C2-16	3.1.1.61	B
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.C2-09	3.1.1.58	A
PZR Manways and Covers	PB	Carbon Steel with Stainless Steel Cladding	Reactor Coolant (Int)	Loss of material	Water Chemistry (B2.1.2)	IV.C2-15	3.1.1.83	D
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 for Class 1 components (B2.1.1) and Water Chemistry (B2.1.2)	IV.C2-18	3.1.1.67	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 Vol. 2 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 for Class 1 components (B2.1.1) and Water Chemistry (B2.1.2)	IV.C2-19	3.1.1.64	B
PZR Nozzles	PB	Carbon Steel with Stainless Steel Cladding	Borated Water Leakage (Ext)	Loss of material	Boric Acid Corrosion (B2.1.4)	IV.C2-09	3.1.1.58	A
PZR Nozzles	PB	Carbon Steel with Stainless Steel Cladding	Reactor Coolant (Int)	Loss of material	Water Chemistry (B2.1.2)	IV.C2-15	3.1.1.83	B
PZR Nozzles	PB	Carbon Steel with Stainless Steel Cladding	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD for Class 1 components (B2.1.1) and Water Chemistry (B2.1.2)	IV.C2-18	3.1.1.67	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 Vol. 2 Item	Table 1 Item	Notes
PZR Nozzles	PB	Carbon Steel with Stainless Steel Cladding	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD for Class 1 components (B2.1.1) and Water Chemistry (B2.1.2)	IV.C2-19	3.1.1.64	B
PZR Pressurizer Shell/Heads	PB	Carbon Steel with Stainless Steel Cladding	Borated Water Leakage (Ext)	Loss of material	Boric Acid Corrosion (B2.1.4)	IV.C2-09	3.1.1.58	A
PZR Pressurizer Shell/Heads	PB	Carbon Steel with Stainless Steel Cladding	Reactor Coolant (Int)	Loss of material	Water Chemistry (B2.1.2)	IV.C2-15	3.1.1.83	B
PZR Pressurizer Shell/Heads	PB	Carbon Steel with Stainless Steel Cladding	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD for Class 1 components (B2.1.1) and Water Chemistry (B2.1.2)	IV.C2-18	3.1.1.67	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 Vol. 2 Item	Table 1 Item	Notes
PZR Pressurizer Shell/Heads	PB	Carbon Steel with Stainless Steel Cladding	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD for Class 1 components (B2.1.1) and Water Chemistry (B2.1.2)	IV.C2-19	3.1.1.64	B
PZR Safe Ends	PB	Nickel Alloys	Plant Indoor Air (Ext)	None	None	IV.E-1	3.1.1.85	A
PZR Safe Ends	PB	Nickel Alloys	Reactor Coolant (Int)	Loss of material	Water Chemistry (B2.1.2)	IV.C2-15	3.1.1.83	B
PZR Safe Ends	PB	Nickel Alloys	Reactor Coolant (Int)	Cracking	Nickel Alloy Aging Management (B2.1.34), ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) for Class 1 components, Water Chemistry (B2.1.2), and Comply with applicable NRC Orders and FSAR Commitment (B2.1.35)	IV.C2-24	3.1.1.31	E, 4
PZR Safe Ends	PB	Nickel Alloys	Reactor Coolant (Int)	Cumulative fatigue damage	Time Limited Aging Analysis evaluated for the period of extended operation.	IV.C2-25	3.1.1.08	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 Vol. 2 Item	Table 1 Item	Notes
PZR Safe Ends	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	IV.E-2	3.1.1.86	A
PZR Safe Ends	PB	Stainless Steel	Reactor Coolant (Int)	Loss of material	Water Chemistry (B2.1.2)	IV.C2-15	3.1.1.83	B
PZR Safe Ends	PB	Stainless Steel	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD for Class 1 components (B2.1.1) and Water Chemistry (B2.1.2)	IV.C2-18	3.1.1.67	B
PZR Safe Ends	PB	Stainless Steel	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD for Class 1 components (B2.1.1) and Water Chemistry (B2.1.2)	IV.C2-19	3.1.1.64	B
Rupture Disc	LBS	Stainless Steel	Plant Indoor Air (Ext)	None	None	IV.E-2	3.1.1.86	A
Rupture Disc	LBS	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2)	IV.C2-22	3.1.1.68	E, 1
Rupture Disc	LBS	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2)	V.D1-30	3.2.1.49	B
Thermowell	PB	Nickel Alloys	Plant Indoor Air (Ext)	None	None	IV.E-1	3.1.1.85	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 Vol. 2 Item	Table 1 Item	Notes
Thermowell	PB	Nickel Alloys	Reactor Coolant (Int)	Cracking	Nickel Alloy Aging Management (B2.1.34), ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) for Class 1 components, Water Chemistry (B2.1.2), and Comply with applicable NRC Orders and FSAR Commitment (B2.1.35)	IV.C2-13	3.1.1.31	E, 4
Thermowell	PB	Nickel Alloys	Reactor Coolant (Int)	Loss of material	Water Chemistry (B2.1.2)	IV.C2-15	3.1.1.83	B
Thermowell	PB	Nickel Alloys	Reactor Coolant (Int)	Cumulative fatigue damage	Time Limited Aging Analysis evaluated for the period of extended operation.	IV.C2-25	3.1.1.08	A
Thermowell	PB	Stainless Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.C2-10	3.3.1.50	B
Thermowell	LBS, PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	IV.E-2	3.1.1.86	A
Thermowell	PB	Stainless Steel	Reactor Coolant (Int)	Loss of material	Water Chemistry (B2.1.2)	IV.C2-15	3.1.1.83	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 Vol. 2 Item	Table 1 Item	Notes
Thermowell	PB	Stainless Steel	Reactor Coolant (Int)	Cumulative fatigue damage	Time Limited Aging Analysis evaluated for the period of extended operation.	IV.C2-25	3.1.1.08	A
Thermowell	PB	Stainless Steel	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.C2-26	3.1.1.62	B
Thermowell	PB	Stainless Steel	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD for Class 1 components (B2.1.1) and Water Chemistry (B2.1.2)	IV.C2-27	3.1.1.68	B
Thermowell	LBS	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2)	IV.C2-22	3.1.1.68	E, 1
Thermowell	LBS	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2)	V.D1-30	3.2.1.49	B
Tubing	PB	Stainless Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.C2-10	3.3.1.50	B
Tubing	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	IV.E-2	3.1.1.86	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 Vol. 2 Item	Table 1 Item	Notes
Tubing	PB	Stainless Steel	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD for Class 1 components (B2.1.1) and Water Chemistry (B2.1.2)	IV.C2-2	3.1.1.68	B
Tubing	PB	Stainless Steel	Reactor Coolant (Int)	Loss of material	Water Chemistry (B2.1.2)	IV.C2-15	3.1.1.83	B
Tubing	PB	Stainless Steel	Treated Borated Water (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD for Class 1 components (B2.1.1) and Water Chemistry (B2.1.2)	IV.C2-22	3.1.1.68	D
Tubing	PB	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2)	V.D1-30	3.2.1.49	B
Valve	PB	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	IV.C2-14	3.1.1.53	B
Valve	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	A
Valve	LBS	Stainless Steel	Demineralized Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	None	None	G, 5

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 Vol. 2 Item	Table 1 Item	Notes
Valve	PB, SIA	Stainless Steel	Dry Gas (Int)	None	None	IV.E-5	3.1.1.86	A
Valve	LBS, PB, SIA	Stainless Steel	Plant Indoor Air (Ext)	None	None	IV.E-2	3.1.1.86	A
Valve	PB	Stainless Steel	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD for Class 1 components (B2.1.1) and Water Chemistry (B2.1.2)	IV.C2-2	3.1.1.68	D
Valve	PB, SIA	Stainless Steel	Reactor Coolant (Int)	Loss of material	Water Chemistry (B2.1.2)	IV.C2-15	3.1.1.83	B
Valve	SIA	Stainless Steel	Reactor Coolant (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	IV.C2-17	3.1.1.36	D
Valve	PB	Stainless Steel	Reactor Coolant (Int)	Cumulative fatigue damage	Time Limited Aging Analysis evaluated for the period of extended operation.	IV.C2-25	3.1.1.08	A
Valve	PB	Stainless Steel	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	IV.C2-26	3.1.1.62	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 Vol. 2 Item	Table 1 Item	Notes
Valve	PB	Stainless Steel	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD for Class 1 components (B2.1.1) and Water Chemistry (B2.1.2)	IV.C2-27	3.1.1.68	B
Valve	LBS	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2)	IV.C2-22	3.1.1.68	E, 1
Valve	PB	Stainless Steel	Treated Borated Water (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD for Class 1 components (B2.1.1) and Water Chemistry (B2.1.2)	IV.C2-22	3.1.1.68	D
Valve	SIA	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2)	IV.C2-22	3.1.1.68	E, 1
Valve	LBS, PB, SIA	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2)	V.D1-30	3.2.1.49	B

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.
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.
I	Aging effect in NUREG-1801 for this component, material and environment combination is not applicable.

Plant Specific Notes:

1	NUREG-1801 line IV.C2-22 was used because it is the only applicable Treated Borated Water line. Water Chemistry (B2.1.2) is used to manage this aging effect. ASME Section XI, Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) will not be used to manage aging because these components associated with the pressurizer relief tank are non-ASME components and are not subject to ASME Section XI Inservice Inspection requirements.
2	The WCGS RCS loops are constructed of CASS. The straight piping pieces are centrifugally cast and the fittings are statically cast. Based on a review of the WCGS Certified Material Test Reports, the Mo and ferrite values for these components are below the industry accepted thermal aging embrittlement significance threshold (<0.5% Mo, <20% ferrite). Therefore, thermal aging embrittlement of WCGS CASS RCS piping is not applicable.
3	Water Chemistry (B2.1.2) and ASME Section XI, Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) is used to manage this aging effect for Cast Austenitic Stainless Steel (CASS) components.
4	Note E was used to include the plant specific Nickel Alloy Aging Management Program (B2.1.34).
5	Loss of material due to pitting and crevice corrosion is a potential aging effect for stainless steel reactor coolant pump seal/standpipe make-up water components in treated (demineralized) water.
6	Loss of preload is a potential aging effect for inconel bolts in the reactor coolant pumps. There is currently no NUREG-1801 line for nickel alloy closure bolting.
7	No vessel, tank, pump, or heat exchanger designs at WCGS are supported by TLAAs as defined in 10 CFR 54.3 except ASME Class 1 components and the Class 2 portions of the steam generators. The design of this WCGS component is therefore not supported by TLAAs.

Table 3.1.2-3 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 Vol. 2 Item	Table 1 Item	Notes
SG Closure Bolting (SG primary manway closure bolting)	PB	Carbon Steel	Borated Water Leakage (Ext)	Cracking	Bolting Integrity (B2.1.7)	IV.D1-2	3.1.1.52	B
SG Closure Bolting (SG primary manway closure bolting)	PB	Carbon Steel	Borated Water Leakage (Ext)	Loss of material	Boric Acid Corrosion (B2.1.4)	IV.D1-3	3.1.1.58	A
SG Closure Bolting (SG primary manway closure bolting)	PB	Carbon Steel	Borated Water Leakage (Ext)	Loss of preload	Bolting Integrity (B2.1.7)	IV.D1-10	3.1.1.52	B

Table 3.1.2-3 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 Vol. 2 Item	Table 1 Item	Notes
SG Closure Bolting (SG secondary manway closure bolting, SG secondary handhole closure bolting, SG secondary instrument hole cover closure bolting)	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.7)	IV.D1-10	3.1.1.52	B
SG Closure Bolting (SG secondary manway closure bolting, SG secondary handhole closure bolting, SG secondary instrument hole cover closure bolting)	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.7)	V.E-4	3.2.1.23	B
SG Components (TLAA)	PB	Carbon Steel	Secondary Water (Int)	Cumulative fatigue damage	Time Limited Aging Analysis evaluated for the period of extended operation.	IV.D1-11	3.1.1.07	A

Table 3.1.2-3 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 Vol. 2 Item	Table 1 Item	Notes
SG Components (TLAA)	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.D1-8	3.1.1.10	A
SG Components (TLAA)	PB	Nickel Alloys	Reactor Coolant (Int)	Cumulative fatigue damage	Time Limited Aging Analysis evaluated for the period of extended operation.	IV.D1-8	3.1.1.10	A
SG Feed ring (SG Feed ring)	DF	Carbon Steel	Secondary Water (Ext)	Wall thinning	Steam Generator Tube Integrity (B2.1.8) and Water Chemistry (B2.1.2)	IV.D1-26	3.1.1.32	E, 1
SG Feed ring (SG Feed ring)	DF	Carbon Steel	Secondary Water (Int)	Wall thinning	Steam Generator Tube Integrity (B2.1.8) and Water Chemistry (B2.1.2)	IV.D1-26	3.1.1.32	E, 1
SG Feed ring (Feedwater ring J-tubes)	DF	Nickel Alloys	Secondary Water (Ext)	Cracking	Steam Generator Tube Integrity (B2.1.8) and Water Chemistry (B2.1.2)	IV.D1-14	3.1.1.74	D
SG Feed ring (Feedwater ring J-tubes)	DF	Nickel Alloys	Secondary Water (Ext)	Loss of material	Steam Generator Tube Integrity (B2.1.8) and Water Chemistry (B2.1.2)	IV.D1-15	3.1.1.74	D
SG Feed ring (Feedwater ring J-tubes)	DF	Nickel Alloys	Secondary Water (Int)	Cracking	Steam Generator Tube Integrity (B2.1.8) and Water Chemistry (B2.1.2)	IV.D1-14	3.1.1.74	D

Table 3.1.2-3 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 Vol. 2 Item	Table 1 Item	Notes
SG Feed ring (Feedwater ring J-tubes)	DF	Nickel Alloys	Secondary Water (Int)	Loss of material	Steam Generator Tube Integrity (B2.1.8) and Water Chemistry (B2.1.2)	IV.D1-15	3.1.1.74	D
SG Flow Distribution Baffle (SG Flow Distribution Baffle)	DF	Stainless Steel	Secondary Water (Ext)	Cracking	Steam Generator Tube Integrity (B2.1.8) and Water Chemistry (B2.1.2)	IV.D1-14	3.1.1.74	D
SG Flow Distribution Baffle (SG Flow Distribution Baffle)	DF	Stainless Steel	Secondary Water (Ext)	Loss of material	Steam Generator Tube Integrity (B2.1.8) and Water Chemistry (B2.1.2)	IV.D1-15	3.1.1.74	D
SG Internal Structures (SG wrapper)	DF	Carbon Steel	Secondary Water (Ext)	Loss of material	Steam Generator Tube Integrity (B2.1.8) and Water Chemistry (B2.1.2)	IV.D1-9	3.1.1.76	B
SG Internal Structures (Non-pressure boundary miscellaneous internal parts)	SS	Carbon Steel	Secondary Water (Ext)	Loss of material	Steam Generator Tube Integrity (B2.1.8) and Water Chemistry (B2.1.2)	IV.D1-9	3.1.1.76	D
SG Internal Structures (SG secondary blowdown apparatus)	DF	Nickel Alloys	Secondary Water (Ext)	Cracking	Steam Generator Tube Integrity (B2.1.8) and Water Chemistry (B2.1.2)	IV.D1-14	3.1.1.74	D

Table 3.1.2-3 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 Vol. 2 Item	Table 1 Item	Notes
SG Internal Structures (SG anti-vibration bars)	SS	Nickel Alloys	Secondary Water (Ext)	Cracking	Steam Generator Tube Integrity (B2.1.8) and Water Chemistry (B2.1.2)	IV.D1-14	3.1.1.74	B
SG Internal Structures (SG secondary blowdown apparatus)	DF	Nickel Alloys	Secondary Water (Ext)	Loss of material	Steam Generator Tube Integrity (B2.1.8) and Water Chemistry (B2.1.2)	IV.D1-15	3.1.1.74	D
SG Internal Structures (SG anti-vibration bars)	SS	Nickel Alloys	Secondary Water (Ext)	Loss of material	Steam Generator Tube Integrity (B2.1.8) and Water Chemistry (B2.1.2)	IV.D1-15	3.1.1.74	B
SG Internal Structures (SG secondary blowdown apparatus)	DF	Nickel Alloys	Secondary Water (Int)	Cracking	Steam Generator Tube Integrity (B2.1.8) and Water Chemistry (B2.1.2)	IV.D1-14	3.1.1.74	D
SG Internal Structures (SG secondary blowdown apparatus)	DF	Nickel Alloys	Secondary Water (Int)	Loss of material	Steam Generator Tube Integrity (B2.1.8) and Water Chemistry (B2.1.2)	IV.D1-15	3.1.1.74	D
SG Plugs (Mechanical SG tube plugs, SG welded tube plug)	PB	Nickel Alloys	Reactor Coolant (Int)	Cracking	Steam Generator Tube Integrity (B2.1.8) and Water Chemistry (B2.1.2)	IV.D1-18	3.1.1.73	B

Table 3.1.2-3 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 Vol. 2 Item	Table 1 Item	Notes
SG Plugs (Mechanical SG tube plugs, SG welded tube plug)	PB	Nickel Alloys	Secondary Water (Ext)	Cracking	Steam Generator Tube Integrity (B2.1.8) and Water Chemistry (B2.1.2)	IV.D1-22	3.1.1.72	D
SG Primary Head and Divider Plate (Channel head)	PB	Carbon Steel with Stainless Steel Cladding	Borated Water Leakage (Ext)	Loss of material	Boric Acid Corrosion (B2.1.4)	IV.D1-3	3.1.1.58	A
SG Primary Head and Divider Plate (Channel head)	PB	Carbon Steel with Stainless Steel Cladding	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD for Class 1 components (B2.1.1) and Water Chemistry (B2.1.2)	IV.D1-1	3.1.1.68	B
SG Primary Head and Divider Plate (Tubesheet-primary face, primary channel divider plate, SG primary nozzle closure ring)	PB	Nickel Alloys	Reactor Coolant (Ext)	Cracking	Nickel Alloy Aging Management (B2.1.34), ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) for Class 1 components, Water Chemistry (B2.1.2), and Comply with applicable NRC Orders and FSAR Commitment (B2.1.35)	IV.D1-4	3.1.1.31	E, 2

Table 3.1.2-3 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 Vol. 2 Item	Table 1 Item	Notes
SG Primary Head and Divider Plate (Tubesheet-primary face, primary channel divider plate, SG primary nozzle closure ring)	DF	Nickel Alloys	Reactor Coolant (Ext)	Cracking	Water Chemistry (B2.1.2)	IV.D1-6	3.1.1.81	B
SG Primary Head and Divider Plate (Tubesheet-primary face, primary channel divider plate, SG primary nozzle closure ring)	NSRS	Nickel Alloys	Reactor Coolant (Ext)	Cracking	Water Chemistry (B2.1.2)	IV.D1-6	3.1.1.81	D
SG Primary Man ways and Flanges (SG primary manway cover)	PB	Carbon Steel	Borated Water Leakage (Ext)	Loss of material	Boric Acid Corrosion (B2.1.4)	IV.D1-3	3.1.1.58	A
SG Primary Man ways and Flanges (Primary manway)	PB	Carbon Steel with Stainless Steel Cladding	Borated Water Leakage (Ext)	Loss of material	Boric Acid Corrosion (B2.1.4)	IV.D1-3	3.1.1.58	A

Table 3.1.2-3 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 Vol. 2 Item	Table 1 Item	Notes
SG Primary Man ways and Flanges (Primary manway)	PB	Carbon Steel with Stainless Steel Cladding	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD for Class 1 components (B2.1.1) and Water Chemistry (B2.1.2)	IV.D1-1	3.1.1.68	B
SG Primary Nozzles and Safe Ends (Primary coolant nozzle)	PB	Carbon Steel with Stainless Steel Cladding	Borated Water Leakage (Ext)	Loss of material	Boric Acid Corrosion (B2.1.4)	IV.D1-3	3.1.1.58	A
SG Primary Nozzles and Safe Ends (Primary coolant nozzle)	PB	Carbon Steel with Stainless Steel Cladding	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD for Class 1 components (B2.1.1) and Water Chemistry (B2.1.2)	IV.D1-1	3.1.1.68	B
SG Primary Nozzles and Safe Ends (Primary coolant nozzle safe end weld, SG primary head drain)	PB	Nickel Alloys	Plant Indoor Air (Ext)	None	None	IV.E-1	3.1.1.85	A

Table 3.1.2-3 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 Vol. 2 Item	Table 1 Item	Notes
SG Primary Nozzles and Safe Ends (Primary coolant nozzle safe end weld, SG primary head drain)	PB	Nickel Alloys	Reactor Coolant (Int)	Cracking	Nickel Alloy Aging Management (B2.1.34), ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) for Class 1 components, Water Chemistry (B2.1.2), and Comply with applicable NRC Orders and FSAR Commitment (B2.1.35)	IV.D1-4	3.1.1.31	E, 2
SG Secondary Man ways and Flanges (Secondary manway, SG secondary manway cover, SG secondary handhole, SG secondary handhole cover, SG secondary instrument hole cover)	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	V.E-7	3.2.1.31	A

Table 3.1.2-3 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 Vol. 2 Item	Table 1 Item	Notes
SG Secondary Man ways and Flanges (Secondary manway, SG secondary manway cover, SG secondary handhole, SG secondary handhole cover, SG secondary instrument hole cover)	PB	Carbon Steel	Secondary Water (Int)	Loss of material	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD for Class 2 components (B2.1.1) and Water Chemistry (B2.1.2)	IV.D1-12	3.1.1.16	B

Table 3.1.2-3 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 Vol. 2 Item	Table 1 Item	Notes
SG Secondary Nozzles and Safe Ends (Bottom blowdown, secondary side shell drain, wide range water level tap, feedwater inlet nozzle, sampling tap, narrow range water level tap, wet layup tap, steam outlet nozzle and integral flow restrictor)	PB, TH (Note: Only steam outlet nozzle and integral flow restrictor has both intended functions)	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	V.E-7	3.2.1.31	A

Table 3.1.2-3 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 Vol. 2 Item	Table 1 Item	Notes
SG Secondary Nozzles and Safe Ends (Bottom blowdown, secondary side shell drain, wide range water level tap, feedwater inlet nozzle, sampling tap, narrow range water level tap, wet layup tap, steam outlet nozzle and integral flow restrictor)	PB, TH (Note: Only steam outlet nozzle and integral flow restrictor has both intended functions)	Carbon Steel	Secondary Water (Int)	Wall thinning	Flow-Accelerated Corrosion (B2.1.6)	IV.D1-5	3.1.1.59	B

Table 3.1.2-3 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 Vol. 2 Item	Table 1 Item	Notes
SG Secondary Nozzles and Safe Ends (Bottom blowdown, secondary side shell drain, wide range water level tap, feedwater inlet nozzle, sampling tap, narrow range water level tap, wet layup tap, steam outlet nozzle and integral flow restrictor)	PB, TH (Note: Only steam outlet nozzle and integral flow restrictor has both intended functions)	Carbon Steel	Secondary Water (Int)	Loss of material	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD for Class 2 components (B2.1.1) and Water Chemistry (B2.1.2)	IV.D1-12	3.1.1.16	D
SG Secondary Shell (Secondary shell)	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	V.E-7	3.2.1.31	A
SG Secondary Shell (Tubesheet-secondary face)	PB	Carbon Steel	Secondary Water (Ext)	Loss of material	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD for Class 2 components (B2.1.1) and Water Chemistry (B2.1.2)	IV.D1-12	3.1.1.16	B

Table 3.1.2-3 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 Vol. 2 Item	Table 1 Item	Notes
SG Secondary Shell (Secondary shell)	PB	Carbon Steel	Secondary Water (Int)	Loss of material	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD for Class 2 components (B2.1.1) and Water Chemistry (B2.1.2)	IV.D1-12	3.1.1.16	B
SG Tube Support Plates (Tube support plates)	SS	Stainless Steel	Secondary Water (Ext)	Cracking	Steam Generator Tube Integrity (B2.1.8) and Water Chemistry (B2.1.2)	IV.D1-14	3.1.1.74	D
SG Tube Support Plates (Tube support plates)	SS	Stainless Steel	Secondary Water (Ext)	Loss of material	Steam Generator Tube Integrity (B2.1.8) and Water Chemistry (B2.1.2)	IV.D1-15	3.1.1.74	D
SG Tubes (SG Tubes)	HT, PB	Nickel Alloys	Reactor Coolant (Int)	Cracking	Steam Generator Tube Integrity (B2.1.8) and Water Chemistry (B2.1.2)	IV.D1-20	3.1.1.73	B
SG Tubes (SG Tubes)	HT, PB	Nickel Alloys	Secondary Water (Ext)	Denting	Steam Generator Tube Integrity (B2.1.8) and Water Chemistry (B2.1.2)	IV.D1-19	3.1.1.79	B
SG Tubes (SG Tubes)	HT, PB	Nickel Alloys	Secondary Water (Ext)	Cumulative fatigue damage	Time Limited Aging Analysis evaluated for the period of extended operation.	IV.D1-21	3.1.1.06	I, 3

Table 3.1.2-3 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 Vol. 2 Item	Table 1 Item	Notes
SG Tubes (SG Tubes)	HT, PB	Nickel Alloys	Secondary Water (Ext)	Cracking	Steam Generator Tube Integrity (B2.1.8) and Water Chemistry (B2.1.2)	IV.D1-22	3.1.1.72	B
SG Tubes (SG Tubes)	HT, PB	Nickel Alloys	Secondary Water (Ext)	Cracking	Steam Generator Tube Integrity (B2.1.8) and Water Chemistry (B2.1.2)	IV.D1-23	3.1.1.72	B
SG Tubes (SG Tubes)	HT, PB	Nickel Alloys	Secondary Water (Ext)	Loss of material	Steam Generator Tube Integrity (B2.1.8) and Water Chemistry (B2.1.2)	IV.D1-24	3.1.1.72	B
Tubing	LBS	Stainless Steel	Plant Indoor Air (Ext)	None	None	IV.E-2	3.1.1.86	A
Tubing	LBS	Stainless Steel	Secondary Water (Int)	Cracking	Water Chemistry (B2.1.2)	VIII.B1-2	3.4.1.39	B
Tubing	LBS	Stainless Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2)	VIII.B1-3	3.4.1.37	B

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.

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 Feedring wall thinning was described in NRC Information Notice 91-19, "Steam Generator Feedwater Distribution Piping Damage." This aging has been detected only in certain Combustion Engineering System 80 steam generators. The WCGS steam generators are Westinghouse Model F design. No plant specific operating experience at WCGS or other units with Model F steam generators suggests wall thinning of the Model F feedrings is occurring, therefore WCGS has determined this condition is not applicable to WCGS and no further action is required.

2 Note E was used to include the plant specific Nickel Alloy Aging Management Program (B2.1.34).

3 Cumulative fatigue damage of steam generator tubes is not a TLAA as defined in 10 CFR 54.3. See section 4.3.2.5.

3.2 AGING MANAGEMENT OF ENGINEERED SAFETY FEATURES

3.2.1 Introduction

Section 3.2 provides the results of the aging management reviews for those component types identified in Section 2.3.2, Engineered Safety Features, subject to aging management review. These systems are described in the following sections:

- Nuclear sampling system (Section 2.3.2.1)
- Containment spray system (Section 2.3.2.2)
- Containment integrated leak rate test system (Section 2.3.2.3)
- Decontamination system (Section 2.3.2.4)
- Liquid radwaste system (Section 2.3.2.5)
- Reactor makeup water system (Section 2.3.2.6)
- Containment purge HVAC system (Section 2.3.2.7)
- Breathing air system (Section 2.3.2.8)
- Hydrogen control system (Section 2.3.2.9)
- High pressure coolant injection system (Section 2.3.2.10)
- Residual heat removal system (Section 2.3.2.11)

Table 3.2.1, Summary of Aging Management Evaluations 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 3.x.1 (Table 1) described in Section 3.0.

3.2.2 Results

The following tables summarize the results of the aging management review for the systems in the Engineered Safety Features area:

- Table 3.2.2-1, Engineered Safety Features – Summary of Aging Management Evaluation – Nuclear Sampling System
- Table 3.2.2-2, Engineered Safety Features – Summary of Aging Management Evaluation – Containment Spray System
- Table 3.2.2-3, Engineered Safety Features – Summary of Aging Management Evaluation – Containment Integrated Leak Rate Test System

- Table 3.2.2-4, Engineered Safety Features – Summary of Aging Management Evaluation – Decontamination System
- Table 3.2.2-5, Engineered Safety Features – Summary of Aging Management Evaluation – Liquid Radwaste System
- Table 3.2.2-6, Engineered Safety Features – Summary of Aging Management Evaluation – Reactor Makeup Water System
- Table 3.2.2-7, Engineered Safety Features – Summary of Aging Management Evaluation – Containment Purge HVAC System
- Table 3.2.2-8, Engineered Safety Features – Summary of Aging Management Evaluation – Breathing Air System
- Table 3.2.2-9, Engineered Safety Features – Summary of Aging Management Evaluation – Hydrogen Control System
- Table 3.2.2-10, Engineered Safety Features – Summary of Aging Management Evaluation – High Pressure Coolant Injection System
- Table 3.2.2-11, 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.

3.2.2.1 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 systems in the following subsections.

3.2.2.1.1 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 components are exposed to the following environments:

- Borated Water Leakage
- Closed Cycle Cooling Water

- 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 (B2.1.7)
- Closed-Cycle Cooling Water System (B2.1.10)
- External Surfaces Monitoring Program (B2.1.20)
- One-Time Inspection (B2.1.16)
- Water Chemistry (B2.1.2)

3.2.2.1.2 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
- Dry Gas
- Plant Indoor Air
- Sodium Hydroxide

- 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 (B2.1.7)
- External Surfaces Monitoring Program (B2.1.20)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)
- One-Time Inspection (B2.1.16)
- Water Chemistry (B2.1.2)

3.2.2.1.3 Containment Integrated Leak Rate Test System

Materials

The materials of construction for the containment integrated leak rate test system component types are:

- Carbon Steel

Environment

The containment integrated leak rate test system component types are exposed to the following environments:

- Plant Indoor Air
- Ventilation Atmosphere

Aging Effects Requiring Management

The following containment integrated leak rate test 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 test system component types:

- Bolting Integrity (B2.1.7)
- External Surfaces Monitoring Program (B2.1.20)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)

3.2.2.1.4 Decontamination System

Materials

The materials of construction for the decontamination system component types are:

- Carbon Steel

Environment

The decontamination system components are exposed to the following environments:

- Plant Indoor Air
- Wetted Gas

Aging Effects Requiring Management

The following decontamination 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 decontamination system component types:

- Bolting Integrity (B2.1.7)
- External Surfaces Monitoring Program (B2.1.20)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)

3.2.2.1.5 Liquid Radwaste System

Materials

The materials of construction for the liquid radwaste system component types are:

- Carbon Steel
- Stainless Steel

Environment

The liquid radwaste system component types are exposed to the following environments:

- Borated Water Leakage
- Closed Cycle Cooling Water
- Demineralized Water
- Dry Gas
- Plant Indoor Air
- Treated Borated Water

Aging Effects Requiring Management

The following liquid radwaste 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 liquid radwaste system component types:

- Bolting Integrity (B2.1.7)
- Closed-Cycle Cooling Water System (B2.1.10)
- External Surfaces Monitoring Program (B2.1.20)
- One-Time Inspection (B2.1.16)
- Water Chemistry (B2.1.2)

3.2.2.1.6 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 component types are exposed to the following environments:

- 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 (B2.1.7)
- One-Time Inspection (B2.1.16)
- Water Chemistry (B2.1.2)

3.2.2.1.7 Containment Purge HVAC System

Materials

The materials of construction for the containment purge HVAC system component types are:

- Carbon Steel
- Carbon Steel (Galvanized or Coated)
- Cast Iron (Grey Cast Iron)
- Copper

- Copper Alloys
- Elastomer
- Stainless Steel

Environment

The containment purge HVAC system components are exposed to the following environments:

- Atmosphere/ Weather
- Closed Cycle Cooling Water
- Encased in Concrete
- Plant Indoor Air
- Ventilation Atmosphere

Aging Effects Requiring Management

The following containment purge 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 containment purge HVAC system component types:

- Bolting Integrity (B2.1.7)
- Closed-Cycle Cooling Water System (B2.1.10)
- External Surfaces Monitoring Program (B2.1.20)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)
- Selective Leaching of Materials (B2.1.17)

3.2.2.1.8 Breathing Air System

Materials

The materials of construction for the breathing air system component types are:

- Carbon Steel

- Stainless Steel

Environment

The breathing air system component types are exposed to the following environments:

- Dry Gas
- Plant Indoor Air

Aging Effects Requiring Management

The following breathing 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 breathing air system component types:

- Bolting Integrity (B2.1.7)

3.2.2.1.9 Hydrogen Control System

Materials

The materials of construction for the hydrogen control system component types are:

- Carbon Steel
- Stainless Steel

Environment

The hydrogen control system component types are exposed to the following environments:

- Dry Gas
- Plant Indoor Air
- Ventilation Atmosphere

Aging Effects Requiring Management

The following 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 hydrogen control system component types:

- Bolting Integrity (B2.1.7)
- External Surfaces Monitoring Program (B2.1.20)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)

3.2.2.1.10 High Pressure Coolant Injection System

Materials

The materials of construction for the high pressure coolant injection system component types are:

- Carbon Steel
- Carbon Steel (Galvanized or Coated)
- Carbon Steel with Stainless Steel Cladding
- Copper Alloy (Brass Copper < 85%)
- Copper-Nickel
- Glass
- Nickel Alloys
- Stainless Steel
- Stainless Steel Cast Austenitic

Environment

The high pressure coolant injection system component types are exposed to the following environments:

- Atmosphere/ Weather
- Borated Water Leakage
- Buried
- Closed Cycle Cooling Water
- Dry Gas
- Lubricating Oil
- Plant Indoor Air

- Reactor Coolant
- Secondary Water
- 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:

- ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)
- Bolting Integrity (B2.1.7)
- Boric Acid Corrosion (B2.1.4)
- Buried Piping and Tanks Inspection (B2.1.18)
- Closed-Cycle Cooling Water System (B2.1.10)
- External Surfaces Monitoring Program (B2.1.20)
- Flow-Accelerated Corrosion (B2.1.6)
- Lubricating Oil Analysis (B2.1.23)
- Nickel Alloy Aging Management Program (B2.1.34)
- One-Time Inspection (B2.1.16)
- One-Time Inspection of ASME Code Class 1 Small-Bore Piping (B2.1.19)
- Water Chemistry (B2.1.2)

3.2.2.1.11 Residual Heat Removal System

Materials

The materials of construction for the residual heat removal system component types are:

- Aluminum

- Carbon Steel
- Insulation Calcium Silicate
- Stainless Steel
- Stainless Steel Cast Austenitic

Environment

The residual heat removal system component types are exposed to the following environments:

- Borated Water Leakage
- Closed Cycle Cooling Water
- 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 (B2.1.7)
- Boric Acid Corrosion (B2.1.4)
- Closed-Cycle Cooling Water System (B2.1.10)
- External Surfaces Monitoring Program (B2.1.20)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)
- One-Time Inspection (B2.1.16)
- One-Time Inspection of ASME Code Class 1 Small-Bore Piping (B2.1.19)

- 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 subsections.

3.2.2.2.1 Cumulative Fatigue Damage

Cumulative fatigue damage of ESF piping is a TLAA as defined in 10 CFR 54.3. TLAAs are evaluated in accordance with 10 CFR 54.21(c)(1).

Pressure boundaries of essential safety feature systems out to the first isolation valve are generally designed to ASME Section III Class 1, with a fatigue analysis. Section 4.3.2.7 describes the evaluation of these TLAAs.

The remainder of ESF piping is designed to ASME Section 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.

3.2.2.2.2 Loss of material due to Cladding (Breach)

Not applicable. WCGS 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 Internal surfaces of stainless steel containment isolation piping and components exposed to treated water

The Water Chemistry program (B2.1.2) and the One-Time Inspection program (B2.1.16) will manage loss of material due to pitting and crevice corrosion for stainless steel components exposed to demineralized water. The one-time inspection will include selected components at susceptible locations where contaminants could accumulate (e.g. stagnant flow locations).

3.2.2.2.3.2 Stainless steel piping and components exposed to soil

The Buried Piping and Tanks Inspection program (B2.1.18) will manage the loss of material due to pitting and crevice corrosion for the stainless steel external surfaces of buried piping.

3.2.2.2.3.3 BWR stainless steel and aluminum piping and components exposed to treated water

Not applicable to WCGS, applicable to BWR only.

3.2.2.2.3.4 Stainless steel and copper piping and components exposed to lubricating oil

The Lubricating Oil Analysis program (B2.1.23) and the One-Time Inspection program (B2.1.16) will manage loss of material due to pitting and crevice corrosion for copper alloys, copper nickel, and stainless steel components exposed to lubricating oil, except for the RCP lube oil leakage collection system. The one-time inspection will include selected components at susceptible locations where contaminants such as water could accumulate.

3.2.2.2.3.5 Partially encased stainless steel tanks exposed to raw water

Not applicable. WCGS has no stainless steel tanks with a moisture barrier configuration exposed to raw water in the emergency core cooling system, so the applicable NUREG-1801 line was not used.

3.2.2.2.3.6 Stainless steel piping, components, and tanks exposed to internal condensation

Not applicable. WCGS has no in scope stainless steel piping, piping components, piping elements, and tank internal surfaces exposed to condensation (internal) in the containment spray and emergency core cooling systems, so the applicable NUREG-1801 line was not used.

3.2.2.2.4 Reduction of Heat Transfer due to Fouling

3.2.2.2.4.1 Stainless steel and copper heat exchanger tubes exposed to lubricating oil

The Lubricating Oil Analysis program (B2.1.23) and the One-Time Inspection program (B2.1.16) will manage reduction of heat transfer due to fouling for copper nickel components exposed to lubricating oil. The one-time inspection will include selected components at susceptible locations where contaminants such as water could accumulate.

3.2.2.2.4.2 Stainless steel heat exchanger tubes exposed to treated water

Not applicable. WCGS 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.

3.2.2.2.5 Hardening and Loss of Strength due to Elastomer Degradation

Not applicable to WCGS, applicable to BWR only.

3.2.2.2.6 Loss of Material due to Erosion

Not applicable. WCGS does not use the safety injection pumps for normal charging, so the applicable NUREG-1801 line was not used.

3.2.2.2.7 Loss of Material due to General Corrosion and Fouling

Not applicable to WCGS, applicable to BWR only.

3.2.2.2.8 Loss of Material due to General, Pitting, and Crevice Corrosion

3.2.2.2.8.1 BWR piping and components exposed to treated water

Not applicable to WCGS, applicable to BWR only.

3.2.2.2.8.2 Internal surfaces of containment isolation piping and components exposed to treated water

The Water Chemistry program (B2.1.2) and the One-Time Inspection program (B2.1.16) will manage loss of material due to general, pitting and crevice corrosion for carbon steel components exposed to demineralized water. The one-time inspection will include selected components at susceptible locations where contaminants could accumulate (e.g. stagnant flow locations).

3.2.2.2.8.3 Steel piping and components exposed to lubricating oil

The Lubricating Oil Analysis program (B2.1.23) and the One-Time Inspection program (B2.1.16) will manage loss of material due to general, pitting, and crevice corrosion for carbon steel (including galvanized) components exposed to lubricating oil, except for the RCP lube oil leakage collection system. The one-time inspection will include selected components at susceptible locations where contaminants such as water could accumulate.

3.2.2.2.9 Loss of Material due to General, Pitting, Crevice, and Microbiologically-Influenced Corrosion (MIC)

Not applicable to WCGS, applicable to BWR only.

3.2.2.2.10 Quality Assurance for Aging Management of Nonsafety-Related Components

Quality Assurance Program and Administrative Controls are discussed in Section B1.3.

3.2.2.3 Time-Limited Aging Analysis

The Time-Limited Aging Analyses identified below are associated with the engineered safety features component types. The section of Chapter 4 that contains the TLAA review results is indicated in parenthesis.

- Cumulative Fatigue Damage (Section 4.3, Metal Fatigue Damage)

3.2.3 Conclusions

The engineered safety features component types that are subject to aging management review 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, 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, 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 Evaluations in Chapter V of NUREG-1801 for Engineered Safety Features

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.2.1.01	Steel and stainless steel piping, piping components, and piping elements in emergency core cooling system	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes, TLAA	Fatigue of metal components is a TLAA. See further evaluation in subsection 3.2.2.2.1.
3.2.1.02	Steel with stainless steel cladding pump casing 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	Not applicable. WCGS 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.

Table 3.2.1 Summary of Aging Management Evaluations 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
3.2.1.03	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 (B2.1.16)	Yes	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Water Chemistry (B2.1.2). See further evaluation in subsection 3.2.2.2.3.1.
3.2.1.04	Stainless steel piping, piping components, and piping elements exposed to soil	Loss of material due to pitting and crevice corrosion	A plant-specific aging management program is to be evaluated.	Yes	Consistent with NUREG-1801. The plant-specific aging management program(s) used to manage the aging include: Buried Piping and Tanks Inspection (B2.1.18). See further evaluation in subsection 3.2.2.2.3.2.
3.2.1.05					Not applicable - BWR only

Table 3.2.1 Summary of Aging Management Evaluations 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
3.2.1.06	Stainless steel and copper alloy piping, piping components, and piping elements exposed to lubricating oil	Loss of material due to pitting and crevice corrosion	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	Yes	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Lubricating Oil Analysis (B2.1.23). See further evaluation in subsection 3.2.2.2.3.4.
3.2.1.07	Partially encased stainless steel 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 bottoms because moisture and water can egress under the tank due to cracking of the perimeter seal from weathering.	Yes	Not applicable. WCGS has no stainless steel tanks with a moisture barrier configuration exposed to raw water in the emergency core cooling system, so the applicable NUREG-1801 line was not used.

Table 3.2.1 Summary of Aging Management Evaluations 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
3.2.1.08	Stainless steel piping, piping components, piping elements, and tank internal surfaces exposed to condensation (internal)	Loss of material due to pitting and crevice corrosion	A plant-specific aging management program is to be evaluated.	Yes	Not applicable. WCGS has no in scope stainless steel piping, piping components, piping elements, and tank internal surfaces exposed to condensation (internal) in the containment spray and emergency core cooling systems, so the applicable NUREG-1801 line was not used.
3.2.1.09	Steel, stainless steel, and copper alloy heat exchanger tubes exposed to lubricating oil	Reduction of heat transfer due to fouling	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	Yes	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Lubricating Oil Analysis (B2.1.23). See further evaluation in subsection 3.2.2.2.4.1.
3.2.1.10	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 (B2.1.16)	Yes	Not applicable. WCGS 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.

Table 3.2.1 Summary of Aging Management Evaluations 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
3.2.1.11					Not applicable - BWR only
3.2.1.12	Stainless steel high-pressure safety injection (charging) pump miniflow orifice exposed to treated borated water	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.	Yes	Not applicable. WCGS does not use the safety injection pumps for normal charging, so the applicable NUREG-1801 line was not used.
3.2.1.13					Not applicable - BWR only
3.2.1.14					Not applicable - BWR only
3.2.1.15	Steel containment isolation piping, piping components, and piping elements internal surfaces exposed to treated water	Loss of material due to general, pitting, and crevice corrosion	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	Yes	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Water Chemistry (B2.1.2). See further evaluation in subsection 3.2.2.2.8.2.

Table 3.2.1 Summary of Aging Management Evaluations 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
3.2.1.16	Steel piping, piping components, and piping elements exposed to lubricating oil	Loss of material due to general, pitting, and crevice corrosion	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	Yes	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Lubricating Oil Analysis (B2.1.23). See further evaluation in subsection 3.2.2.2.8.3.
3.2.1.17					Not applicable - BWR only
3.2.1.18					Not applicable - BWR only
3.2.1.19					Not applicable - BWR only
3.2.1.20					Not applicable - BWR only
3.2.1.21	High-strength steel closure bolting exposed to air with steam or water leakage	Cracking due to cyclic loading, stress corrosion cracking	Bolting Integrity (B2.1.7)	No	Not applicable. WCGS has no in scope high-strength steel closure bolting exposed to air with steam or water leakage in the engineered safety features systems, so the applicable NUREG-1801 line was not used.

Table 3.2.1 Summary of Aging Management Evaluations 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
3.2.1.22	Steel closure bolting exposed to air with steam or water leakage	Loss of material due to general corrosion	Bolting Integrity (B2.1.7)	No	Not applicable. WCGS has no in scope steel closure bolting exposed to air with steam or water leakage in the engineered safety features systems, so the applicable NUREG-1801 line was not used.
3.2.1.23	Steel bolting and closure bolting exposed to air – outdoor (external), or air – indoor uncontrolled (external)	Loss of material due to general, pitting, and crevice corrosion	Bolting Integrity (B2.1.7)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Bolting Integrity (B2.1.7).
3.2.1.24	Steel closure bolting exposed to air – indoor uncontrolled (external)	Loss of preload due to thermal effects, gasket creep, and self-loosening	Bolting Integrity (B2.1.7)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Bolting Integrity (B2.1.7).

Table 3.2.1 Summary of Aging Management Evaluations 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
3.2.1.25	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-Cycle Cooling Water System (B2.1.10)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Closed-Cycle Cooling Water System (B2.1.10).
3.2.1.26	Steel piping, piping components, and piping elements exposed to closed cycle cooling water	Loss of material due to general, pitting, and crevice corrosion	Closed-Cycle Cooling Water System (B2.1.10)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Closed-Cycle Cooling Water System (B2.1.10).
3.2.1.27	Steel heat exchanger components exposed to closed cycle cooling water	Loss of material due to general, pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System (B2.1.10)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Closed-Cycle Cooling Water System (B2.1.10).

Table 3.2.1 Summary of Aging Management Evaluations 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
3.2.1.28	Stainless steel piping, piping components, piping elements, and heat exchanger components exposed to closed-cycle cooling water	Loss of material due to pitting and crevice corrosion	Closed-Cycle Cooling Water System (B2.1.10)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Closed-Cycle Cooling Water System (B2.1.10).
3.2.1.29	Copper alloy piping, piping components, piping elements, and heat exchanger components exposed to closed cycle cooling water	Loss of material due to pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System (B2.1.10)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Closed-Cycle Cooling Water System (B2.1.10).
3.2.1.30	Stainless steel and copper alloy heat exchanger tubes exposed to closed cycle cooling water	Reduction of heat transfer due to fouling	Closed-Cycle Cooling Water System (B2.1.10)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Closed-Cycle Cooling Water System (B2.1.10).

Table 3.2.1 Summary of Aging Management Evaluations 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
3.2.1.31	External surfaces of steel components including ducting, piping, ducting closure bolting, and containment isolation piping external surfaces exposed to air - indoor uncontrolled (external); condensation (external) and air - outdoor (external)	Loss of material due to general corrosion	External Surfaces Monitoring (B2.1.20)	No	Consistent with NUREG-1801.
3.2.1.32	Steel piping and ducting components and 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 (B2.1.22)	No	Not applicable. WCGS has no in scope steel piping and ducting components and internal surfaces exposed to air – indoor uncontrolled (internal) in the containment spray system, so the applicable NUREG-1801 line was not used.
3.2.1.33	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 (B2.1.22)	No	Consistent with NUREG-1801.

Table 3.2.1 Summary of Aging Management Evaluations 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
3.2.1.34	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 (B2.1.22)	No	Not applicable - BWR only
3.2.1.35	Steel containment isolation piping and components internal surfaces exposed to raw water	Loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion, and fouling	Open-Cycle Cooling Water System (B2.1.9)	No	Not applicable. Containment isolation piping and components internal surfaces are addressed by other plant systems' NUREG-1801 lines, so the applicable NUREG-1801 line was not used.
3.2.1.36	Steel heat exchanger components exposed to raw water	Loss of material due to general, pitting, crevice, galvanic, and microbiologically-influenced corrosion, and fouling	Open-Cycle Cooling Water System (B2.1.9)	No	Not applicable. WCGS has no in scope steel heat exchanger components exposed to raw water in the containment spray and emergency core cooling systems, so the applicable NUREG-1801 line was not used.

Table 3.2.1 Summary of Aging Management Evaluations 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
3.2.1.37	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 (B2.1.9)	No	Not applicable. WCGS has no in scope stainless steel piping, piping components, and piping elements exposed to raw water in the emergency core cooling system, so the applicable NUREG-1801 line was not used.
3.2.1.38	Stainless steel containment isolation piping and components internal surfaces exposed to raw water	Loss of material due to pitting, crevice, and microbiologically-influenced corrosion, and fouling	Open-Cycle Cooling Water System (B2.1.9)	No	Not applicable. Containment isolation piping and components internal surfaces are addressed by other plant systems' NUREG-1801 lines, so the applicable NUREG-1801 line was not used.
3.2.1.39	Stainless steel heat exchanger components exposed to raw water	Loss of material due to pitting, crevice, and microbiologically-influenced corrosion, and fouling	Open-Cycle Cooling Water System (B2.1.9)	No	Not applicable. WCGS has no in scope stainless steel heat exchanger components exposed to raw water in the containment spray and emergency core cooling systems, so the applicable NUREG-1801 lines were not used.

Table 3.2.1 Summary of Aging Management Evaluations 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
3.2.1.40	Steel and stainless steel heat exchanger tubes (serviced by open-cycle cooling water) exposed to raw water	Reduction of heat transfer due to fouling	Open-Cycle Cooling Water System (B2.1.9)	No	Not applicable. WCGS has no in scope steel and stainless steel heat exchanger tubes (serviced by open-cycle cooling water) exposed to raw water in the containment spray and emergency core cooling systems, so the applicable NUREG-1801 lines were not used.
3.2.1.41	Copper alloy >15% Zn piping, piping components, piping elements, and heat exchanger components exposed to closed cycle cooling water	Loss of material due to selective leaching	Selective Leaching of Materials (B2.1.17)	No	Not applicable. WCGS has no in scope copper alloy >15% Zn piping, piping components, piping elements, and heat exchanger components exposed to closed cycle cooling water in the containment spray and emergency core cooling systems, so the applicable NUREG-1801 lines were not used.
3.2.1.42	Gray cast iron piping, piping components, piping elements exposed to closed-cycle cooling water	Loss of material due to selective leaching	Selective Leaching of Materials (B2.1.17)	No	Not applicable. WCGS has no in scope gray cast iron piping, piping components, and piping elements exposed to closed cycle cooling water in the emergency core cooling system, so the applicable NUREG-1801 line was not used.

Table 3.2.1 Summary of Aging Management Evaluations 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
3.2.1.43	Gray cast iron piping, piping components, and piping elements exposed to soil	Loss of material due to selective leaching	Selective Leaching of Materials (B2.1.17)	No	Not applicable. WCGS has no in scope gray cast iron piping, piping components and piping elements exposed to soil in the emergency core cooling system, so the applicable NUREG-1801 line was not used.
3.2.1.44	Gray cast iron motor cooler exposed to treated water	Loss of material due to selective leaching	Selective Leaching of Materials (B2.1.17)	No	Not applicable. WCGS has no in scope gray cast iron motor cooler exposed to treated water in the containment spray and emergency core cooling systems, so the applicable NUREG-1801 lines were not used.
3.2.1.45	Aluminum, copper alloy >15% Zn, and steel external surfaces, bolting, and 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	Consistent with NUREG-1801.

Table 3.2.1 Summary of Aging Management Evaluations 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
3.2.1.46	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 (B2.1.22)	No	Not applicable. WCGS has no in scope steel encapsulation components exposed to air with borated water leakage (internal) in the containment spray system, so the applicable NUREG-1801 line was not used.
3.2.1.47	Cast austenitic stainless steel piping, piping components, and piping elements exposed to treated borated water >250°C (>482°F)	Loss of fracture toughness due to thermal aging embrittlement	Thermal Aging Embrittlement of CASS	No	Not applicable. WCGS has no in scope cast austenitic stainless steel piping, piping components, and piping elements exposed to treated borated water >250°C in the emergency core cooling system, so the applicable NUREG-1801 line was not used.
3.2.1.48	Stainless steel or stainless-steel-clad steel piping, piping components, piping elements, and tanks (including safety injection tanks/accumulators) exposed to treated borated water >60°C (>140°F)	Cracking due to stress corrosion cracking	Water Chemistry (B2.1.2)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Water Chemistry (B2.1.2).

Table 3.2.1 Summary of Aging Management Evaluations 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
3.2.1.49	Stainless steel piping, piping components, piping elements, and tanks exposed to treated borated water	Loss of material due to pitting and crevice corrosion	Water Chemistry (B2.1.2)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Water Chemistry (B2.1.2).
3.2.1.50	Aluminum piping, piping components, and piping elements exposed to air- indoor uncontrolled (internal/external)	None	None	NA	Consistent with NUREG-1801.
3.2.1.51	Galvanized steel ducting exposed to air – indoor controlled (external)	None	None	NA	Not applicable. WCGS has no in scope galvanized steel ducting exposed to air – indoor controlled (external) in the engineered safety features systems, so the applicable NUREG-1801 line was not used.
3.2.1.52	Glass piping elements exposed to air – indoor uncontrolled (external), lubricating oil, raw water, treated water, or treated borated water	None	None	NA	Consistent with NUREG-1801.

Table 3.2.1 Summary of Aging Management Evaluations 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
3.2.1.53	Stainless steel, copper alloy, and nickel alloy piping, piping components, and piping elements exposed to air – indoor uncontrolled (external)	None	None	NA	Consistent with NUREG-1801.
3.2.1.54	Steel piping, piping components, and piping elements exposed to air – indoor controlled (external)	None	None	NA	Not applicable. WCGS has no in scope steel piping, piping components, and piping elements exposed to air – indoor controlled (external) in the engineered safety features systems, so the applicable NUREG-1801 line was not used.
3.2.1.55	Steel and stainless steel piping, piping components, and piping elements in concrete	None	None	NA	Consistent with NUREG-1801.
3.2.1.56	Steel, stainless steel, and copper alloy piping, piping components, and piping elements exposed to gas	None	None	NA	Consistent with NUREG-1801.

Table 3.2.1 Summary of Aging Management Evaluations 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
3.2.1.57	Stainless steel and copper alloy <15% Zn piping, piping components, and piping elements exposed to air with borated water leakage	None	None	NA	Not applicable. WCGS has no in scope stainless steel and copper alloy <15% Zn piping, piping components, and piping elements exposed to air with borated water leakage in the engineered safety features systems, so the applicable NUREG-1801 line was not used.

Table 3.2.2-1 Engineered Safety Features – Summary of Aging Management Evaluation – Nuclear Sampling System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Closure Bolting	LBS	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.7)	V.E-4	3.2.1.23	B
Closure Bolting	LBS	Carbon Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.7)	V.E-5	3.2.1.24	B
Closure Bolting	LBS, PB	Stainless Steel	Borated Water Leakage (Ext)	Loss of preload	Bolting Integrity (B2.1.7)	None	None	F
Flow Indicator	LBS	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F-12	3.2.1.53	A
Flow Indicator	LBS	Stainless Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VIII.F-23	3.4.1.16	B
Piping	LBS	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	V.D1-6	3.2.1.27	D
Piping	LBS	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	V.E-7	3.2.1.31	A
Piping	LBS	Stainless Steel	Demineralized Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	V.C-4	3.2.1.03	D
Piping	LBS, PB, SIA	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F-12	3.2.1.53	A
Piping	LBS, PB, SIA	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2)	V.D1-30	3.2.1.49	B
Piping	LBS, PB, SIA	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2)	V.D1-31	3.2.1.48	B

Table 3.2.2-1 Engineered Safety Features – Summary of Aging Management Evaluation – Nuclear Sampling System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Tubing	LBS, PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F-12	3.2.1.53	A
Tubing	LBS	Stainless Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VIII.F-23	3.4.1.16	B
Tubing	LBS, PB	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2)	V.D1-30	3.2.1.49	B
Tubing	LBS, PB	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2)	V.D1-31	3.2.1.48	B
Valve	LBS, PB, SIA	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F-12	3.2.1.53	A
Valve	LBS	Stainless Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VIII.F-23	3.4.1.16	B
Valve	LBS, PB, SIA	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2)	V.D1-30	3.2.1.49	B
Valve	LBS, PB, SIA	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2)	V.D1-31	3.2.1.48	B

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.

D Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.

F Material not in NUREG-1801 for this component.

Plant Specific Notes:

None

Table 3.2.2-2 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 Vol. 2 Item	Table 1 Item	Notes
Closure Bolting	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.7)	V.E-4	3.2.1.23	B
Closure Bolting	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.7)	V.E-5	3.2.1.24	B
Closure Bolting	LBS, PB	Stainless Steel	Borated Water Leakage (Ext)	Loss of preload	Bolting Integrity (B2.1.7)	None	None	F, 1
Eductor	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F-12	3.2.1.53	A
Eductor	PB	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2)	V.A-27	3.2.1.49	B
Expansion Joint	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F-12	3.2.1.53	A
Expansion Joint	PB	Stainless Steel	Plant Indoor Air (Int)	None	None	V.F-12	3.2.1.53	A, 3
Flow Element	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F-12	3.2.1.53	A
Flow Element	PB	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2)	V.A-27	3.2.1.49	B
Orifice	LBS	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F-12	3.2.1.53	A
Orifice	LBS	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2)	V.A-27	3.2.1.49	B

Table 3.2.2-2 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 Vol. 2 Item	Table 1 Item	Notes
Piping	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	V.E-7	3.2.1.31	A
Piping	PB	Carbon Steel	Plant Indoor Air (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	V.A-2	3.2.1.33	A
Piping	PB	Stainless Steel	Dry Gas (Int)	None	None	V.F-15	3.2.1.56	A
Piping	LBS, PB, SIA	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F-12	3.2.1.53	A
Piping	PB, SIA	Stainless Steel	Plant Indoor Air (Int)	None	None	V.F-12	3.2.1.53	A, 3
Piping	PB, SIA	Stainless Steel	Sodium Hydroxide (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	None	None	G, 2
Piping	LBS, PB, SIA	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2)	V.A-27	3.2.1.49	B
Pump	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F-12	3.2.1.53	A
Pump	PB	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2)	V.A-27	3.2.1.49	B
Spray Nozzle	SP	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F-12	3.2.1.53	A
Spray Nozzle	SP	Stainless Steel	Plant Indoor Air (Int)	None	None	V.F-12	3.2.1.53	A, 3

Table 3.2.2-2 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 Vol. 2 Item	Table 1 Item	Notes
Tank	PB	Stainless Steel	Dry Gas (Int)	None	None	V.F-15	3.2.1.56	C
Tank	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F-12	3.2.1.53	C
Tank	PB	Stainless Steel	Plant Indoor Air (Int)	None	None	V.F-12	3.2.1.53	C, 3
Tank	PB	Stainless Steel	Sodium Hydroxide (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	None	None	G, 2
Tubing	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F-12	3.2.1.53	A
Tubing	PB	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2)	V.A-27	3.2.1.49	B
Valve	PB	Stainless Steel	Dry Gas (Int)	None	None	V.F-15	3.2.1.56	A
Valve	LBS, PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F-12	3.2.1.53	A
Valve	PB	Stainless Steel	Plant Indoor Air (Int)	None	None	V.F-12	3.2.1.53	A, 3
Valve	PB	Stainless Steel	Sodium Hydroxide (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	None	None	G, 2
Valve	LBS, PB	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2)	V.A-27	3.2.1.49	B
Vortex Breaker	DF	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F-12	3.2.1.53	A
Vortex Breaker	DF	Stainless Steel	Plant Indoor Air (Int)	None	None	V.F-12	3.2.1.53	C, 3

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.
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:

1	Loss of Preload requires aging management for stainless steel closure bolting in valves in the engineered safety features systems. Loss of Preload for stainless steel components in a borated water leakage environment is not evaluated in NUREG-1801.
2	Operating experience does not suggest there is any aging effect, and the use of stainless steel up to 200 °F and 50 w% NaOH is common in industrial applications with no special consideration for aging. There is no NUREG-1801 line for the NaOH environment.
3	These items are assigned the environment of "Plant Indoor Air (Internal)." The items are vented or open to the plant atmosphere so the distinction between internal and external is not relevant for aging purposes. For this reason, NUREG-1801 line V.F-12 (Air - Indoor Uncontrolled (External)) was used for comparison.

Table 3.2.2-3 Engineered Safety Features – Summary of Aging Management Evaluation - Containment Integrated Leak Rate Test System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Closure Bolting	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.7)	V.E-4	3.2.1.23	B
Closure Bolting	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.7)	V.E-5	3.2.1.24	B
Piping	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	V.C-1	3.2.1.31	A
Piping	PB	Carbon Steel	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.F3-3	3.3.1.72	C
Valve	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	V.C-1	3.2.1.31	A
Valve	PB	Carbon Steel	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.F3-3	3.3.1.72	C

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.

Table 3.2.2-4 Engineered Safety Features – Summary of Aging Management Evaluation - Decontamination System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Closure Bolting	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.7)	V.E-4	3.2.1.23	B
Closure Bolting	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.7)	V.E-5	3.2.1.24	B
Piping	SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	V.C-1	3.2.1.31	C
Piping	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	V.C-1	3.2.1.31	A
Piping	PB, SIA	Carbon Steel	Wetted Gas (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VIII.B1-7	3.4.1.30	A
Valve	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	V.C-1	3.2.1.31	A
Valve	PB	Carbon Steel	Wetted Gas (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VIII.B1-7	3.4.1.30	A

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.

Plant Specific Notes:

None

Table 3.2.2-5 Engineered Safety Features – Summary of Aging Management Evaluation - Liquid Radwaste System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Closure Bolting	LBS, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.7)	V.E-4	3.2.1.23	B
Closure Bolting	LBS, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.7)	V.E-5	3.2.1.24	B
Closure Bolting	LBS, PB	Stainless Steel	Borated Water Leakage (Ext)	Loss of preload	Bolting Integrity (B2.1.7)	None	None	F, 1
Flow Element	PB	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.C2-14	3.3.1.47	B
Flow Element	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	V.C-1	3.2.1.31	A
Flow Element	LBS	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F-12	3.2.1.53	A
Flow Element	LBS	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2)	V.A-27	3.2.1.49	B
Flow Element	LBS	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2)	V.A-28	3.2.1.48	B

Table 3.2.2-5 Engineered Safety Features – Summary of Aging Management Evaluation - Liquid Radwaste System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Heat Exchanger Shell Side (HX # 10)	PB	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.C2-1	3.3.1.48	B
Heat Exchanger Shell Side (HX # 10)	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	V.C-1	3.2.1.31	C
Heat Exchanger Tube Side (HX # 11, 12)	PB	Stainless Steel	Closed Cycle Cooling Water (Ext)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	V.C-7	3.2.1.28	D
Heat Exchanger Tube Side (HX # 13)	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F-12	3.2.1.53	C
Heat Exchanger Tube Side (HX # 11, 12, 13)	PB	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2)	V.A-27	3.2.1.49	D
Heat Exchanger Tube Side (HX # 11, 12, 13)	PB	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2)	V.A-28	3.2.1.48	D
Heater	LBS	Carbon Steel	Demineralized Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	V.C-6	3.2.1.15	D
Heater	LBS	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	V.C-1	3.2.1.31	C
Instrument Bellows	LBS	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F-12	3.2.1.53	A

Table 3.2.2-5 Engineered Safety Features – Summary of Aging Management Evaluation - Liquid Radwaste System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Instrument Bellows	LBS	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2)	V.A-27	3.2.1.49	B
Instrument Bellows	LBS	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2)	V.A-28	3.2.1.48	B
Piping	PB, SIA	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.C2-14	3.3.1.47	B
Piping	PB, SIA	Carbon Steel	Dry Gas (Int)	None	None	V.F-18	3.2.1.56	A
Piping	PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	V.C-1	3.2.1.31	A
Piping	LBS	Stainless Steel	Demineralized Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	V.C-4	3.2.1.03	B
Piping	SIA	Stainless Steel	Dry Gas (Int)	None	None	V.F-15	3.2.1.56	A
Piping	LBS, PB, SIA	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F-12	3.2.1.53	A
Piping	LBS, PB, SIA	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2)	V.A-27	3.2.1.49	B
Piping	LBS, PB, SIA	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2)	V.A-28	3.2.1.48	B
Pump	LBS	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F-12	3.2.1.53	A
Pump	LBS	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2)	V.A-27	3.2.1.49	B
Pump	LBS	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2)	V.A-28	3.2.1.48	B

Table 3.2.2-5 Engineered Safety Features – Summary of Aging Management Evaluation - Liquid Radwaste System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Tank	LBS	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F-12	3.2.1.53	C
Tank	LBS	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2)	V.A-27	3.2.1.49	B
Tank	LBS	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2)	V.A-28	3.2.1.48	B
Thermowell	PB	Stainless Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	V.C-7	3.2.1.28	B
Thermowell	LBS, PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F-12	3.2.1.53	A
Thermowell	LBS	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2)	V.A-27	3.2.1.49	B
Thermowell	LBS	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2)	V.A-28	3.2.1.48	B
Tubing	PB	Stainless Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	V.C-7	3.2.1.28	B
Tubing	LBS, PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F-12	3.2.1.53	A
Tubing	LBS	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2)	V.A-27	3.2.1.49	B
Tubing	LBS	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2)	V.A-28	3.2.1.48	B
Valve	PB	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.C2-14	3.3.1.47	B
Valve	PB, SIA	Carbon Steel	Dry Gas (Int)	None	None	V.F-18	3.2.1.56	A

Table 3.2.2-5 Engineered Safety Features – Summary of Aging Management Evaluation - Liquid Radwaste System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Valve	PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	V.C-1	3.2.1.31	A
Valve	LBS	Stainless Steel	Demineralized Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	V.C-4	3.2.1.03	B
Valve	SIA	Stainless Steel	Dry Gas (Int)	None	None	V.F-15	3.2.1.56	A
Valve	LBS, PB, SIA	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F-12	3.2.1.53	A
Valve	LBS, PB, SIA	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2)	V.A-27	3.2.1.49	B
Valve	LBS, PB, SIA	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2)	V.A-28	3.2.1.48	B

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.

D Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.

F Material not in NUREG-1801 for this component.

Plant Specific Notes:

1 NUREG 1801 does not consider stainless steel bolting in any environment. This non-NUREG-1801 line was added to account for the loss of preload / stress relaxation aging effect not addressed by other NUREG-1801 or non-NUREG-1801 lines. This non-NUREG-1801 line is based upon the same aging effects seen in carbon-steel bolting in NUREG-1801 line V.E-5.

Table 3.2.2-6 Engineered Safety Features – Summary of Aging Management Evaluation - Reactor Makeup Water System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Closure Bolting	LBS, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.7)	V.E-4	3.2.1.23	B
Closure Bolting	LBS, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.7)	V.E-5	3.2.1.24	B
Orifice	LBS	Stainless Steel	Demineralized Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	V.C-4	3.2.1.03	D
Orifice	LBS	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F-12	3.2.1.53	A
Piping	LBS, PB, SIA	Stainless Steel	Demineralized Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	V.C-4	3.2.1.03	D
Piping	LBS, PB, SIA	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F-12	3.2.1.53	A
Pump	LBS	Stainless Steel Cast Austenitic	Demineralized Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	V.C-4	3.2.1.03	D
Pump	LBS	Stainless Steel Cast Austenitic	Plant Indoor Air (Ext)	None	None	V.F-12	3.2.1.53	A
Tubing	LBS	Stainless Steel	Demineralized Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	V.C-4	3.2.1.03	D
Tubing	LBS	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F-12	3.2.1.53	A

Table 3.2.2-6 Engineered Safety Features – 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 Vol. 2 Item	Table 1 Item	Notes
Valve	LBS, PB, SIA	Stainless Steel	Demineralized Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	V.C-4	3.2.1.03	D
Valve	LBS, PB, SIA	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F-12	3.2.1.53	A

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.

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 3.2.2-7 Engineered Safety Features – Summary of Aging Management Evaluation - Containment Purge HVAC System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Closure Bolting	PB	Carbon Steel	Atmosphere/ Weather (Ext)	Loss of preload	Bolting Integrity (B2.1.7)	None	None	H, 1
Closure Bolting	PB	Carbon Steel	Atmosphere/ Weather (Ext)	Loss of material	Bolting Integrity (B2.1.7)	V.E-1	3.2.1.23	B
Closure Bolting	LBS, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.7)	V.E-4	3.2.1.23	B
Closure Bolting	LBS, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.7)	V.E-5	3.2.1.24	B
Closure Bolting	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.F3-4	3.3.1.55	A
Damper	PB	Carbon Steel (Galvanized or Coated)	Atmosphere/ Weather (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	V.E-8	3.2.1.31	A
Damper	FB, PB	Carbon Steel (Galvanized or Coated)	Encased in Concrete (Ext)	None	None	V.F-17	3.2.1.55	C
Damper	PB	Carbon Steel (Galvanized or Coated)	Plant Indoor Air (Ext)	None	None	VII.J-6	3.3.1.92	C
Damper	FB, PB	Carbon Steel (Galvanized or Coated)	Ventilation Atmosphere (Int)	None	None	VII.J-6	3.3.1.92	C

Table 3.2.2-7 Engineered Safety Features – Summary of Aging Management Evaluation - Containment Purge HVAC System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Ductwork	DF	Carbon Steel (Galvanized or Coated)	Atmosphere/ Weather (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	V.E-8	3.2.1.31	A
Ductwork	PB	Carbon Steel (Galvanized or Coated)	Plant Indoor Air (Ext)	None	None	VII.J-6	3.3.1.92	C
Ductwork	DF, PB	Carbon Steel (Galvanized or Coated)	Ventilation Atmosphere (Int)	None	None	VII.J-6	3.3.1.92	C
Flex Connectors	PB	Elastomer	Plant Indoor Air (Ext)	Hardening and loss of strength	External Surfaces Monitoring Program (B2.1.20)	VII.F3-7	3.3.1.11	E
Flex Connectors	PB	Elastomer	Ventilation Atmosphere (Int)	Hardening and loss of strength	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.F3-7	3.3.1.11	A
Heat Exchanger Tube Side (HX # 14, 15, 16)	LBS	Copper	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.F3-8	3.3.1.51	B

Table 3.2.2-7 Engineered Safety Features – Summary of Aging Management Evaluation - Containment Purge HVAC System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Heat Exchanger Tube Side (HX # 14, 15, 16)	LBS	Copper	Ventilation Atmosphere (Ext)	None	None	V.F-3	3.2.1.53	C
Piping	LBS	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	V.C-9	3.2.1.26	B
Piping	LBS, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	V.E-7	3.2.1.31	A
Piping	PB	Carbon Steel	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.F3-3	3.3.1.72	A
Pump	LBS	Cast Iron (Gray Cast Iron)	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	V.C-9	3.2.1.26	B
Pump	LBS	Cast Iron (Gray Cast Iron)	Closed Cycle Cooling Water (Int)	Loss of material	Selective Leaching of Materials (B2.1.17)	VII.F3-18	3.3.1.85	B
Pump	LBS	Cast Iron (Gray Cast Iron)	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	V.E-7	3.2.1.31	A
Tubing	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F-12	3.2.1.53	A

Table 3.2.2-7 Engineered Safety Features – Summary of Aging Management Evaluation - Containment Purge HVAC System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Tubing	PB	Stainless Steel	Ventilation Atmosphere (Int)	None	None	V.F-12	3.2.1.53	A, 2
Valve	LBS	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	V.C-9	3.2.1.26	B
Valve	LBS, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	V.E-7	3.2.1.31	A
Valve	PB	Carbon Steel	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.F3-3	3.3.1.72	A
Valve	LBS	Cast Iron (Gray Cast Iron)	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	V.C-9	3.2.1.26	B
Valve	LBS	Cast Iron (Gray Cast Iron)	Closed Cycle Cooling Water (Int)	Loss of material	Selective Leaching of Materials (B2.1.17)	VII.F3-18	3.3.1.85	B
Valve	LBS	Cast Iron (Gray Cast Iron)	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	V.E-7	3.2.1.31	A
Valve	LBS	Copper Alloys	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.F3-15	3.3.1.51	B
Valve	LBS	Copper Alloys	Plant Indoor Air (Ext)	None	None	V.F-3	3.2.1.53	A
Valve	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F-12	3.2.1.53	A

Table 3.2.2-7 Engineered Safety Features – Summary of Aging Management Evaluation - Containment Purge HVAC System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Valve	PB	Stainless Steel	Ventilation Atmosphere (Int)	None	None	V.F-12	3.2.1.53	A, 2

Notes for Table 3.2.2-7:

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.

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.

H Aging effect not in NUREG-1801 for this component, material and environment combination.

Plant Specific Notes:

1 Loss of Preload is conservatively considered to be applicable for all closure bolting. NUREG-1801 only addresses Loss of Preload for bolting of "Steel in Air-Indoor Uncontrolled."

2 Stainless steel valves and tubing in the containment purge system with an internal environment of ventilation atmosphere are not normally expected to be exposed to condensation. NUREG-1801 line referenced for the aging evaluation is V.F-12 which is for Air-Indoor Uncontrolled (external). In ventilation systems, the internal and external air environments are evaluated as equivalent.

Table 3.2.2-8 Engineered Safety Features – Summary of Aging Management Evaluation - Breathing Air System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Closure Bolting	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.7)	V.E-4	3.2.1.23	B
Closure Bolting	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.7)	V.E-5	3.2.1.24	B
Piping	PB, SIA	Stainless Steel	Dry Gas (Int)	None	None	V.F-15	3.2.1.56	A
Piping	PB, SIA	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F-12	3.2.1.53	A
Valve	PB, SIA	Stainless Steel	Dry Gas (Int)	None	None	V.F-15	3.2.1.56	A
Valve	PB, SIA	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F-12	3.2.1.53	A

Notes for Table 3.2.2-8:

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 3.2.2-9 Engineered Safety Features – Summary of Aging Management Evaluation - Hydrogen Control System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Closure Bolting	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.7)	V.E-4	3.2.1.23	B
Closure Bolting	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.7)	V.E-5	3.2.1.24	B
Orifice	PB	Stainless Steel	Dry Gas (Int)	None	None	V.F-15	3.2.1.56	A
Orifice	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F-12	3.2.1.53	A
Piping	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	V.C-1	3.2.1.31	A
Piping	PB	Carbon Steel	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	None	None	G
Piping	PB, SIA	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F-12	3.2.1.53	A
Piping	PB, SIA	Stainless Steel	Ventilation Atmosphere (Int)	None	None	V.F-12	3.2.1.53	A
Recombiners	DF	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F-12	3.2.1.53	C
Recombiners	DF	Stainless Steel	Ventilation Atmosphere (Int)	None	None	V.F-12	3.2.1.53	A
Sample Vessel	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F-12	3.2.1.53	C

Table 3.2.2-9 Engineered Safety Features – Summary of Aging Management Evaluation - Hydrogen Control System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Sample Vessel	PB	Stainless Steel	Ventilation Atmosphere (Int)	None	None	V.F-12	3.2.1.53	A
Tubing	PB	Stainless Steel	Dry Gas (Int)	None	None	V.F-15	3.2.1.56	A
Tubing	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F-12	3.2.1.53	A
Tubing	PB	Stainless Steel	Ventilation Atmosphere (Int)	None	None	V.F-12	3.2.1.53	A
Valve	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	V.C-1	3.2.1.31	A
Valve	PB	Carbon Steel	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	None	None	G
Valve	PB	Stainless Steel	Dry Gas (Int)	None	None	V.F-15	3.2.1.56	A
Valve	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F-12	3.2.1.53	A
Valve	PB	Stainless Steel	Ventilation Atmosphere (Int)	None	None	V.F-12	3.2.1.53	A

Notes for Table 3.2.2-9:

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.
G	Environment not in NUREG-1801 for this component and material.

Plant Specific Notes:

None

Table 3.2.2-10 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 Vol. 2 Item	Table 1 Item	Notes
Accumulator	PB	Carbon Steel with Stainless Steel Cladding	Borated Water Leakage (Ext)	Loss of material	Boric Acid Corrosion (B2.1.4)	V.D1-1	3.2.1.45	A
Accumulator	PB	Carbon Steel with Stainless Steel Cladding	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2)	V.D1-30	3.2.1.49	B
Accumulator	PB	Carbon Steel with Stainless Steel Cladding	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2)	V.D1-33	3.2.1.48	B
Accumulator	PB	Nickel Alloys	Plant Indoor Air (Ext)	None	None	V.F-11	3.2.1.53	C
Accumulator	PB	Nickel Alloys	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2)	None	None	F, 2
Accumulator	PB	Nickel Alloys	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2) and Nickel Alloy Aging Management (B2.1.34)	None	None	F, 2

Table 3.2.2-10 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 Vol. 2 Item	Table 1 Item	Notes
Class 1 Piping <= 4in	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F-12	3.2.1.53	A
Class 1 Piping <= 4in	PB	Stainless Steel	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD for Class 1 components (B2.1.1) and Water Chemistry (B2.1.2) and One-Time Inspection Of ASME Code Class 1 Small-Bore Piping (B2.1.19)	IV.C2-1	3.1.1.70	B
Class 1 Piping <= 4in	PB	Stainless Steel	Reactor Coolant (Int)	Loss of material	Water Chemistry (B2.1.2)	IV.C2-15	3.1.1.83	B
Closure Bolting	LBS, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.7)	V.E-4	3.2.1.23	B
Closure Bolting	LBS, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.7)	V.E-5	3.2.1.24	B
Closure Bolting	LBS, PB	Stainless Steel	Borated Water Leakage (Ext)	Loss of preload	Bolting Integrity (B2.1.7)	None	None	F, 1
Filter	FIL	Stainless Steel	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	V.D1-24	3.2.1.06	B
Filter	FIL	Stainless Steel	Lubricating Oil (Ext)	Loss of material	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	V.D1-24	3.2.1.06	B

Table 3.2.2-10 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 Vol. 2 Item	Table 1 Item	Notes
Filter	PB	Carbon Steel	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	V.D1-28	3.2.1.16	B
Filter	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	V.E-7	3.2.1.31	A
Flow Element	LBS, PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F-12	3.2.1.53	A
Flow Element	LBS, PB	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2)	V.D1-30	3.2.1.49	B
Heat Exchanger Shell Side (HX # 17)	PB	Stainless Steel	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	V.D1-24	3.2.1.06	D
Heat Exchanger Shell Side (HX # 17)	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F-12	3.2.1.53	C
Heat Exchanger Tube Side (HX # 18)	HT, PB	Copper-Nickel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	V.D1-2	3.2.1.29	B
Heat Exchanger Tube Side (HX # 18)	HT, PB	Copper-Nickel	Closed Cycle Cooling Water (Int)	Reduction of heat transfer	Closed-Cycle Cooling Water System (B2.1.10)	VII.C2-2	3.3.1.52	B

Table 3.2.2-10 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 Vol. 2 Item	Table 1 Item	Notes
Heat Exchanger Tube Side (HX # 18)	HT, PB	Copper-Nickel	Lubricating Oil (Ext)	Reduction of heat transfer	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	V.D1-8	3.2.1.09	B
Heat Exchanger Tube Side (HX # 18)	HT, PB	Copper-Nickel	Lubricating Oil (Ext)	Loss of material	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	V.D1-18	3.2.1.06	D
Heat Exchanger Tube Side (HX # 19)	PB	Stainless Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	V.D1-4	3.2.1.28	B
Heat Exchanger Tube Side (HX # 19)	PB	Stainless Steel	Lubricating Oil (Ext)	Loss of material	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	V.D1-24	3.2.1.06	D
Heat Exchanger Tube Side (HX # 20)	PB	Stainless Steel Cast Austenitic	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	V.D1-4	3.2.1.28	B
Heat Exchanger Tube Side (HX # 20)	PB	Stainless Steel Cast Austenitic	Plant Indoor Air (Ext)	None	None	V.F-12	3.2.1.53	A
Instrument Bellows	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F-12	3.2.1.53	A
Instrument Bellows	PB	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2)	V.D1-30	3.2.1.49	B

Table 3.2.2-10 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 Vol. 2 Item	Table 1 Item	Notes
Orifice	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F-12	3.2.1.53	A
Orifice	PB	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2)	V.D1-30	3.2.1.49	B
Piping	PB, SIA	Carbon Steel	Dry Gas (Int)	None	None	V.F-18	3.2.1.56	A
Piping	PB	Carbon Steel	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	V.D1-28	3.2.1.16	B
Piping	LBS, PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	V.E-7	3.2.1.31	A
Piping	LBS	Carbon Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2)	VIII.B1-8	3.4.1.37	B
Piping	LBS	Carbon Steel	Secondary Water (Int)	Wall thinning	Flow-Accelerated Corrosion (B2.1.6)	VIII.B1-9	3.4.1.29	B
Piping	LBS	Stainless Steel	Atmosphere/ Weather (Ext)	None	None	None	None	G
Piping	LBS, PB	Stainless Steel	Buried (Ext)	Loss of material	Buried Piping and Tanks Inspection (B2.1.18)	V.D1-26	3.2.1.04	E
Piping	PB	Stainless Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	V.D1-22	3.2.1.28	B
Piping	PB	Stainless Steel	Dry Gas (Int)	None	None	V.F-15	3.2.1.56	A
Piping	LBS, PB, SIA	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F-12	3.2.1.53	A

Table 3.2.2-10 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 Vol. 2 Item	Table 1 Item	Notes
Piping	PB	Stainless Steel	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD for Class 1 components (B2.1.1) and Water Chemistry (B2.1.2)	IV.C2-2	3.1.1.68	B
Piping	PB	Stainless Steel	Reactor Coolant (Int)	Loss of material	Water Chemistry (B2.1.2)	IV.C2-15	3.1.1.83	B
Piping	LBS	Stainless Steel	Secondary Water (Int)	Cracking	Water Chemistry (B2.1.2)	VIII.B1-2	3.4.1.39	B
Piping	LBS	Stainless Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2)	VIII.B1-3	3.4.1.37	B
Piping	PB	Stainless Steel	Treated Borated Water (Int)	Cumulative fatigue damage	Time Limited Aging Analysis evaluated for the period of extended operation.	V.D1-27	3.2.1.01	A
Piping	LBS, PB, SIA	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2)	V.D1-30	3.2.1.49	B
Pump	PB	Carbon Steel	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	V.D1-28	3.2.1.16	B
Pump	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	V.E-7	3.2.1.31	A
Pump	PB	Copper-Nickel	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	V.D1-18	3.2.1.06	B

Table 3.2.2-10 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 Vol. 2 Item	Table 1 Item	Notes
Pump	PB	Copper-Nickel	Plant Indoor Air (Ext)	None	None	V.F-3	3.2.1.53	A
Pump	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F-12	3.2.1.53	A
Pump	PB	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2)	V.D1-30	3.2.1.49	B
Sight Gauge	PB	Copper Alloy (Brass Copper < 85%)	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	V.D1-18	3.2.1.06	B
Sight Gauge	PB	Copper Alloy (Brass Copper < 85%)	Plant Indoor Air (Ext)	None	None	V.F-3	3.2.1.53	A
Sight Gauge	PB	Glass	Lubricating Oil (Int)	None	None	V.F-7	3.2.1.52	A
Sight Gauge	PB	Glass	Plant Indoor Air (Ext)	None	None	V.F-6	3.2.1.52	A
Tank	PB	Carbon Steel (Galvanized or Coated)	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	V.D1-28	3.2.1.16	D
Tank	PB	Carbon Steel (Galvanized or Coated)	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	V.E-7	3.2.1.31	A
Tank	PB	Stainless Steel	Atmosphere/ Weather (Ext)	None	None	None	None	G
Tank	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F-12	3.2.1.53	C

Table 3.2.2-10 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 Vol. 2 Item	Table 1 Item	Notes
Tank	PB	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2)	V.D1-30	3.2.1.49	B
Thermowell	PB	Stainless Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	V.D1-22	3.2.1.28	B
Thermowell	LBS, PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F-12	3.2.1.53	A
Thermowell	LBS	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2)	V.D1-30	3.2.1.49	B
Tubing	LBS, PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F-12	3.2.1.53	A
Tubing	LBS, PB	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2)	V.D1-30	3.2.1.49	B
Valve	PB, SIA	Carbon Steel	Dry Gas (Int)	None	None	V.F-18	3.2.1.56	A
Valve	LBS, PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	V.E-7	3.2.1.31	A
Valve	LBS	Carbon Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2)	VIII.B1-8	3.4.1.37	B
Valve	LBS	Carbon Steel	Secondary Water (Int)	Wall thinning	Flow-Accelerated Corrosion (B2.1.6)	VIII.B1-9	3.4.1.29	B
Valve	PB	Carbon Steel	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	V.D1-28	3.2.1.16	B
Valve	PB	Stainless Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	V.D1-22	3.2.1.28	B
Valve	PB	Stainless Steel	Dry Gas (Int)	None	None	V.F-15	3.2.1.56	A

Table 3.2.2-10 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 Vol. 2 Item	Table 1 Item	Notes
Valve	LBS, PB, SIA	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F-12	3.2.1.53	A
Valve	PB	Stainless Steel	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD for Class 1 components (B2.1.1) and Water Chemistry (B2.1.2)	IV.C2-5	3.1.1.68	B
Valve	PB	Stainless Steel	Reactor Coolant (Int)	Loss of material	Water Chemistry (B2.1.2)	IV.C2-15	3.1.1.83	B
Valve	LBS, PB, SIA	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2)	V.D1-30	3.2.1.49	B

Notes for Table 3.2.2-10:

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.

F Material not in NUREG-1801 for this component.

G Environment not in NUREG-1801 for this component and material.

Plant Specific Notes:

1 Loss of Preload requires aging management for stainless steel closure bolting in valves in the engineered safety features systems. Loss of Preload for stainless steel components in a borated water leakage environment is not evaluated in NUREG-1801.

2 NUREG-1801, Section V.D1 does not include any nickel alloy components. The HPCI system accumulator nozzles contain nickel alloy 82/182 weld metal. The plant-specific Nickel Alloy Aging Management Program (B2.1.34) manages cracking of nickel alloys. Water Chemistry program (B2.1.2) manages loss of material and cracking.

Table 3.2.2-11 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 Vol. 2 Item	Table 1 Item	Notes
Class 1 Piping <= 4in	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F-12	3.2.1.53	A
Class 1 Piping <= 4in	PB	Stainless Steel	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD for Class 1 components (B2.1.1) and Water Chemistry (B2.1.2) and One-Time Inspection Of ASME Code Class 1 Small-Bore Piping (B2.1.19)	IV.C2-1	3.1.1.70	B
Class 1 Piping <= 4in	PB	Stainless Steel	Reactor Coolant (Int)	Loss of material	Water Chemistry (B2.1.2)	IV.C2-15	3.1.1.83	B
Closure Bolting	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.7)	V.E-4	3.2.1.23	B
Closure Bolting	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.7)	V.E-5	3.2.1.24	B
Closure Bolting	LBS, PB	Stainless Steel	Borated Water Leakage (Ext)	Loss of preload	Bolting Integrity (B2.1.7)	None	None	F
Expansion Joint	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F-12	3.2.1.53	A
Expansion Joint	PB	Stainless Steel	Plant Indoor Air (Int)	None	None	V.F-12	3.2.1.53	A, 2

Table 3.2.2-11 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 Vol. 2 Item	Table 1 Item	Notes
Flow Element	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F-12	3.2.1.53	A
Flow Element	PB	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2)	V.D1-30	3.2.1.49	B
Flow Element	PB	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2)	V.D1-31	3.2.1.48	B
Heat Exchanger Shell Side (HX # 21)	PB	Carbon Steel	Borated Water Leakage (Ext)	Loss of material	Boric Acid Corrosion (B2.1.4)	V.D1-1	3.2.1.45	A
Heat Exchanger Shell Side (HX # 22)	SS	Carbon Steel	Closed Cycle Cooling Water (Ext)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	V.D1-6	3.2.1.27	B
Heat Exchanger Shell Side (HX # 21)	PB	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	V.D1-6	3.2.1.27	B
Heat Exchanger Tube Side (HX # 23, 24)	HT, PB	Stainless Steel	Closed Cycle Cooling Water (Ext)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	V.D1-4	3.2.1.28	B
Heat Exchanger Tube Side (HX # 23)	HT, PB	Stainless Steel	Closed Cycle Cooling Water (Ext)	Reduction of heat transfer	Closed-Cycle Cooling Water System (B2.1.10)	V.D1-9	3.2.1.30	B

Table 3.2.2-11 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 Vol. 2 Item	Table 1 Item	Notes
Heat Exchanger Tube Side (HX # 23, 24)	HT, PB	Stainless Steel	Closed Cycle Cooling Water (Ext)	Cracking	Closed-Cycle Cooling Water System (B2.1.10)	V.D1-23	3.2.1.25	D
Heat Exchanger Tube Side (HX # 25)	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F-12	3.2.1.53	C
Heat Exchanger Tube Side (HX # 23)	HT, PB	Stainless Steel	Treated Borated Water (Int)	Reduction of heat transfer	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	None	None	G
Heat Exchanger Tube Side (HX # 23, 24, 25)	HT, PB	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2)	V.D1-30	3.2.1.49	B
Heat Exchanger Tube Side (HX # 23, 24, 25)	HT, PB	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2)	V.D1-31	3.2.1.48	B
Insulation	INS	Aluminum	Plant Indoor Air (Ext)	None	None	V.F-2	3.2.1.50	C
Insulation	INS	Insulation Calcium Silicate	Plant Indoor Air (Ext)	None	None	None	None	J, 1

Table 3.2.2-11 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 Vol. 2 Item	Table 1 Item	Notes
Orifice	PB, TH	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F-12	3.2.1.53	A
Orifice	PB, TH	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2)	V.D1-30	3.2.1.49	B
Orifice	PB, TH	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2)	V.D1-31	3.2.1.48	B
Piping	PB, SIA	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	V.D1-6	3.2.1.27	D
Piping	PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	V.E-7	3.2.1.31	A
Piping	PB	Carbon Steel	Plant Indoor Air (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	V.A-2	3.2.1.33	A
Piping	LBS, PB, SIA	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F-12	3.2.1.53	A
Piping	PB	Stainless Steel	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD for Class 1 components (B2.1.1) and Water Chemistry (B2.1.2)	IV.C2-2	3.1.1.68	B
Piping	PB	Stainless Steel	Reactor Coolant (Int)	Loss of material	Water Chemistry (B2.1.2)	IV.C2-15	3.1.1.83	B

Table 3.2.2-11 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 Vol. 2 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.	V.D1-27	3.2.1.01	A
Piping	LBS, PB, SIA	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2)	V.D1-30	3.2.1.49	B
Piping	LBS, PB, SIA	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2)	V.D1-31	3.2.1.48	B
Pump	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F-12	3.2.1.53	A
Pump	PB	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2)	V.D1-30	3.2.1.49	B
Pump	PB	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2)	V.D1-31	3.2.1.48	B
Screen	FIL	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F-12	3.2.1.53	A
Spacer Ring	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F-12	3.2.1.53	A
Spacer Ring	PB	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2)	V.D1-30	3.2.1.49	B
Spacer Ring	PB	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2)	V.D1-31	3.2.1.48	B
Tank	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F-12	3.2.1.53	C
Tank	PB	Stainless Steel	Plant Indoor Air (Int)	None	None	V.F-12	3.2.1.53	C

Table 3.2.2-11 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 Vol. 2 Item	Table 1 Item	Notes
Thermowell	PB	Stainless Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	V.D1-22	3.2.1.28	B
Thermowell	PB	Stainless Steel	Closed Cycle Cooling Water (Int)	Cracking	Closed-Cycle Cooling Water System (B2.1.10)	V.D1-23	3.2.1.25	B
Thermowell	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F-12	3.2.1.53	A
Thermowell	PB	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2)	V.D1-30	3.2.1.49	B
Thermowell	PB	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2)	V.D1-31	3.2.1.48	B
Tubing	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F-12	3.2.1.53	A
Tubing	PB	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2)	V.D1-30	3.2.1.49	B
Tubing	PB	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2)	V.D1-31	3.2.1.48	B
Valve	PB, SIA	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	V.D1-6	3.2.1.27	D
Valve	PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	V.E-7	3.2.1.31	A
Valve	PB	Stainless Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	V.D1-4	3.2.1.28	B
Valve	PB	Stainless Steel	Closed Cycle Cooling Water (Int)	Cracking	Closed-Cycle Cooling Water System (B2.1.10)	V.D1-23	3.2.1.25	B
Valve	LBS, PB, SIA	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F-12	3.2.1.53	A

Table 3.2.2-11 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 Vol. 2 Item	Table 1 Item	Notes
Valve	PB	Stainless Steel	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD for Class 1 components (B2.1.1) and Water Chemistry (B2.1.2)	IV.C2-5	3.1.1.68	B
Valve	PB	Stainless Steel	Reactor Coolant (Int)	Loss of material	Water Chemistry (B2.1.2)	IV.C2-15	3.1.1.83	B
Valve	LBS, PB, SIA	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2)	V.D1-30	3.2.1.49	B
Valve	LBS, PB, SIA	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2)	V.D1-31	3.2.1.48	B
Valve	PB	Stainless Steel Cast Austenitic	Plant Indoor Air (Ext)	None	None	V.F-12	3.2.1.53	A
Valve	PB	Stainless Steel Cast Austenitic	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2)	V.D1-30	3.2.1.49	B
Valve	PB	Stainless Steel Cast Austenitic	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2)	V.D1-31	3.2.1.48	B
Vortex Breaker	DF	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F-12	3.2.1.53	A
Vortex Breaker	DF	Stainless Steel	Plant Indoor Air (Int)	None	None	V.F-12	3.2.1.53	A, 2

Notes for Table 3.2.2-11:

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.
F	Material not in NUREG-1801 for this component.
G	Environment not in NUREG-1801 for this component and material.
J	Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant Specific Notes:

1	NUREG-1801 does not consider mechanical insulation. The in-scope thermal insulation is located in areas with non-aggressive environments (meaning the insulation is not exposed to contaminants). Based on the review of the plant specific operating experience, it was determined that for stainless steel insulation, closed cell foam, quilted fiberglass insulation, calcium silicate and insulation jacketing in non-aggressive environments, there were no aging effects requiring management.
2	These items are assigned the environment of "Plant Indoor Air (Internal)." The items are vented or open to the plant atmosphere so the distinction between internal and external is not relevant for aging purposes. For this reason, NUREG-1801 line V.F-12 (Air - Indoor Uncontrolled (External)) was used for comparison.

3.3 AGING MANAGEMENT OF AUXILIARY SYSTEMS

3.3.1 Introduction

Section 3.3 provides the results of the aging management reviews for those component types identified in Section 2.3.3, Auxiliary Systems, subject to aging management review. These systems are described in the following sections:

- Fuel handling - Fuel storage and handling system (Section 2.3.3.1)
- Fuel pool cooling and cleanup system (Section 2.3.3.2)
- Essential service water system (Section 2.3.3.3)
- Component cooling water system (Section 2.3.3.4)
- Containment cooling system (Section 2.3.3.5)
- Compressed air system (Section 2.3.3.6)
- Chemical and volume control system (Section 2.3.3.7)
- Auxiliary building HVAC system (Section 2.3.3.8)
- Control building HVAC system (Section 2.3.3.9)
- Fuel building HVAC system (Section 2.3.3.10)
- Essential service water pumphouse building HVAC system (Section 2.3.3.11)
- Miscellaneous buildings HVAC system (Section 2.3.3.12)
- Diesel generator building HVAC system (Section 2.3.3.13)
- Fire protection system (Section 2.3.3.14)
- Emergency diesel engine fuel oil storage and transfer system (Section 2.3.3.15)
- Emergency diesel engine system (Section 2.3.3.16)
- Floor and equipment drains system (Section 2.3.3.17)
- Oily waste system (Section 2.3.3.18)
- Cranes, hoists and elevator systems (Section 2.3.3.19)
- Turbine building HVAC system (Section 2.3.3.20)
- Miscellaneous auxiliary systems in-scope ONLY based on Criterion 10 CFR 54.4(a)(2) (Section 2.3.3.21)

Table 3.3.1, Summary of Aging Management Evaluations 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 3.x.1 (Table 1) described in Section 3.0.

3.3.2 Results

The following tables summarize the results of the aging management review for the systems in the Auxiliary Systems area:

- Table 3.3.2-1 Auxiliary Systems – Summary of Aging Management Evaluation – Fuel Handling – 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 – Essential Service Water System
- Table 3.3.2-4 Auxiliary Systems – Summary of Aging Management Evaluation – Component Cooling Water System
- Table 3.3.2-5 Auxiliary Systems – Summary of Aging Management Evaluation – Containment Cooling System
- Table 3.3.2-6 Auxiliary Systems – Summary of Aging Management Evaluation – Compressed Air System
- Table 3.3.2-7 Auxiliary Systems – Summary of Aging Management Evaluation – Chemical and Volume Control System
- Table 3.3.2-8 Auxiliary Systems – Summary of Aging Management Evaluation – Auxiliary Building HVAC System
- Table 3.3.2-9 Auxiliary Systems – Summary of Aging Management Evaluation – Control Building HVAC System
- Table 3.3.2-10 Auxiliary Systems – Summary of Aging Management Evaluation – Fuel Building HVAC System
- Table 3.3.2-11 Auxiliary Systems – Summary of Aging Management Evaluation – Essential Service Water Pumphouse Building HVAC System
- Table 3.3.2-12 Auxiliary Systems – Summary of Aging Management Evaluation – Miscellaneous Buildings HVAC System
- Table 3.3.2-13 Auxiliary Systems – Summary of Aging Management Evaluation – Diesel Generator Building HVAC System
- Table 3.3.2-14 Auxiliary Systems – Summary of Aging Management Evaluation – Fire Protection System

- Table 3.3.2-15 Auxiliary Systems – Summary of Aging Management Evaluation – Emergency Diesel Engine Fuel Oil Storage and Transfer System
- Table 3.3.2-16 Auxiliary Systems – Summary of Aging Management Evaluation – Emergency Diesel Engine System
- Table 3.3.2-17 Auxiliary Systems – Summary of Aging Management Evaluation – Floor and Equipment Drains System
- Table 3.3.2-18 Auxiliary Systems – Summary of Aging Management Evaluation – Oily Waste System
- Table 3.3.2-19 Auxiliary Systems – Summary of Aging Management Evaluation – Cranes, Hoists and Elevator Systems
- Table 3.3.2-20 Auxiliary Systems – Summary of Aging Management Evaluation – Turbine Building HVAC System
- Table 2.3.3-21 Auxiliary Systems – Summary of Aging Management Evaluation – Miscellaneous Auxiliary Systems In-Scope ONLY based on Criterion 10 CFR 54.4(a) (2).

These tables use the format of Table 2 discussed in Section 3.0.

3.3.2.1 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 systems in the following subsections.

3.3.2.1.1 Fuel Handling—Fuel Storage and Handling System

Materials

The materials of construction for the fuel handling - fuel storage and handling system component types are:

- Boral
- Carbon Steel
- Stainless Steel

Environment

The fuel handling - fuel storage and handling system components are exposed to the following environments:

- Borated Water Leakage
- Plant Indoor Air
- Treated Borated Water

Aging Effects Requiring Management

The following fuel handling - fuel storage and handling system aging effects require management:

- Cracking
- Loss of material

Aging Management Programs

The following aging management programs manage the aging effects for the fuel handling - fuel storage and handling system component types:

- Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B2.1.11)
- Structures Monitoring Program (B2.1.32)
- 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
- Stainless Steel Cast Austenitic

Environment

The fuel pool cooling and cleanup system component types are exposed to the following environments:

- Borated Water Leakage
- Closed-Cycle Cooling Water
- Encased in Concrete
- Plant Indoor Air

- Raw Water
- 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 (B2.1.7)
- Closed-Cycle Cooling Water System (B2.1.10)
- External Surfaces Monitoring Program (B2.1.20)
- One-Time Inspection (B2.1.16)
- Open-Cycle Cooling Water System (B2.1.9)
- Water Chemistry (B2.1.2)

3.3.2.1.3 Essential Service Water System

Materials

The materials of construction for the essential service water system component types are:

- Carbon Steel
- Nickel Alloys
- Stainless Steel

Environment

The essential service water system component types are exposed to the following environments:

- Atmosphere/ Weather
- Buried

- Encased in Concrete
- Plant Indoor Air
- Raw Water

Aging Effects Requiring Management

The following essential 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 essential service water system component types:

- Bolting Integrity (B2.1.7)
- Buried Piping and Tanks Inspection (B2.1.18)
- External Surfaces Monitoring Program (B2.1.20)
- Open-Cycle Cooling Water System (B2.1.9)

3.3.2.1.4 Component Cooling Water System

Materials

The materials of construction for the component cooling water system component types are:

- Carbon Steel
- Copper-Nickel
- Glass
- Stainless Steel
- Stainless Steel Cast Austenitic

Environment

The component cooling water system components are exposed to the following environments:

- Closed-Cycle Cooling Water
- Demineralized Water
- 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 (B2.1.7)
- Closed-Cycle Cooling Water System (B2.1.10)
- External Surfaces Monitoring Program (B2.1.20)
- One-Time Inspection (B2.1.16)
- Open-Cycle Cooling Water System (B2.1.9)
- Water Chemistry (B2.1.2)

3.3.2.1.5 Containment Cooling System

Materials

The materials of construction for the containment cooling system component types are:

- Carbon Steel
- Carbon Steel (Galvanized or Coated)
- Copper-Nickel
- Stainless Steel

Environment

The containment cooling system component types are exposed to the following environments:

- Plant Indoor Air
- Raw Water
- Silicone Fluid

- Ventilation Atmosphere

Aging Effects Requiring Management

The following containment cooling 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 containment cooling system component types:

- Bolting Integrity (B2.1.7)
- External Surfaces Monitoring Program (B2.1.20)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)
- Open-Cycle Cooling Water System (B2.1.9)

3.3.2.1.6 Compressed Air System

Materials

The materials of construction for the compressed air system component types are:

- Carbon Steel
- Copper
- Copper Alloys
- Stainless Steel

Environment

The compressed air system components are exposed to the following environments:

- Dry Gas
- Plant Indoor Air
- Wetted Gas

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:

- 10 CFR Part 50, Appendix J (B2.1.30)
- Bolting Integrity (B2.1.7)
- External Surfaces Monitoring Program (B2.1.20)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)

3.3.2.1.7 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 (Brass Copper < 85%)
- Copper-Nickel
- Glass
- Insulation Calcium Silicate
- Insulation Foamglas
- 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
- Demineralized Water
- Dry Gas
- Lubricating Oil
- Plant Indoor Air
- Raw Water
- Reactor Coolant
- Treated Borated 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

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 (B2.1.7)
- Closed-Cycle Cooling Water System (B2.1.10)
- External Surfaces Monitoring Program (B2.1.20)
- Lubricating Oil Analysis (B2.1.23)
- One-Time Inspection (B2.1.16)
- One-Time Inspection of ASME Code Class Small-Bore Piping (B2.1.19)
- Open-Cycle Cooling Water System (B2.1.9)

- Water Chemistry (B2.1.2)

3.3.2.1.8 Auxiliary Building HVAC System

Materials

The materials of construction for the auxiliary building HVAC system component types are:

- Aluminum
- Carbon Steel
- Carbon Steel (Galvanized or Coated)
- Cast Iron (Gray Cast Iron)
- Copper
- Copper Alloys
- Copper-Nickel
- Elastomer
- Stainless Steel

Environment

The auxiliary building HVAC system component types are exposed to the following environments:

- Closed-Cycle Cooling Water
- Demineralized Water
- Encased in Concrete
- Plant Indoor Air
- Raw Water
- Ventilation Atmosphere
- Wetted Gas

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 (B2.1.7)
- Closed-Cycle Cooling Water System (B2.1.10)
- External Surfaces Monitoring Program (B2.1.20)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)
- One-Time Inspection (B2.1.16)
- Open-Cycle Cooling Water System (B2.1.9)
- Selective Leaching of Materials (B2.1.17)
- Water Chemistry (B2.1.2)

3.3.2.1.9 Control Building HVAC System

Materials

The materials of construction for the control building HVAC system component types are:

- Aluminum
- Carbon Steel
- Carbon Steel (Galvanized or Coated)
- Cast Iron
- Cast Iron (Gray Cast Iron)
- Copper
- Copper Alloys
- Elastomer
- Stainless Steel

Environment

The control building HVAC system component types are exposed to the following environments:

- Closed Cycle Cooling Water

- Dry Gas
- Encased in Concrete
- Plant Indoor Air
- Raw Water
- Ventilation Atmosphere
- Wetted Gas

Aging Effects Requiring Management

The following control building HVAC 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 control building HVAC system component types:

- Bolting Integrity (B2.1.7)
- Closed-Cycle Cooling Water System (B2.1.10)
- External Surfaces Monitoring Program (B2.1.20)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)
- Open-Cycle Cooling Water System (B2.1.9)
- Selective Leaching of Materials (B2.1.17)

3.3.2.1.10 Fuel Building HVAC System

Materials

The materials of construction for the fuel building HVAC system component types are:

- Aluminum
- Carbon Steel
- Carbon Steel (Galvanized or Coated)
- Cast Iron (Gray Cast Iron)
- Copper

- Copper Alloys
- Copper-Nickel
- Elastomer
- Stainless Steel

Environment

The fuel building HVAC system component types are exposed to the following environments:

- Closed Cycle Cooling Water
- Encased in Concrete
- Plant Indoor Air
- Raw Water
- Ventilation Atmosphere
- Wetted Gas

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 (B2.1.7)
- Closed-Cycle Cooling Water System (B2.1.10)
- External Surfaces Monitoring Program (B2.1.20)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)
- Open-Cycle Cooling Water System (B2.1.9)
- Selective Leaching of Materials (B2.1.17)

3.3.2.1.11 Essential Service Water Pumphouse Building HVAC System

Materials

The materials of construction for the essential service water pumphouse building HVAC system component types are:

- Carbon Steel
- Carbon Steel (Galvanized or Coated)
- Elastomer

Environment

The essential service water pumphouse building HVAC system component types are exposed to the following environments:

- Plant Indoor Air
- Ventilation Atmosphere

Aging Effects Requiring Management

The following essential service water pumphouse 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 essential service water pumphouse building HVAC system component types:

- Bolting Integrity (B2.1.7)
- External Surfaces Monitoring Program (B2.1.20)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)

3.3.2.1.12 Miscellaneous Buildings HVAC System

Materials

The materials of construction for the miscellaneous buildings HVAC system component types are:

- Aluminum
- Carbon Steel
- Carbon Steel (Galvanized or Coated)
- Cast Iron (Gray Cast Iron)
- Copper
- Copper Alloy (Brass Copper < 85%)
- Copper-Nickel
- Elastomer
- Stainless Steel

Environment

The miscellaneous buildings HVAC system component types are exposed to the following environments:

- Closed-Cycle Cooling Water
- Encased in Concrete
- Plant Indoor Air
- Raw Water
- Ventilation Atmosphere

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 (B2.1.7)
- Closed-Cycle Cooling Water System (B2.1.10)
- External Surfaces Monitoring Program (B2.1.20)

- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)
- Open-Cycle Cooling Water System (B2.1.9)
- Selective Leaching of Materials (B2.1.17)

3.3.2.1.13 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 or Coated)
- Elastomer

Environment

The diesel generator building HVAC system component types are exposed to the following environments:

- 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 (B2.1.7)
- External Surfaces Monitoring Program (B2.1.20)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)

3.3.2.1.14 Fire Protection System

Materials

The materials of construction for the fire protection system component types are:

- Bronze
- Carbon Steel
- Carbon Steel (Galvanized or Coated)
- Cast Iron
- Cast Iron (Galvanized or Coated)
- Cast Iron (Gray Cast Iron)
- Copper
- Copper Alloy (Brass Copper < 85%)
- Ductile Iron
- Elastomer
- Stainless Steel

Environment

The fire protection system component types are exposed to the following environments:

- Atmosphere/ Weather
- Buried
- Dry Gas
- Fuel Oil
- Lubricating Oil
- Plant Indoor Air
- Raw Water
- Wetted Gas

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:

- Bolting Integrity (B2.1.7)
- Buried Piping and Tanks Inspection (B2.1.18)
- External Surfaces Monitoring Program (B2.1.20)
- Fire Protection (B2.1.12)
- Fire Water System (B2.1.13)
- Fuel Oil Chemistry (B2.1.14)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)
- Lubricating Oil Analysis (B2.1.23)
- One-Time Inspection (B2.1.16)
- Selective Leaching of Materials (B2.1.17)

3.3.2.1.15 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
- Fuel Oil
- Plant Indoor Air

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 (B2.1.7)
- Buried Piping and Tanks Inspection (B2.1.18)
- External Surfaces Monitoring Program (B2.1.20)
- Fuel Oil Chemistry (B2.1.14)
- One-Time Inspection (B2.1.16)

3.3.2.1.16 Emergency Diesel Engine System

Materials

The materials of construction for the emergency diesel engine system component types are:

- Carbon Steel
- Copper Alloy (Brass Copper < 85%)
- Glass
- Insulation Ceramic Fibers
- Stainless Steel

Environment

The emergency diesel engine system component types are exposed to the following environments:

- Atmosphere/ Weather
- Closed Cycle Cooling Water
- Demineralized Water
- Diesel Exhaust
- Dry Gas

- Fuel Oil
- Lubricating Oil
- Plant Indoor Air
- Raw Water
- Ventilation Atmosphere
- Wetted Gas

Aging Effects Requiring Management

The following emergency diesel engine system aging effects require management:

- Cracking
- Loss of material
- Reduction of heat transfer

Aging Management Programs

The following aging management programs manage the aging effects for the emergency diesel engine system component types:

- Closed-Cycle Cooling Water System (B2.1.10)
- External Surfaces Monitoring Program (B2.1.20)
- Fuel Oil Chemistry (B2.1.14)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)
- Lubricating Oil Analysis (B2.1.23)
- One-Time Inspection (B2.1.16)
- Open-Cycle Cooling Water System (B2.1.9)
- Selective Leaching of Materials (B2.1.17)
- Water Chemistry (B2.1.2)

3.3.2.1.17 Floor and Equipment Drains System

Materials

The materials of construction for the floor and equipment drains system component types are:

- Carbon Steel

- Glass
- Stainless Steel

Environment

The floor and equipment drains system component types are exposed to the following environments:

- Lubricating Oil
- Plant Indoor Air
- Raw Water
- Treated Borated Water
- Wetted Gas

Aging Effects Requiring Management

The following floor and equipment drains 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 floor and equipment drains system component types:

- Bolting Integrity (B2.1.7)
- External Surfaces Monitoring Program (B2.1.20)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)
- Water Chemistry (B2.1.2)

3.3.2.1.18 Oily Waste System

Materials

The materials of construction for the oily waste system component types are:

- Carbon Steel
- Carbon Steel (Galvanized or Coated)
- Cast Iron (Gray Cast Iron)

- Stainless Steel

Environment

The oily waste system component types are exposed to the following environments:

- Plant Indoor Air
- Raw 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 (B2.1.7)
- External Surfaces Monitoring Program (B2.1.20)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)
- Selective Leaching of Materials (B2.1.17)

3.3.2.1.19 Cranes, Hoists and Elevator Systems

Materials

The material of construction for the cranes, hoists and elevator systems component types is:

- Carbon Steel

Environment

The cranes, hoists and elevator systems component types are exposed to the following environments:

- Atmosphere/ Weather
- Plant Indoor Air

Aging Effects Requiring Management

The following cranes, hoists and elevator systems aging effect requires management:

- Loss of material

Aging Management Programs

The following aging management program manages the aging effects for the cranes, hoists and elevator systems component types:

- Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B2.1.11)

3.3.2.1.20 Turbine Building HVAC System

Materials

The materials of construction for the turbine building HVAC system component types are:

- Carbon Steel
- Carbon Steel (Galvanized or Coated)
- Elastomer

Environment

The turbine building HVAC system component types are exposed to the following environments:

- Encased in Concrete
- Plant Indoor Air
- Ventilation Atmosphere

Aging Effects Requiring Management

The following turbine 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 turbine building HVAC system component types:

- Bolting Integrity (B2.1.7)
- External Surfaces Monitoring Program (B2.1.20)

- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)

3.3.2.1.21 Miscellaneous Auxiliary Systems In-Scope ONLY based on Criterion 10 CFR 54.4(a)(2)

Materials

The materials of construction for the miscellaneous auxiliary systems in-scope ONLY based on Criterion 10 CFR 54.4(a) (2) component types are:

- Bronze
- Carbon Steel
- Carbon Steel (Galvanized or Coated)
- Cast Iron
- Copper
- Copper Alloy (Brass Copper < 85%)
- Copper Alloys
- Polyvinyl Chloride (PVC)
- Stainless Steel
- Stainless Steel Cast Austenitic

Environment

The miscellaneous auxiliary systems in-scope ONLY based on Criterion 10 CFR 54.4(a)(2) component types are exposed to the following environments:

- Atmosphere/ Weather
- Borated Water Leakage
- Closed Cycle Cooling Water
- Demineralized Water
- Plant Indoor Air
- Potable Water
- Raw Water
- Treated Borated Water
- Wetted Gas

Aging Effects Requiring Management

The following miscellaneous auxiliary systems in-scope ONLY based on Criterion 10 CFR 54.4(a)(2) 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 miscellaneous auxiliary systems in-scope ONLY based on Criterion 10 CFR 54.4(a)(2) component types:

- Bolting Integrity (B2.1.7)
- Closed-Cycle Cooling Water System (B2.1.10)
- External Surfaces Monitoring Program (B2.1.20)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)
- One-Time Inspection (B2.1.16)
- Open-Cycle Cooling Water System (B2.1.9)
- 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 subsections.

3.3.2.2.1 Cumulative Fatigue Damage

Cumulative fatigue damage of auxiliary system piping and heat exchangers, and the number of significant lifts assumed for design of load handling cranes, are TLAAs as defined in 10 CFR 54.3. TLAAs are evaluated in accordance with 10 CFR 54.21(c)(1).

WCGS piping outside the reactor coolant pressure boundary is designed to ASME Section 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 piping design TLAAs.

A survey of other than ASME Section III Class 1 pressure-retaining components (vessels, heat exchangers, pumps, and valves) discovered none with fatigue analyses or designed for a finite number of load cycles.

Section 4.7.1 describes the evaluation of load handling crane TLAAs..

3.3.2.2.2 Reduction of Heat Transfer due to Fouling

Not applicable to WCGS, applicable to BWR only.

3.3.2.2.3 Cracking due to Stress Corrosion Cracking (SCC)

3.3.2.2.3.1 Stainless steel piping and components of BWR standby liquid control system exposed to sodium pentaborate

Not applicable to WCGS, applicable to BWR only.

3.3.2.2.3.2 Stainless steel heat exchanger components exposed to treated water

Not applicable to WCGS, applicable to BWR only.

3.3.2.2.3.3 Stainless steel diesel engine exhaust piping and components exposed to diesel exhaust

The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program (B2.1.22) will manage cracking from stress corrosion cracking for stainless steel internal surfaces exposed to diesel exhaust.

3.3.2.2.4 Cracking due to Stress Corrosion Cracking and Cyclic Loading

3.3.2.2.4.1 Stainless steel PWR non-regenerative heat exchanger components exposed to borated water

Not applicable. Other available applicable NUREG-1801 lines were used.

3.3.2.2.4.2 Stainless steel PWR regenerative heat exchanger components exposed to borated water

The Water Chemistry program (B2.1.2) and the One-Time Inspection program (B2.1.16) will manage cracking due to stress corrosion cracking and cyclic loading for stainless steel heat exchangers exposed to treated borated water. The one-time inspection will include selected components at susceptible locations.

3.3.2.2.4.3 Stainless steel pump casings in the chemical and volume control system

The Water Chemistry program (B2.1.2) and the One-Time Inspection program (B2.1.16) will manage cracking due to stress corrosion cracking and cyclic loading for stainless steel pump casings exposed to treated borated water. The one-time inspection will include selected components at susceptible locations.

3.3.2.2.4.4 High strength bolting exposed to steam or water leakage

Not applicable. WCGS has no in-scope high-strength 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.

3.3.2.2.5 Hardening and Loss of Strength due to Elastomer Degradation

3.3.2.2.5.1 Elastomer seals of HVAC systems exposed to air-indoor (unconotrolled)

The External Surfaces Monitoring program (B2.1.20) will manage the hardening and loss of strength from elastomer degradation for elastomer external surfaces exposed to plant indoor air (uncontrolled) in locations where the ambient temperature cannot be shown to be less than 95F.

The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program (B2.1.22) will manage the hardening and loss of strength from elastomer degradation for elastomer internal surfaces exposed to ventilation atmosphere in locations where the ambient temperature cannot be shown to be less than 95F.

In general, ambient temperature in HVAC equipment spaces is expected to be below 95 degrees. Below 95 degrees, thermal aging of elastomers is not considered significant.

3.3.2.2.5.2 Elastomer linings in spent fuel pool cooling and cleanup systems

Not applicable. WCGS has no in-scope elastomer lined components exposed to treated or treated borated water in the fuel pool cooling and cleanup system, so the applicable NUREG-1801 lines were not used.

3.3.2.2.6 Reduction of Neutron-Absorbing Capacity and Loss of Material due to General Corrosion

The original boraflex spent fuel pool racks were replaced in 1999 with boral spent fuel pool racks. The WCGS Technical Specifications, Section 4.3 require that the spent fuel storage racks be maintained for reactivity (k-effective) at or below 0.95 if fully flooded with unborated water, which includes an allowance for uncertainties as described in Section 9.1A of the USAR. The new racks are designed, fabricated and installed to ensure operation for an intended period of 60 years. This modification was incorporated in Amendment No. 120 to the Operating License.

Additionally, WCGS response to an NRC request for additional information for the boral spent fuel pool racks modification stated that there is no net loss of aluminum cladding during the passivation process in which aluminum slightly corrodes before forming an impervious hydrated aluminum oxide film. The response also noted that since operational experience shows no degradation of neutron absorption capability for boral exposed to spent fuel pool environments, no special corrosion measures are necessary. The NRC Safety Evaluation report for Amendment No. 120 (March 22, 1999) agreed that the materials for the new racks were compatible with the environment in the spent fuel pool, and that the racks would not undergo material degradation which could affect their ability to safely store fuel.

3.3.2.2.7 Loss of Material due to General, Pitting, and Crevice Corrosion

3.3.2.2.7.1 Steel Stainless piping and components in the reactor coolant pump oil collection system exposed to lubricating oil

The Lubricating Oil Analysis program (B2.1.23) and the One-Time Inspection program (B2.1.16) will manage loss of material due to general, pitting, and crevice corrosion for carbon steel (including galvanized) and cast iron components exposed to lubricating oil. The one-time inspection will include selected components at susceptible locations where contaminants such as water could accumulate.

For the RCP lubricating oil collection system, the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program (B2.1.22) will manage loss of material due to general, pitting, and crevice corrosion for carbon steel components exposed to lubricating oil.

3.3.2.2.7.2 Steel piping and components in BWR reactor water cleanup and shutdown cooling systems exposed to treated water

Not applicable to WCGS, applicable to BWR only.

3.3.2.2.7.3 Steel diesel exhaust piping and components exposed to diesel exhaust

The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program (B2.1.22) will manage the loss of material from general (carbon steel (including galvanized) and cast iron only), pitting, and crevice corrosion for stainless steel, carbon steel (including galvanized) and cast iron internal surfaces exposed to ventilation atmosphere, wetted gas, and diesel exhaust.

3.3.2.2.8 Loss of Material due to General, Pitting, Crevice, and Microbiologically-Influenced Corrosion (MIC)

The Buried Piping and Tanks Inspection program (B2.1.18) will manage the loss of material due to general, pitting, crevice and microbiologically influenced corrosion for the carbon steel external surfaces of buried components (including cast iron and ductile iron).

WCGS buried steel piping applicable to this summary item is coated and/or wrapped in accordance with industry standards. A review of WCGS operating history indicates a single case of a pin hole leak failure of in-scope fire protection system piping that resulted from loss of material due to external pitting corrosion underneath a holiday in the protective coating, which was subsequently weld repaired. Additionally, WCGS does not have any documented below grade aggressive environment conditions. Although all WCGS in-scope buried piping is protected by the cathodic protection system, no credit is taken for this for aging management. Based upon the above discussion, WCGS maintains that application of the wrapping/coating and programmatic inspection of the wrapping/coating condition will be adequate to manage loss of material due to external corrosion.

The Buried Piping and Tanks Inspection program is a new program that will be implemented within the ten year period prior to the period of extended operation, during which time an opportunistic or planned inspection will be performed. Upon entering the period of extended operation the WCGS Buried Piping and Tanks Inspection program will require a planned inspection within ten years unless an opportunistic inspection has occurred within this ten year period.

3.3.2.2.9 Loss of Material due to General, Pitting, Crevice, and Microbiologically-Influenced Corrosion and Fouling

3.3.2.2.9.1 Steel piping and components exposed to fuel oil

The Fuel Oil Chemistry program (B2.1.14) and the One-Time Inspection program (B2.1.16) will manage loss of material due to general, pitting, crevice, and microbiologically influenced corrosion for carbon steel components in the fuel oil system. The one-time inspection will include selected components at susceptible locations where contaminants could accumulate (e.g. stagnant flow locations and tank bottoms).

3.3.2.2.9.2 Steel heat exchanger components exposed to lubricating oil

The Lubricating Oil Analysis program (B2.1.23) and the One-Time Inspection program (B2.1.16) will manage loss of material due to general, pitting, crevice, and microbiologically influenced corrosion and fouling for carbon steel components exposed to lubricating oil. The one-time inspection will include selected components at susceptible locations where contaminants such as water could accumulate.

3.3.2.2.10 Loss of Material due to Pitting and Crevice Corrosion

3.3.2.2.10.1 Elastomer lined and stainless steel clad components exposed to treated or treated borated water

Not applicable. WCGS has no in-scope components constructed of steel with elastomer lining or steel with stainless steel cladding exposed to treated or treated borated water in the fuel pool cooling and cleanup system, so the applicable NUREG-1801 lines were not used.

3.3.2.2.10.2 Stainless steel, aluminum, and stainless steel clad heat exchanger components exposed to treated water

Not applicable to WCGS, applicable to BWR only.

3.3.2.2.10.3 Copper alloy HVAC piping and components exposed to condensation (external)

The External Surfaces Monitoring Program (B2.1.20) will manage the loss of material from pitting and crevice corrosion for copper, copper alloy, copper-nickel, and brass external surfaces exposed to plant indoor air.

The Inspection of Internal Surfaces of Miscellaneous Piping and Ducting Components program (B2.1.22) will manage the loss of material from pitting and crevice corrosion for copper, copper alloy, copper-nickel, and brass internal surfaces exposed to ventilation atmosphere.

3.3.2.2.10.4 Copper alloy piping and components exposed to lubricating oil

The Lubricating Oil Analysis program (B2.1.23) and the One-Time Inspection program (B2.1.16) will manage loss of material due to pitting and crevice corrosion for copper, bronze, and brass components exposed to lubricating oil. The one-time inspection will include selected components at susceptible locations where contaminants such as water could accumulate.

3.3.2.2.10.5 HVAC aluminum piping and components and stainless steel ducting and components exposed to condensation

The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program (B2.1.22) will manage the loss of material from pitting and crevice corrosion for stainless steel internal surfaces exposed to wetted gas.

3.3.2.2.10.6 Copper alloy piping and components exposed to internal condensation

The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program (B2.1.22) will manage the loss of material from pitting and crevice corrosion for bronze internal surfaces exposed to wetted gas.

3.3.2.2.10.7 Stainless steel piping and components exposed to soil

Not applicable. WCGS has no in-scope stainless steel components exposed to soil in the open-cycle cooling water, ultimate heat sink, fire protection, diesel fuel oil, or emergency diesel generator systems, so the applicable NUREG-1801 lines were not used.

3.3.2.2.10.8 Stainless steel piping and components of BWR standby liquid control system exposed to sodium pentaborate

Not applicable to WCGS, applicable to BWR only.

3.3.2.2.11 Loss of Material due to Pitting, Crevice, and Galvanic Corrosion

Not applicable to WCGS, applicable to BWR only.

3.3.2.2.12 Loss of Material due to Pitting, Crevice, and Microbiologically-Influenced Corrosion

3.3.2.2.12.1 Stainless steel, aluminum, and copper alloy piping and components exposed to fuel oil

The Fuel Oil Chemistry program (B2.1.14) and the One-Time Inspection program (B2.1.16) will manage loss of material due to pitting, crevice and microbiologically-influenced corrosion for stainless steel and brass components exposed to fuel oil. The one-time inspection will include selected components at susceptible locations where contaminants could accumulate (e.g. stagnant flow locations).

3.3.2.2.12.2 Stainless steel piping and components exposed to lubricating oil

The Lubricating Oil Analysis program (B2.1.23) and the One-Time Inspection program (B2.1.16) will manage loss of material due to pitting, crevice, and microbiologically-influenced corrosion for stainless steel components exposed to lubricating oil. The one-time inspection will include selected components at susceptible locations where contaminants such as water could accumulate.

For the RCP lubricating oil collection system, the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program (B2.1.22) will manage loss of material due to pitting, crevice, and microbiologically-influenced corrosion for stainless steel components exposed to lubricating oil.

3.3.2.2.13 Loss of Material due to Wear

Not applicable. WCGS has no in-scope elastomer components exposed to air - indoor uncontrolled (internal or external) with relative motion with other components to produce an aging effect of loss of material due to wear. Therefore, the applicable NUREG-1801 lines were not used.

3.3.2.2.14 Loss of Material due to Cladding Breach

Not applicable. WCGS has no in-scope pumps in the chemical and volume control system that are steel with stainless steel cladding exposed to treated borated water, so the NUREG-1801 line was not used.

3.3.2.2.15 Quality Assurance for Aging Management of Nonsafety-Related Components

Quality Assurance Program and Administrative Controls are discussed in Section B1.3.

3.3.2.3 Time-Limited Aging Analysis

The time-limited aging analyses identified below are associated with the auxiliary systems components. The section of Chapter 4 that contains the TLAA review results is indicated in parenthesis.

- Cumulative Fatigue Damage (Section 4.3, Metal Fatigue Damage)
- Crane Load Cycle Limits (Section 4.7.1, Containment Polar Crane, Fuel Building Cask Handling Crane, Spent Fuel Bridge Crane, and Fuel Handling Machine CMAA-70 Load Cycle Limits)

3.3.3 Conclusions

The auxiliary systems component types that are subject to aging management review 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, 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, 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 Evaluations in Chapter VII of NUREG-1801 for Auxiliary Systems

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1.01	Steel cranes - structural girders exposed to air – indoor uncontrolled (external)	Cumulative fatigue damage	TLAA to be evaluated for structural girders of cranes. See the Standard Review Plan, Section 4.7 for generic guidance for meeting the requirements of 10 CFR 54.21(c)(1).	Yes, TLAA	Fatigue of metal components is a TLAA. See further evaluation in subsection 3.3.2.2.1.
3.3.1.02	Steel and stainless steel piping, piping components, piping elements, and heat exchanger components exposed to air – indoor uncontrolled, treated borated water or treated water	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes, TLAA	Fatigue of Class 1 components is a TLAA. No vessel, tank, pump, or heat exchanger designs at WCGS are supported by TLAAs except ASME Section III Class 1 components and the Class 2 portions of the steam generators. The CVCS system contains no in-scope carbon steel piping. See further evaluation in subsection 3.3.2.2.1.
3.3.1.03					Not applicable - BWR only
3.3.1.04					Not applicable - BWR only

Table 3.3.1 Summary of Aging Management Evaluations in Chapter VII of NUREG-1801 for Auxiliary Systems (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1.05					Not applicable - BWR only
3.3.1.06	Stainless steel diesel engine exhaust piping, piping components, and piping elements exposed to diesel exhaust	Cracking due to stress corrosion cracking	A plant specific aging management program is to be evaluated.	Yes	Consistent with NUREG-1801. The plant-specific aging management program(s) used to manage the aging include: Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22). See further evaluation in subsection 3.3.2.2.3.3.
3.3.1.07	Stainless steel non-regenerative heat exchanger components exposed to treated borated water >60°C (>140°F)	Cracking due to stress corrosion cracking and cyclic loading	Water Chemistry (B2.1.2) and a plant-specific verification program. An acceptable verification program is to include temperature and radioactivity monitoring of the shell side water, and eddy current testing of tubes.	Yes	Not applicable. Other available applicable NUREG-1801 lines were used.

Table 3.3.1 Summary of Aging Management Evaluations in Chapter VII of NUREG-1801 for Auxiliary Systems (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1.08	Stainless steel regenerative heat exchanger components exposed to treated borated water >60°C (>140°F)	Cracking due to stress corrosion cracking and cyclic loading	A plant-specific aging management program is to be evaluated.	Yes	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 (B2.1.16). See further evaluation in subsection 3.3.2.2.4.2.
3.3.1.09	Stainless steel high-pressure pump casing in PWR chemical and volume control system	Cracking due to stress corrosion cracking and cyclic loading	A plant-specific aging management program is to be evaluated.	Yes	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 (B2.1.16). See further evaluation in subsection 3.3.2.2.4.3.
3.3.1.10	High-strength steel closure bolting exposed to air with steam or water leakage.	Cracking due to stress corrosion cracking, cyclic loading	Bolting Integrity (B2.1.7) The AMP is to be augmented by appropriate inspection to detect cracking if the bolts are not otherwise replaced during maintenance.	Yes	Not applicable. WCGS has no in-scope high-strength 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.

Table 3.3.1 Summary of Aging Management Evaluations in Chapter VII of NUREG-1801 for Auxiliary Systems (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1.11	Elastomer seals and components exposed to air – indoor uncontrolled (internal/external)	Hardening and loss of strength due to elastomer degradation	A plant specific aging management program is to be evaluated.	Yes	Consistent with NUREG-1801. The plant-specific aging management programs used to manage aging include: Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22) and External Surfaces Monitoring (B2.1.20). See further evaluation in subsection 3.3.2.2.5.1. Exception to NUREG-1801 for duct flex connectors in the Control Building HVAC System. Aging effect in NUREG-1801 for this material and environment combination is not applicable. Ambient temperature for these elastomer components is expected to be below 95 degrees. Below 95 degrees, thermal aging of elastomers is not considered significant (NUREG-1801, Rev. 1, Chapter IX).
3.3.1.12	Elastomer lining exposed to treated water or treated borated water	Hardening and loss of strength due to elastomer degradation	A plant-specific aging management program is to be evaluated.	Yes	Not applicable. WCGS has no in-scope elastomer lined components exposed to treated or treated borated water in the fuel pool cooling and cleanup system, so the applicable NUREG-1801 lines were not used.

Table 3.3.1 Summary of Aging Management Evaluations in Chapter VII of NUREG-1801 for Auxiliary Systems (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1.13	Boral, boron steel spent fuel storage racks neutron-absorbing sheets exposed to treated water or treated borated water	Reduction of neutron-absorbing capacity and loss of material due to general corrosion	A plant specific aging management program is to be evaluated.	Yes	Exception to NUREG-1801. Aging effect in NUREG-1801 for this material and environment combination is not applicable. Aluminum, which is the host material in boral, is a reactive material but develops a strongly bonded oxide film which gives it excellent corrosion resistance in most environments. There is no net loss of aluminum cladding during the passivation process in which aluminum forms a hydrated aluminum oxide film. Additionally, aluminum alloys exhibit negligible corrosive action in boric acid solutions. Industry operating experience also shows no degradation of neutron absorbing capacity for boral exposed to spent fuel pool environments. As a result no AMP is needed to manage loss of material or reduction of neutron absorbing capacity for boral in treated borated water. See further evaluation in subsection 3.3.2.2.6.

Table 3.3.1 Summary of Aging Management Evaluations in Chapter VII of NUREG-1801 for Auxiliary Systems (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1.14	Steel piping, piping component, and piping elements exposed to lubricating oil	Loss of material due to general, pitting, and crevice corrosion	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	Yes	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Lubricating Oil Analysis (B2.1.23). See further evaluation in subsection 3.3.2.2.7.1.
3.3.1.15	Steel reactor coolant pump oil collection system piping, tubing, and valve bodies exposed to lubricating oil	Loss of material due to general, pitting, and crevice corrosion	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	Yes	Consistent with NUREG-1801 with a different aging management program. The component environment is potentially contaminated lubricating oil that is not managed by Lubricating Oil Analysis (B2.1.23), to maintain lubricating oil quality. Loss of material on internal component surfaces exposed to contaminated lubricating oil environment will be managed by Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22), in lieu of Lubricating Oil Analysis (B2.1.23). See further evaluation in subsection 3.3.2.2.7.1.

Table 3.3.1 Summary of Aging Management Evaluations in Chapter VII of NUREG-1801 for Auxiliary Systems (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1.16	Steel reactor coolant pump oil collection system tank exposed to lubricating oil	Loss of material due to general, pitting, and crevice corrosion	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16) to evaluate the thickness of the lower portion of the tank	Yes	Not applicable. The WCGS reactor coolant pump oil collection system tank is constructed of stainless steel vice steel, so the applicable NUREG-1801 line was not used.
3.3.1.17					Not applicable - BWR only
3.3.1.18	Stainless steel and steel diesel engine exhaust piping, piping components, and piping elements exposed to diesel exhaust	Loss of material/ general (steel only), pitting and crevice corrosion	A plant specific aging management program is to be evaluated.	Yes	Consistent with NUREG-1801. The plant-specific aging management program(s) used to manage the aging include: Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22). See further evaluation in subsection 3.3.2.2.7.3.
3.3.1.19	Steel (with or without coating or wrapping) piping, piping components, and piping elements exposed to soil	Loss of material due to general, pitting, crevice, and microbiologically influenced corrosion	Buried Piping and Tanks Inspection (B2.1.18)	Yes	Consistent with NUREG-1801. See further evaluation in subsection 3.3.2.2.8.

Table 3.3.1 Summary of Aging Management Evaluations in Chapter VII of NUREG-1801 for Auxiliary Systems (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1.20	Steel piping, piping components, piping elements, and tanks exposed to fuel oil	Loss of material due to general, pitting, crevice, and microbiologically influenced corrosion, and fouling	Fuel Oil Chemistry (B2.1.14) and One-Time Inspection (B2.1.16)	Yes	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Fuel Oil Chemistry (B2.1.14). See further evaluation in subsection 3.3.2.2.9.1.
3.3.1.21	Steel heat exchanger components exposed to lubricating oil	Loss of material due to general, pitting, crevice, and microbiologically influenced corrosion, and fouling	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	Yes	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Lubricating Oil Analysis (B2.1.23). See further evaluation in subsection 3.3.2.2.9.2.
3.3.1.22	Steel with elastomer lining or stainless steel cladding piping, piping components, and piping elements exposed to treated water and treated borated 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 (B2.1.16)	Yes	Not applicable. WCGS has no in-scope components constructed of steel with elastomer lining or steel with stainless steel cladding exposed to treated or treated borated water in the fuel pool cooling and cleanup system, so the applicable NUREG-1801 lines were not used.
3.3.1.23					Not applicable - BWR only
3.3.1.24					Not applicable - BWR only

Table 3.3.1 Summary of Aging Management Evaluations in Chapter VII of NUREG-1801 for Auxiliary Systems (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1.25	Copper alloy HVAC piping, piping components, piping elements exposed to condensation (external)	Loss of material due to pitting and crevice corrosion	A plant-specific aging management program is to be evaluated.	Yes	Consistent with NUREG-1801. The plant-specific aging management programs used to manage aging include: Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22) and External Surfaces Monitoring (B2.1.20). See further evaluation in subsection 3.3.2.2.10.3.
3.3.1.26	Copper alloy piping, piping components, and piping elements exposed to lubricating oil	Loss of material due to pitting and crevice corrosion	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	Yes	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Lubricating Oil Analysis (B2.1.23). See further evaluation in subsection 3.3.2.2.10.4.
3.3.1.27	Stainless steel HVAC ducting and aluminum HVAC piping, piping components and piping elements exposed to condensation	Loss of material due to pitting and crevice corrosion	A plant-specific aging management program is to be evaluated.	Yes	Consistent with NUREG-1801. The plant-specific aging management program(s) used to manage the aging include: Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22). See further evaluation in subsection 3.3.2.2.10.5.

Table 3.3.1 Summary of Aging Management Evaluations in Chapter VII of NUREG-1801 for Auxiliary Systems (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1.28	Copper alloy fire protection piping, piping components, and piping elements exposed to condensation (internal)	Loss of material due to pitting and crevice corrosion	A plant-specific aging management program is to be evaluated.	Yes	Consistent with NUREG-1801. The plant-specific aging management program(s) used to manage the aging include: Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22). See further evaluation in subsection 3.3.2.2.10.6.
3.3.1.29	Stainless steel piping, piping components, and piping elements exposed to soil	Loss of material due to pitting and crevice corrosion	A plant-specific aging management program is to be evaluated.	Yes	Not applicable. WCGS has no in-scope stainless steel components exposed to soil in the open-cycle cooling water, ultimate heat sink, fire protection, diesel fuel oil, or emergency diesel generator systems, so the applicable NUREG-1801 lines were not used.
3.3.1.30					Not applicable - BWR only
3.3.1.31					Not applicable - BWR only
3.3.1.32	Stainless steel, aluminum and copper alloy piping, piping components, and piping elements exposed to fuel oil	Loss of material due to pitting, crevice, and microbiologically influenced corrosion	Fuel Oil Chemistry (B2.1.14) and One-Time Inspection (B2.1.16)	Yes	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Fuel Oil Chemistry (B2.1.14). See further evaluation in subsection 3.3.2.2.12.1.

Table 3.3.1 Summary of Aging Management Evaluations in Chapter VII of NUREG-1801 for Auxiliary Systems (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1.33	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 (B2.1.23) and One-Time Inspection (B2.1.16)	Yes	Consistent with NUREG-1801 with aging management program exceptions for components associated with the Centrifugal Charging Pump and Standby Diesel Engine lubricating oil systems. The aging management program(s) with exceptions to NUREG-1801 include: Lubricating Oil Analysis (B2.1.23). See further evaluation in subsection 3.3.2.2.12.2. Consistent with NUREG-1801 except a different aging management program is credited for components associated with the reactor coolant pump lube oil collection system. The component environment is potentially contaminated lubricating oil that is not within the scope of Lubricating Oil Analysis (B2.1.23), to maintain lube oil quality. Loss of material on internal component surfaces exposed to contaminated oil environment will be managed by Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22). See further evaluation in subsection 3.3.2.2.7.1.

Table 3.3.1 Summary of Aging Management Evaluations in Chapter VII of NUREG-1801 for Auxiliary Systems (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1.34	Elastomer seals and components exposed to air – indoor uncontrolled (internal or external)	Loss of material due to Wear	A plant specific aging management program is to be evaluated.	Yes	Not applicable. WCGS has no in-scope elastomer components exposed to air - indoor uncontrolled (internal or external) with relative motion with other components to produce an aging effect of loss of material due to wear. Therefore, the applicable NUREG-1801 lines were not used.
3.3.1.35	Steel with stainless steel cladding pump casing 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	Not applicable. WCGS has no in-scope pumps in the chemical and volume control system that are steel with stainless steel cladding exposed to treated borated water, so the NUREG-1801 line was not used.
3.3.1.36					Not applicable - BWR only
3.3.1.37					Not applicable - BWR only
3.3.1.38					Not applicable - BWR only
3.3.1.39					Not applicable - BWR only
3.3.1.40	Steel tanks in diesel fuel oil system exposed to air - outdoor (external)	Loss of material due to general, pitting, and crevice corrosion	Aboveground Steel Tanks	No	Not applicable. WCGS has no in-scope steel tanks in the emergency diesel engine fuel oil storage and transfer system exposed to air - outdoor (external), so the applicable NUREG-1801 line was not used.

Table 3.3.1 Summary of Aging Management Evaluations in Chapter VII of NUREG-1801 for Auxiliary Systems (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1.41	High-strength steel closure bolting exposed to air with steam or water leakage	Cracking due to cyclic loading, stress corrosion cracking	Bolting Integrity (B2.1.7)	No	Not applicable. WCGS has no in-scope high-strength steel closure bolting in the auxiliary systems, so the applicable NUREG-1801 line was not used.
3.3.1.42	Steel closure bolting exposed to air with steam or water leakage	Loss of material due to general corrosion	Bolting Integrity (B2.1.7)	No	Not applicable. WCGS has no in-scope steel closure bolting exposed to air with steam or water leakage in the auxiliary systems, so the applicable NUREG-1801 line was not used.
3.3.1.43	Steel bolting and closure bolting exposed to air – indoor uncontrolled (external) or air – outdoor (External)	Loss of material due to general, pitting, and crevice corrosion	Bolting Integrity (B2.1.7)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Bolting Integrity (B2.1.7).
3.3.1.44	Steel compressed air system closure bolting exposed to condensation	Loss of material due to general, pitting, and crevice corrosion	Bolting Integrity (B2.1.7)	No	Not applicable. WCGS has no in-scope steel closure bolting exposed to condensation in the compressed air system, so the applicable NUREG-1801 line was not used.
3.3.1.45	Steel closure bolting exposed to air – indoor uncontrolled (external)	Loss of preload due to thermal effects, gasket creep, and self-loosening	Bolting Integrity (B2.1.7)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Bolting Integrity (B2.1.7).

Table 3.3.1 Summary of Aging Management Evaluations in Chapter VII of NUREG-1801 for Auxiliary Systems (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1.46	Stainless steel and stainless clad steel piping, piping components, piping elements, and heat exchanger components exposed to closed cycle cooling water >60°C (>140°F)	Cracking due to stress corrosion cracking	Closed-Cycle Cooling Water System (B2.1.10)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Closed-Cycle Cooling Water System (B2.1.10).
3.3.1.47	Steel piping, piping components, piping elements, tanks, and heat exchanger components exposed to closed cycle cooling water	Loss of material due to general, pitting, and crevice corrosion	Closed-Cycle Cooling Water System (B2.1.10)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Closed-Cycle Cooling Water System (B2.1.10).
3.3.1.48	Steel piping, piping components, piping elements, tanks, and heat exchanger components exposed to closed cycle cooling water	Loss of material due to general, pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System (B2.1.10)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Closed-Cycle Cooling Water System (B2.1.10).
3.3.1.49					Not applicable - BWR only

Table 3.3.1 Summary of Aging Management Evaluations in Chapter VII of NUREG-1801 for Auxiliary Systems (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1.50	Stainless steel piping, piping components, and piping elements exposed to closed cycle cooling water	Loss of material due to pitting and crevice corrosion	Closed-Cycle Cooling Water System (B2.1.10)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Closed-Cycle Cooling Water System (B2.1.10).
3.3.1.51	Copper alloy piping, piping components, piping elements, and heat exchanger components exposed to closed cycle cooling water	Loss of material due to pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System (B2.1.10)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Closed-Cycle Cooling Water System (B2.1.10).
3.3.1.52	Steel, stainless steel, and copper alloy heat exchanger tubes exposed to closed cycle cooling water	Reduction of heat transfer due to fouling	Closed-Cycle Cooling Water System (B2.1.10)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Closed-Cycle Cooling Water System (B2.1.10).

Table 3.3.1 Summary of Aging Management Evaluations in Chapter VII of NUREG-1801 for Auxiliary Systems (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1.53	Steel compressed air system piping, piping components, and piping elements exposed to condensation (internal)	Loss of material due to general and pitting corrosion	Compressed Air Monitoring	No	Consistent with NUREG-1801 with a different aging management program. 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 in-scope for WCGS. In-scope piping and components are associated with containment penetrations and nitrogen gas piping and components used as a backup source for closure of valves. Therefore, Inspections of Internal Surfaces In Miscellaneous Piping and Ducting Components (B2.1.22), or 10 CFR Part 50 Appendix J (B2.1.30), is credited, as appropriate, to manage aging effects for the in-scope piping and components.
3.3.1.54	Stainless steel compressed air system piping, piping components, and piping elements exposed to internal condensation	Loss of material due to pitting and crevice corrosion	Compressed Air Monitoring	No	Not applicable. WCGS has no in-scope stainless steel components exposed to internal condensation in the compressed air system, so the applicable NUREG-1801 line was not used.
3.3.1.55	Steel ducting closure bolting exposed to air – indoor uncontrolled (external)	Loss of material due to general corrosion	External Surfaces Monitoring (B2.1.20)	No	Consistent with NUREG-1801.

Table 3.3.1 Summary of Aging Management Evaluations in Chapter VII of NUREG-1801 for Auxiliary Systems (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1.56	Steel HVAC ducting and components external surfaces exposed to air – indoor uncontrolled (external)	Loss of material due to general corrosion	External Surfaces Monitoring (B2.1.20)	No	Consistent with NUREG-1801.
3.3.1.57	Steel piping and components external surfaces exposed to air – indoor uncontrolled (External)	Loss of material due to general corrosion	External Surfaces Monitoring (B2.1.20)	No	Consistent with NUREG-1801.
3.3.1.58	Steel external surfaces exposed to air – indoor uncontrolled (external), air - outdoor (external), and condensation (external)	Loss of material due to general corrosion	External Surfaces Monitoring (B2.1.20)	No	Consistent with NUREG-1801 for all components except different AMP credited for containment equipment hatch and radiation missile shield hand trolleys. Inspection of Overhead Heavy and Light Load (Related to Refueling) Handling Systems (B2.1.11) is credited to manage aging as the containment equipment hatch and radiation missile shield hand trolleys are evaluated as crane components.
3.3.1.59	Steel heat exchanger components exposed to air – indoor uncontrolled (external) or air -outdoor (external)	Loss of material due to general, pitting, and crevice corrosion	External Surfaces Monitoring (B2.1.20)	No	Consistent with NUREG-1801.

Table 3.3.1 Summary of Aging Management Evaluations in Chapter VII of NUREG-1801 for Auxiliary Systems (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1.60	Steel piping, piping components, and piping elements exposed to air - outdoor (external)	Loss of material due to general, pitting, and crevice corrosion	External Surfaces Monitoring (B2.1.20)	No	Consistent with NUREG-1801.
3.3.1.61	Elastomer fire barrier penetration seals exposed to air – outdoor or air - indoor uncontrolled	Increased hardness, shrinkage and loss of strength due to weathering	Fire Protection (B2.1.12)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Fire Protection (B2.1.12).
3.3.1.62	Aluminum piping, piping components, and piping elements exposed to raw water	Loss of material due to pitting and crevice corrosion	Fire Protection (B2.1.12)	No	Not applicable. WCGS has no in-scope aluminum components exposed to raw water in the fire protection system, so the applicable NUREG-1801 line was not used.
3.3.1.63	Steel fire rated doors exposed to air – outdoor or air - indoor uncontrolled	Loss of material due to Wear	Fire Protection (B2.1.12)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Fire Protection (B2.1.12).
3.3.1.64	Steel piping, piping components, and piping elements exposed to fuel oil	Loss of material due to general, pitting, and crevice corrosion	Fire Protection (B2.1.12) and Fuel Oil Chemistry (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 Protection (B2.1.12), Fuel Oil Chemistry (B2.1.14).

Table 3.3.1 Summary of Aging Management Evaluations in Chapter VII of NUREG-1801 for Auxiliary Systems (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1.65	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 (B2.1.12) and Structures Monitoring Program (B2.1.32)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Fire Protection (B2.1.12).
3.3.1.66	Reinforced concrete structural fire barriers – walls, ceilings and floors exposed to air – outdoor	Concrete cracking and spalling due to freeze thaw, aggressive chemical attack, and reaction with aggregates	Fire Protection (B2.1.12) and Structures Monitoring Program (B2.1.32)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Fire Protection (B2.1.12).
3.3.1.67	Reinforced concrete structural fire barriers – walls, ceilings and floors exposed to air – outdoor or air - indoor uncontrolled	Loss of material due to corrosion of embedded steel	Fire Protection (B2.1.12) and Structures Monitoring Program (B2.1.32)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Fire Protection (B2.1.12).

Table 3.3.1 Summary of Aging Management Evaluations in Chapter VII of NUREG-1801 for Auxiliary Systems (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1.68	Steel piping, piping components, and piping elements exposed to raw water	Loss of material due to general, pitting, crevice, and microbiologically influenced corrosion, and fouling	Fire Water System (B2.1.13)	No	Consistent with NUREG-1801 for steel piping, piping components, and piping elements exposed to raw water on the external surfaces. Consistent with NUREG-1801 except different aging management program is credited for steel piping, piping components, and piping elements exposed to raw water on the internal surfaces. Fire Water System (B2.1.13), will be credited in conjunction with Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22), to manage the aging effects.

Table 3.3.1 Summary of Aging Management Evaluations in Chapter VII of NUREG-1801 for Auxiliary Systems (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1.69	Stainless steel piping, piping components, and piping elements exposed to raw water	Loss of material due to pitting and crevice corrosion, and fouling	Fire Water System (B2.1.13)	No	Consistent with NUREG-1801 with different aging management program and aging management program exceptions for components associated with the Fire Protection System. The aging management programs credited to manage aging of stainless steel piping, piping components, and piping elements exposed to raw water (internal) in the Fire Protection System include: Fire Water System (B2.1.13) and Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22). The aging management program(s) with exceptions to NUREG-1801 include: Fire Water System (B2.1.13). Consistent with NUREG-1801 except a different aging management program is credited for components associated with the floor and equipment drain system. The component environment is potentially contaminated sump (raw) water that is not within the scope of Fire Water System (B2.1.13), to manage the aging effects. Loss of material on internal component surfaces exposed to contaminated sump (raw) water will be managed by Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22).

Table 3.3.1 Summary of Aging Management Evaluations in Chapter VII of NUREG-1801 for Auxiliary Systems (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1.70	Copper alloy piping, piping components, and piping elements exposed to raw water	Loss of material due to pitting, crevice, and microbiologically influenced corrosion, and fouling	Fire Water System (B2.1.13)	No	Consistent with NUREG-1801 with aging management program exceptions for the copper alloy sprinkler heads exposed to raw water (internal) in the Fire Protection System. The aging management program(s) with exceptions to NUREG-1801 include: Fire Water System (B2.1.13). Consistent with NUREG-1801 with different aging management program for all other copper alloy components exposed to raw water (internal) in the Fire Protection System. The aging management programs credited to manage aging of copper alloy piping, piping components, and piping elements exposed to raw water (internal) in the Fire Protection System include: Fire Water System (B2.1.13) and Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22).
3.3.1.71	Steel 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 (B2.1.22)	No	Consistent with NUREG-1801.

Table 3.3.1 Summary of Aging Management Evaluations in Chapter VII of NUREG-1801 for Auxiliary Systems (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1.72	Steel HVAC 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 (B2.1.22)	No	Consistent with NUREG-1801.
3.3.1.73	Steel crane structural girders in load handling system 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 (B2.1.11)	No	Consistent with NUREG-1801.
3.3.1.74	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 (B2.1.11)	No	Consistent with NUREG-1801.
3.3.1.75	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 (B2.1.9)	No	Not applicable. WCGS has no in-scope elastomer components exposed to raw water in the open-cycle cooling water systems, so the applicable NUREG-1801 lines were not used.

Table 3.3.1 Summary of Aging Management Evaluations in Chapter VII of NUREG-1801 for Auxiliary Systems (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1.76	Steel piping, piping components, and piping elements (without lining/coating or with degraded lining/coating) exposed to raw water	Loss of material due to general, pitting, crevice, and microbiologically influenced corrosion, fouling, and lining/coating degradation	Open-Cycle Cooling Water System (B2.1.9)	No	Consistent with NUREG-1801 for all components except different aging management program is credited for piping and valves in the secondary liquid waste and oily waste systems. The environment for these components is potentially contaminated raw water that is not within the scope of Open Cycle Cooling Water System (B2.1.9), to manage aging. Loss of material on internal component surfaces exposed to contaminated raw water environment will be managed by Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22).
3.3.1.77	Steel heat exchanger components exposed to raw water	Loss of material due to general, pitting, crevice, galvanic, and microbiologically influenced corrosion, and fouling	Open-Cycle Cooling Water System (B2.1.9)	No	Consistent with NUREG-1801.
3.3.1.78	Stainless steel, nickel alloy, and copper alloy piping, piping components, and piping elements exposed to raw water	Loss of material due to pitting and crevice corrosion	Open-Cycle Cooling Water System (B2.1.9)	No	Consistent with NUREG-1801.

Table 3.3.1 Summary of Aging Management Evaluations in Chapter VII of NUREG-1801 for Auxiliary Systems (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1.79	Stainless steel piping, piping components, and piping elements exposed to raw water	Loss of material due to pitting and crevice corrosion, and fouling	Open-Cycle Cooling Water System (B2.1.9)	No	Consistent with NUREG-1801 for all components except a different aging management program is credited for piping and piping components in the secondary liquid waste, yard drainage, chemical and detergent waste, and oily waste systems. The component environment is potentially contaminated raw water that is not within the scope of Open Cycle Cooling Water (B2.1.9), to manage aging. Loss of material on internal component surfaces exposed to contaminated raw water environment will be managed by Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22).
3.3.1.80	Stainless steel and copper alloy 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 (B2.1.9)	No	Consistent with NUREG-1801.
3.3.1.81	Copper alloy piping, piping components, and piping elements, exposed to raw water	Loss of material due to pitting, crevice, and microbiologically influenced corrosion, and fouling	Open-Cycle Cooling Water System (B2.1.9)	No	Not applicable. WCGS has no in-scope copper alloy piping, piping components or piping elements exposed to raw water in the open-cycle cooling water systems, so the applicable NUREG-1801 lines were not used.

Table 3.3.1 Summary of Aging Management Evaluations in Chapter VII of NUREG-1801 for Auxiliary Systems (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1.82	Copper alloy heat exchanger components exposed to raw water	Loss of material due to pitting, crevice, galvanic, and microbiologically influenced corrosion, and fouling	Open-Cycle Cooling Water System (B2.1.9)	No	Consistent with NUREG-1801.
3.3.1.83	Stainless steel and copper alloy heat exchanger tubes exposed to raw water	Reduction of heat transfer due to fouling	Open-Cycle Cooling Water System (B2.1.9)	No	Consistent with NUREG-1801.
3.3.1.84	Copper alloy >15% Zn piping, piping components, piping elements, and heat exchanger components exposed to raw water, treated water, or closed cycle cooling water	Loss of material due to selective leaching	Selective Leaching of Materials (B2.1.17)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Selective Leaching of Materials (B2.1.17).
3.3.1.85	Gray cast iron piping, piping components, and piping elements exposed to soil, raw water, treated water, or closed-cycle cooling water	Loss of material due to selective leaching	Selective Leaching of Materials (B2.1.17)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Selective Leaching of Materials (B2.1.17).

Table 3.3.1 Summary of Aging Management Evaluations in Chapter VII of NUREG-1801 for Auxiliary Systems (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1.86	Structural steel (new fuel storage rack assembly) exposed to air – indoor uncontrolled (external)	Loss of material due to general, pitting, and crevice corrosion	Structures Monitoring Program (B2.1.32)	No	Consistent with NUREG-1801.
3.3.1.87	Boraflex spent fuel storage racks neutron-absorbing sheets exposed to treated borated water	Reduction of neutron-absorbing capacity due to boraflex degradation	Boraflex Monitoring	No	Not applicable. WCGS has no boraflex spent fuel storage racks exposed to treated borated water in the fuel pool cooling and cleanup system, so the applicable NUREG-1801 line was not used.
3.3.1.88	Aluminum and copper alloy >15% Zn 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. WCGS has no in-scope aluminum or copper alloy > 15% Zn piping, piping components, or piping elements exposed to air with borated water leakage in the auxiliary systems, so the applicable NUREG-1801 lines were not used.
3.3.1.89	Steel bolting and external surfaces exposed to air with borated water leakage	Loss of material due to Boric acid corrosion	Boric Acid Corrosion (B2.1.4)	No	Not applicable. WCGS has no in-scope steel bolting and external surfaces exposed to air with borated water leakage in the auxiliary systems, so the applicable NUREG-1801 lines were not used.

Table 3.3.1 Summary of Aging Management Evaluations in Chapter VII of NUREG-1801 for Auxiliary Systems (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1.90	Stainless steel and steel with stainless steel cladding piping, piping components, piping elements, tanks, and fuel storage racks exposed to treated borated water >60°C (>140°F)	Cracking due to stress corrosion cracking	Water Chemistry (B2.1.2)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Water Chemistry (B2.1.2).
3.3.1.91	Stainless steel and steel with stainless steel cladding 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 all components except a different aging management program is credited for components in the floor and equipment drains system. The component environment is potentially contaminated raw water that is not within the scope of Open Cycle Cooling Water (B2.1.9), to manage aging. Loss of material on internal component surfaces exposed to contaminated raw water environment will be managed by Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22).
3.3.1.92	Galvanized steel piping, piping components, and piping elements exposed to air – indoor uncontrolled	None	None	NA	Consistent with NUREG-1801.

Table 3.3.1 Summary of Aging Management Evaluations in Chapter VII of NUREG-1801 for Auxiliary Systems (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1.93	Glass piping elements exposed to air, air – indoor uncontrolled (external), fuel oil, lubricating oil, raw water, treated water, and treated borated water	None	None	NA	Consistent with NUREG-1801.
3.3.1.94	Stainless steel and nickel alloy piping, piping components, and piping elements exposed to air – indoor uncontrolled (external)	None	None	NA	Consistent with NUREG-1801.
3.3.1.95	Steel and aluminum piping, piping components, and piping elements exposed to air – indoor controlled (external)	None	None	NA	Consistent with NUREG-1801.
3.3.1.96	Steel and stainless steel piping, piping components, and piping elements in concrete	None	None	NA	Consistent with NUREG-1801.

Table 3.3.1 Summary of Aging Management Evaluations in Chapter VII of NUREG-1801 for Auxiliary Systems (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.3.1.97	Steel, stainless steel, aluminum, and copper alloy piping, piping components, and piping elements exposed to gas	None	None	NA	Consistent with NUREG-1801.
3.3.1.98	Steel, stainless steel, and copper alloy piping, piping components, and piping elements exposed to dried air	None	None	NA	Consistent with NUREG-1801.
3.3.1.99	Stainless steel and copper alloy <15% Zn piping, piping components, and piping elements exposed to air with borated water leakage	None	None	NA	Consistent with NUREG-1801.

Table 3.3.2-1 Auxiliary Systems – Summary of Aging Management Evaluation - Fuel Handling—Fuel Storage and Handling System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Crane	NSRS, SS	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B2.1.11)	VII.B-1	3.3.1.74	A
Crane	NSRS, SS	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B2.1.11)	VII.B-3	3.3.1.73	A
Fuel Handling Equip	NSRS	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B2.1.11)	VII.B-1	3.3.1.74	A
Fuel Handling Equip	MB, NSRS	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B2.1.11)	VII.B-3	3.3.1.73	A
Fuel Handling Equip	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Cumulative fatigue damage	Time Limited Aging Analysis evaluated for the period of extended operation.	VII.B-2	3.3.1.01	A

Table 3.3.2-1 Auxiliary Systems – Summary of Aging Management Evaluation - Fuel Handling—Fuel Storage and Handling System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Fuel Handling Equip	PB	Stainless Steel	Borated Water Leakage (Int)	None	None	VII.J-16	3.3.1.99	C
Fuel Handling Equip	NSRS, PB, SS	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	C
Neutron Absorbers (Boral)	AN	Boral	Treated Borated Water (Ext)	None	None	VII.A2-5	3.3.1.13	I, 1
New Fuel Racks	SS	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	VII.A1-1	3.3.1.86	A
New Fuel Racks	SS	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	C
Spent Fuel Racks	SS	Stainless Steel	Treated Borated Water (Ext)	Cumulative fatigue damage	Time Limited Aging Analysis evaluated for the period of extended operation.	None	None	H, 2
Spent Fuel Racks	SS	Stainless Steel	Treated Borated Water (Ext)	Loss of material	Water Chemistry (B2.1.2)	VII.A2-1	3.3.1.91	D
Spent Fuel Racks	SS	Stainless Steel	Treated Borated Water (Ext)	Cracking	Water Chemistry (B2.1.2)	VII.A2-7	3.3.1.90	B

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.

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.

I Aging effect in NUREG-1801 for this component, material and environment combination is not applicable.

Plant Specific Notes:

1 The boraflex spent fuel pool racks at WCGS were replaced in 1999 with boral. WCGS Specifications require that the new racks be designed, fabricated and installed to ensure operation for a period of 60 years. This specification was written based upon the criterion of NUREG-0800 which requires that reactivity (k-effective) be maintained equivalent to or less than 0.95. Additionally the WCGS Technical Specifications require that the spent fuel storage racks be maintained for reactivity (k-effective) at or below 0.95 if fully flooded with unborated water, which includes an allowance for uncertainties. The NRC approved this modification in Amendment No. 120 to the WCGS Operating License. As a result no aging management program is necessary to monitor or survey the neutron absorbing capacity of the boral. Aluminum, which is the host material in boral, is a reactive material but develops a strongly bonded oxide film which gives it excellent corrosion resistance in most environments. Additionally, aluminum alloys exhibit negligible action in boric acid solutions. As a result no aging management program is needed for aluminum as there are no aging effects requiring management.

2 Fatigue design of the spent fuel 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 this TLAA for the fatigue design of the spent fuel racks.

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 Vol. 2 Item	Table 1 Item	Notes
Closure Bolting	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.7)	VII.I-4	3.3.1.43	B
Closure Bolting	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.7)	VII.I-5	3.3.1.45	B
Closure Bolting	LBS, PB	Stainless Steel	Borated Water Leakage (Ext)	Loss of preload	Bolting Integrity (B2.1.7)	None	None	F, 2
Closure Bolting	PB	Stainless Steel	Treated Borated Water (Ext)	Cracking	Water Chemistry (B2.1.2)	None	None	H, 1
Closure Bolting	PB	Stainless Steel	Treated Borated Water (Ext)	Loss of preload	Bolting Integrity (B2.1.7)	None	None	F
Closure Bolting	PB	Stainless Steel	Treated Borated Water (Ext)	Loss of material	Water Chemistry (B2.1.2)	VII.A3-8	3.3.1.91	B
Flow Element	LBS, PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	A
Flow Element	LBS, PB	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2)	None	None	H, 1
Flow Element	LBS, PB	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2)	VII.A3-8	3.3.1.91	B

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 Vol. 2 Item	Table 1 Item	Notes
Heat Exchanger Shell Side (HX # 26)	PB	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.A3-3	3.3.1.48	B
Heat Exchanger Shell Side (HX # 26)	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	A
Heat Exchanger Tube Side (HX # 28)	HT, PB	Stainless Steel	Closed Cycle Cooling Water (Ext)	Reduction of heat transfer	Closed-Cycle Cooling Water System (B2.1.10)	VII.C2-3	3.3.1.52	B
Heat Exchanger Tube Side (HX # 27, 28)	HT, PB	Stainless Steel	Closed Cycle Cooling Water (Ext)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.C2-10	3.3.1.50	D
Heat Exchanger Tube Side (HX # 29)	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	C
Heat Exchanger Tube Side (HX # 27, 28, 29)	HT, PB	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2)	None	None	H, 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 Vol. 2 Item	Table 1 Item	Notes
Heat Exchanger Tube Side (HX # 27, 28, 29)	HT, PB	Stainless Steel	Treated Borated Water (Int)	Reduction of heat transfer	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	None	None	F
Heat Exchanger Tube Side (HX # 27, 28, 29)	HT, PB	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2)	VII.A3-8	3.3.1.91	D
Expansion Joint Bellows	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	A
Expansion Joint Bellows	PB	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2)	None	None	H, 1
Expansion Joint Bellows	PB	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2)	VII.A3-8	3.3.1.91	B
Penetrations Mechanical	PB	Stainless Steel	Treated Borated Water (Ext)	Cracking	Water Chemistry (B2.1.2)	None	None	H, 1
Penetrations Mechanical	PB	Stainless Steel	Treated Borated Water (Ext)	Loss of material	Water Chemistry (B2.1.2)	VII.A3-8	3.3.1.91	B
Penetrations Mechanical	PB	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2)	None	None	H, 1
Penetrations Mechanical	PB	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2)	VII.A3-8	3.3.1.91	B
Piping	PB, SIA	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.A3-3	3.3.1.48	D

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 Vol. 2 Item	Table 1 Item	Notes
Piping	PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	A
Piping	PB	Carbon Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.9)	VII.C1-19	3.3.1.76	A
Piping	PB, SIA	Stainless Steel	Encased in Concrete (Ext)	None	None	VII.J-17	3.3.1.96	A
Piping	LBS, PB, SIA	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	A
Piping	PB	Stainless Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.9)	VII.C1-15	3.3.1.79	A
Piping	PB, SIA	Stainless Steel	Treated Borated Water (Ext)	Cracking	Water Chemistry (B2.1.2)	None	None	H, 1
Piping	PB, SIA	Stainless Steel	Treated Borated Water (Ext)	Loss of material	Water Chemistry (B2.1.2)	VII.A3-8	3.3.1.91	B
Piping	LBS, PB, SIA	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2)	None	None	H, 1
Piping	LBS, PB, SIA	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2)	VII.A3-8	3.3.1.91	B
Pump	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	A
Pump	PB	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2)	None	None	H, 1
Pump	PB	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2)	VII.A3-8	3.3.1.91	B
Pump	LBS	Stainless Steel Cast Austenitic	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	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 Vol. 2 Item	Table 1 Item	Notes
Pump	LBS	Stainless Steel Cast Austenitic	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2)	None	None	H, 1
Pump	LBS	Stainless Steel Cast Austenitic	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2)	VII.A3-8	3.3.1.91	B
Thermowell	PB	Stainless Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.C2-10	3.3.1.50	B
Thermowell	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	A
Thermowell	PB	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2)	None	None	H, 1
Thermowell	PB	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2)	VII.A3-8	3.3.1.91	B
Tubing	LBS, PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	A
Tubing	LBS, PB	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2)	None	None	H, 1
Tubing	LBS, PB	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2)	VII.A3-8	3.3.1.91	B
Valve	PB	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.A3-3	3.3.1.48	D
Valve	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	A
Valve	PB	Carbon Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.9)	VII.C1-19	3.3.1.76	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 Vol. 2 Item	Table 1 Item	Notes
Valve	LBS, PB, SIA	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	A
Valve	PB	Stainless Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.9)	VII.C1-15	3.3.1.79	A
Valve	LBS, PB, SIA	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2)	None	None	H, 1
Valve	LBS, PB, SIA	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2)	VII.A3-8	3.3.1.91	B

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.

D Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.

F Material not in NUREG-1801 for this component.

H Aging effect not in NUREG-1801 for this component, material and environment combination.

Plant Specific Notes:

1 This non-NUREG-1801 line is based upon the NUREG-1801 line VII.A2-7, which considers stainless steel components in treated borated water environment over 140 degrees F.

2 NUREG 1801 does not consider stainless steel bolting in any environment. This non-NUREG-1801 line was added to account for the loss of preload / stress relaxation aging effect not addressed by other NUREG-1801 or non-NUREG-1801 lines.

Table 3.3.2-3 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 Vol. 2 Item	Table 1 Item	Notes
Closure Bolting	PB	Carbon Steel	Atmosphere/ Weather (Ext)	Loss of preload	Bolting Integrity (B2.1.7)	None	None	H, 1
Closure Bolting	PB	Carbon Steel	Atmosphere/ Weather (Ext)	Loss of material	Bolting Integrity (B2.1.7)	VII.I-1	3.3.1.43	B
Closure Bolting	LBS, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.7)	VII.I-4	3.3.1.43	B
Closure Bolting	LBS, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.7)	VII.I-5	3.3.1.45	B
Closure Bolting	PB	Carbon Steel	Raw Water (Ext)	Loss of material	Open-Cycle Cooling Water System (B2.1.9)	VII.C1-19	3.3.1.76	C
Filter	FIL	Stainless Steel	Raw Water (Ext)	Loss of material	Open-Cycle Cooling Water System (B2.1.9)	VII.C1-15	3.3.1.79	A
Filter	FIL	Stainless Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.9)	VII.C1-15	3.3.1.79	A
Flow Element	PB	Stainless Steel	Atmosphere/ Weather (Ext)	None	None	None	None	G, 2
Flow Element	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	A
Flow Element	PB	Stainless Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.9)	VII.C1-15	3.3.1.79	A
Orifice	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	A
Orifice	PB	Carbon Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.9)	VII.C1-19	3.3.1.76	A
Orifice	PB, TH	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	A

Table 3.3.2-3 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 Vol. 2 Item	Table 1 Item	Notes
Orifice	PB, TH	Stainless Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.9)	VII.C1-15	3.3.1.79	A
Piping	PB	Carbon Steel	Atmosphere/ Weather (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-9	3.3.1.58	A
Piping	PB	Carbon Steel	Buried (Ext)	Loss of material	Buried Piping and Tanks Inspection (B2.1.18)	VII.C1-18	3.3.1.19	A
Piping	PB	Carbon Steel	Encased in Concrete (Ext)	None	None	VII.J-21	3.3.1.96	A
Piping	PB, SIA, SP	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	A
Piping	PB	Carbon Steel	Raw Water (Ext)	Loss of material	Open-Cycle Cooling Water System (B2.1.9)	VII.C1-19	3.3.1.76	A
Piping	PB, SIA, SP	Carbon Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.9)	VII.C1-19	3.3.1.76	A
Piping	PB	Nickel Alloys	Plant Indoor Air (Ext)	None	None	VII.J-14	3.3.1.94	A
Piping	PB	Nickel Alloys	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.9)	VII.C1-13	3.3.1.78	A
Piping	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	A
Piping	PB	Stainless Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.9)	VII.C1-15	3.3.1.79	A
Pump	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	A

Table 3.3.2-3 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 Vol. 2 Item	Table 1 Item	Notes
Pump	PB	Carbon Steel	Raw Water (Ext)	Loss of material	Open-Cycle Cooling Water System (B2.1.9)	VII.C1-19	3.3.1.76	A
Pump	PB	Carbon Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.9)	VII.C1-19	3.3.1.76	A
Strainer	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	A
Strainer	PB	Carbon Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.9)	VII.C1-19	3.3.1.76	A
Strainer Element	FIL	Stainless Steel	Raw Water (Ext)	Loss of material	Open-Cycle Cooling Water System (B2.1.9)	VII.C1-15	3.3.1.79	A
Strainer Element	FIL	Stainless Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.9)	VII.C1-15	3.3.1.79	A
Tank	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	A
Tank	PB	Carbon Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.9)	VII.C1-19	3.3.1.76	C
Thermowell	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	A
Thermowell	PB	Stainless Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.9)	VII.C1-15	3.3.1.79	A
Tubing	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	A
Tubing	PB	Stainless Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.9)	VII.C1-15	3.3.1.79	A

Table 3.3.2-3 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 Vol. 2 Item	Table 1 Item	Notes
Valve	PB	Carbon Steel	Atmosphere/ Weather (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-9	3.3.1.58	A
Valve	LBS, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	A
Valve	LBS, PB	Carbon Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.9)	VII.C1-19	3.3.1.76	A
Valve	PB, SIA	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	A
Valve	PB, SIA	Stainless Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.9)	VII.C1-15	3.3.1.79	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.

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.

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 Loss of Preload is conservatively considered to be applicable for all closure bolting. NUREG-1801 only addresses Loss of Preload for bolting of "Steel in Air-Indoor Uncontrolled."

2 These stainless steel components are located in an underground concrete vault with an uncontrolled external air environment and are not exposed to aggressive chemical species. The WCGS plant outdoor environment is not subject to industrial air pollution or saline

environment. Alternate wetting and drying resulting from ground water has shown a tendency to "wash" the exterior surface material rather than concentrate contaminants. Stainless steel does not experience any appreciable aging effects in this environment.

Table 3.3.2-4 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 Vol. 2 Item	Table 1 Item	Notes
Closure Bolting	LBS, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.7)	VII.I-4	3.3.1.43	B
Closure Bolting	LBS, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.7)	VII.I-5	3.3.1.45	B
Flow Element	LBS, PB	Stainless Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.C2-10	3.3.1.50	B
Flow Element	LBS, PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	A
Heat Exchanger Shell Side (HX # 30)	PB	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.C2-1	3.3.1.48	B
Heat Exchanger Shell Side (HX # 30)	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	A
Heat Exchanger Tube Side (HX # 31)	PB	Carbon Steel	Closed Cycle Cooling Water (Ext)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.C2-1	3.3.1.48	B

Table 3.3.2-4 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 Vol. 2 Item	Table 1 Item	Notes
Heat Exchanger Tube Side (HX # 33)	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	A
Heat Exchanger Tube Side (HX # 31, 33)	PB	Carbon Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.9)	VII.C1-5	3.3.1.77	A
Heat Exchanger Tube Side (HX # 32)	HT, PB	Copper-Nickel	Closed Cycle Cooling Water (Ext)	Reduction of heat transfer	Closed-Cycle Cooling Water System (B2.1.10)	VII.C2-2	3.3.1.52	B
Heat Exchanger Tube Side (HX # 32)	HT, PB	Copper-Nickel	Closed Cycle Cooling Water (Ext)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.C2-4	3.3.1.51	D
Heat Exchanger Tube Side (HX # 32)	HT, PB	Copper-Nickel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.9)	VII.C1-3	3.3.1.82	A
Heat Exchanger Tube Side (HX # 32)	HT, PB	Copper-Nickel	Raw Water (Int)	Reduction of heat transfer	Open-Cycle Cooling Water System (B2.1.9)	VII.C1-6	3.3.1.83	A
Piping	LBS, PB, SIA	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.C2-14	3.3.1.47	B

Table 3.3.2-4 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 Vol. 2 Item	Table 1 Item	Notes
Piping	LBS, PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	A
Piping	PB	Carbon Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.9)	VII.C1-19	3.3.1.76	A
Piping	PB	Stainless Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.C2-10	3.3.1.50	B
Piping	LBS, PB, SIA	Stainless Steel	Demineralized Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VIII.E-29	3.4.1.16	B
Piping	LBS, PB, SIA	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	A
Pump	PB	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.C2-14	3.3.1.47	B
Pump	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	A
Sight Gauge	PB	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.C2-14	3.3.1.47	B
Sight Gauge	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	A
Sight Gauge	PB	Glass	Closed Cycle Cooling Water (Int)	None	None	VII.J-13	3.3.1.93	A
Sight Gauge	PB	Glass	Plant Indoor Air (Ext)	None	None	VII.J-8	3.3.1.93	A
Tank	LBS, PB	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.C2-14	3.3.1.47	B

Table 3.3.2-4 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 Vol. 2 Item	Table 1 Item	Notes
Tank	LBS, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	A
Thermowell	PB	Stainless Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.C2-10	3.3.1.50	B
Thermowell	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	A
Thermowell	PB	Stainless Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.9)	VII.C1-15	3.3.1.79	A
Tubing	LBS, PB	Stainless Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.C2-10	3.3.1.50	B
Tubing	LBS, PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	A
Valve	LBS, PB, SIA	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.C2-14	3.3.1.47	B
Valve	LBS, PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	A
Valve	PB	Carbon Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.9)	VII.C1-19	3.3.1.76	A
Valve	PB	Stainless Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.C2-10	3.3.1.50	B
Valve	LBS, PB	Stainless Steel	Demineralized Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VIII.E-29	3.4.1.16	B
Valve	LBS, PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	A

Table 3.3.2-4 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 Vol. 2 Item	Table 1 Item	Notes
Valve	PB	Stainless Steel Cast Austenitic	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.C2-10	3.3.1.50	B
Valve	PB	Stainless Steel Cast Austenitic	Demineralized Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VIII.E-29	3.4.1.16	B
Valve	PB	Stainless Steel Cast Austenitic	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	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.

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 3.3.2-5 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 Vol. 2 Item	Table 1 Item	Notes
Closure Bolting	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.7)	VII.I-4	3.3.1.43	B
Closure Bolting	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.7)	VII.I-5	3.3.1.45	B
Heat Exchanger Shell Side (HX # 34)	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.F3-2	3.3.1.56	A
Heat Exchanger Shell Side (HX # 34	PB	Carbon Steel	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.F3-3	3.3.1.72	A
Heat Exchanger Shell Side (HX # 35, 36, 37)	PB, SS	Carbon Steel (Galvanized or Coated)	Plant Indoor Air (Ext)	None	None	VII.J-6	3.3.1.92	C
Heat Exchanger Shell Side (HX # 36, 37)	PB	Carbon Steel (Galvanized or Coated)	Ventilation Atmosphere (Int)	None	None	VII.J-6	3.3.1.92	C
Heat Exchanger Tube Side (HX # 38)	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.F3-2	3.3.1.56	A

Table 3.3.2-5 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 Vol. 2 Item	Table 1 Item	Notes
Heat Exchanger Tube Side (HX # 38)	PB	Carbon Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.9)	VII.C1-5	3.3.1.77	A
Heat Exchanger Tube Side (HX # 39, 40)	HT, PB	Copper-Nickel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.9)	VII.C1-3	3.3.1.82	A
Heat Exchanger Tube Side (HX # 40)	HT, PB	Copper-Nickel	Raw Water (Int)	Reduction of heat transfer	Open-Cycle Cooling Water System (B2.1.9)	VII.C1-6	3.3.1.83	A
Heat Exchanger Tube Side (HX # 39, 40)	HT, PB	Copper-Nickel	Ventilation Atmosphere (Ext)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.F3-16	3.3.1.25	E
Instrument Bellows	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	A
Instrument Bellows	PB	Stainless Steel	Silicone Fluid (Int)	None	None	None	None	G
Piping	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	A
Piping	PB	Carbon Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.9)	VII.C1-19	3.3.1.76	A
Piping	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	A

Table 3.3.2-5 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 Vol. 2 Item	Table 1 Item	Notes
Piping	PB	Stainless Steel	Silicone Fluid (Int)	None	None	None	None	G
Thermowell	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	A
Thermowell	PB	Stainless Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.9)	VII.C1-15	3.3.1.79	A
Tubing	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	A
Tubing	PB	Stainless Steel	Silicone Fluid (Int)	None	None	None	None	G
Valve	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	A
Valve	PB	Carbon Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.9)	VII.C1-19	3.3.1.76	A

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.

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.

G Environment not in NUREG-1801 for this component and material.

Plant Specific Notes:

None

Table 3.3.2-6 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 Vol. 2 Item	Table 1 Item	Notes
Accumulator	PB	Carbon Steel	Dry Gas (Int)	None	None	VII.J-23	3.3.1.97	C
Accumulator	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.D-3	3.3.1.57	A
Closure Bolting	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.7)	VII.I-4	3.3.1.43	B
Closure Bolting	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.7)	VII.I-5	3.3.1.45	B
Closure Bolting	PB	Copper Alloys	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.7)	None	None	F
Orifice	SIA	Carbon Steel	Dry Gas (Int)	None	None	VII.J-22	3.3.1.98	A
Orifice	SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.D-3	3.3.1.57	A
Orifice	SIA	Carbon Steel	Wetted Gas (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.D-2	3.3.1.53	E, 1
Piping	PB, SIA	Carbon Steel	Dry Gas (Int)	None	None	VII.J-23	3.3.1.97	A
Piping	PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.D-3	3.3.1.57	A

Table 3.3.2-6 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 Vol. 2 Item	Table 1 Item	Notes
Piping	PB	Carbon Steel	Plant Indoor Air (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	None	None	G
Piping	PB	Carbon Steel	Wetted Gas (Int)	Loss of material	10 CFR Part 50, Appendix J (B2.1.30)	VII.D-2	3.3.1.53	E, 1
Piping	SIA	Carbon Steel	Wetted Gas (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.D-2	3.3.1.53	E, 1
Piping	SIA	Copper	Dry Gas (Int)	None	None	VII.J-3	3.3.1.98	A
Piping	SIA	Copper	Plant Indoor Air (Ext)	None	None	V.F-3	3.2.1.53	A
Piping	PB, SIA	Stainless Steel	Dry Gas (Int)	None	None	VII.J-18	3.3.1.98	A
Piping	PB, SIA	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	A
Piping	SIA	Stainless Steel	Plant Indoor Air (Int)	None	None	None	None	G
Tubing	PB	Stainless Steel	Dry Gas (Int)	None	None	VII.J-18	3.3.1.98	A
Tubing	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	A
Valve	SIA	Carbon Steel	Dry Gas (Int)	None	None	VII.J-22	3.3.1.98	A
Valve	PB	Carbon Steel	Dry Gas (Int)	None	None	VII.J-23	3.3.1.97	A

Table 3.3.2-6 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 Vol. 2 Item	Table 1 Item	Notes
Valve	PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.D-3	3.3.1.57	A
Valve	PB	Carbon Steel	Plant Indoor Air (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	None	None	G
Valve	PB	Carbon Steel	Wetted Gas (Int)	Loss of material	10 CFR Part 50, Appendix J (B2.1.30)	VII.D-2	3.3.1.53	E, 1
Valve	SIA	Carbon Steel	Wetted Gas (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.D-2	3.3.1.53	E, 1
Valve	SIA	Copper Alloys	Dry Gas (Int)	None	None	VII.J-3	3.3.1.98	A
Valve	SIA	Copper Alloys	Plant Indoor Air (Ext)	None	None	V.F-3	3.2.1.53	A
Valve	PB	Stainless Steel	Dry Gas (Int)	None	None	VII.J-18	3.3.1.98	A
Valve	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	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.

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.

G Environment not in NUREG-1801 for this component and material.

Plant Specific Notes:

1 NUREG-1801, Section XI.M24, "Compressed Air Monitoring" applies to monitoring of the piping and components associated with the air compressors and dryers. Air compressor and dryer piping and components are not in-scope for WCGS. In-scope piping and components are associated with containment penetrations and nitrogen gas piping/components for backup closure of valves. Therefore NUREG-1801, Section XI.M24 is not considered appropriate to WCGS and alternate aging management programs are specified for the in-scope piping and components.

Table 3.3.2-7 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 Vol. 2 Item	Table 1 Item	Notes
Class 1 Piping <= 4in	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	A
Class 1 Piping <= 4in	PB	Stainless Steel	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD for Class 1 components (B2.1.1) and Water Chemistry (B2.1.2) and One-Time Inspection Of ASME Code Class 1 Small-Bore Piping (B2.1.19)	IV.C2-1	3.1.1.70	B
Class 1 Piping <= 4in	PB	Stainless Steel	Reactor Coolant (Int)	Loss of material	Water Chemistry (B2.1.2)	IV.C2-15	3.1.1.83	B
Closure Bolting	LBS, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.7)	VII.I-4	3.3.1.43	B
Closure Bolting	LBS, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.7)	VII.I-5	3.3.1.45	B
Closure Bolting	LBS, PB	Stainless Steel	Borated Water Leakage (Ext)	Loss of preload	Bolting Integrity (B2.1.7)	None	None	F, 5

Table 3.3.2-7 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 Vol. 2 Item	Table 1 Item	Notes
Filter	FIL, PB	Carbon Steel	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	VII.E1-19	3.3.1.14	D
Filter	FIL, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	A
Filter	FIL, PB	Cast Iron	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	VII.E1-19	3.3.1.14	D
Filter	FIL, PB	Cast Iron	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	A
Filter	FIL, PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	C
Filter	FIL, PB	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2)	VII.E1-17	3.3.1.91	D
Filter	FIL, PB	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2)	VII.E1-20	3.3.1.90	D
Flexible Hoses	PB	Stainless Steel	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	VII.E1-15	3.3.1.33	B
Flexible Hoses	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	A
Flow Element	LBS	Stainless Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.C2-10	3.3.1.50	B
Flow Element	LBS	Stainless Steel	Closed Cycle Cooling Water (Int)	Cracking	Closed-Cycle Cooling Water System (B2.1.10)	VII.C2-11	3.3.1.46	B

Table 3.3.2-7 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 Vol. 2 Item	Table 1 Item	Notes
Flow Element	LBS, PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	A
Flow Element	LBS, PB	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2)	VII.E1-17	3.3.1.91	B
Flow Element	LBS, PB	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2)	VII.E1-20	3.3.1.90	B
Heat Exchanger (HX # 45, 46, 47, 49, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68)	PB	Stainless Steel	Treated Borated Water (Int)	Cumulative fatigue damage	Time Limited Aging Analysis evaluated for the period of extended operation.	VII.E1-4	3.3.1.02	I, 7
Heat Exchanger Shell Side (HX # 41, 42, 43)	PB	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.E1-6	3.3.1.48	B
Heat Exchanger Shell Side (HX # 41, 42, 43)	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	A
Heat Exchanger Shell Side (HX # 44)	PB	Stainless Steel	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	VII.E1-15	3.3.1.33	D

Table 3.3.2-7 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 Vol. 2 Item	Table 1 Item	Notes
Heat Exchanger Shell Side (HX # 44, 45, 46)	LBS, PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	C
Heat Exchanger Shell Side (HX # 47)	PB	Stainless Steel	Treated Borated Water (Ext)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VII.E1-5	3.3.1.08	E
Heat Exchanger Shell Side (HX # 47)	PB	Stainless Steel	Treated Borated Water (Ext)	Loss of material	Water Chemistry (B2.1.2)	VII.E1-17	3.3.1.91	D
Heat Exchanger Shell Side (HX # 45, 46, 47)	LBS, PB	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VII.E1-5	3.3.1.08	E
Heat Exchanger Shell Side (HX # 45, 46, 47)	LBS, PB	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2)	VII.E1-17	3.3.1.91	D
Heat Exchanger Tube Side (HX # 48)	HT, PB	Copper-Nickel	Lubricating Oil (Ext)	Loss of material	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	VII.E1-12	3.3.1.26	D

Table 3.3.2-7 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 Vol. 2 Item	Table 1 Item	Notes
Heat Exchanger Tube Side (HX # 48)	HT, PB	Copper-Nickel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	None	None	G, 3
Heat Exchanger Tube Side (HX # 48)	HT, PB	Copper-Nickel	Treated Borated Water (Int)	Reduction of heat transfer	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	None	None	G, 4
Heat Exchanger Tube Side (HX # 52, 55, 58)	HT, PB	Stainless Steel	Closed Cycle Cooling Water (Ext)	Reduction of heat transfer	Closed-Cycle Cooling Water System (B2.1.10)	VII.C2-3	3.3.1.52	B
Heat Exchanger Tube Side (HX # 51, 52, 54, 55, 57, 58)	HT, PB	Stainless Steel	Closed Cycle Cooling Water (Ext)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.C2-10	3.3.1.50	D
Heat Exchanger Tube Side (HX # 51, 52, 54, 55, 57, 58)	HT, PB	Stainless Steel	Closed Cycle Cooling Water (Ext)	Cracking	Closed-Cycle Cooling Water System (B2.1.10)	VII.C2-11	3.3.1.46	D
Heat Exchanger Tube Side (HX # 49)	PB	Stainless Steel	Lubricating Oil (Ext)	Loss of material	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	VII.E1-15	3.3.1.33	D

Table 3.3.2-7 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 Vol. 2 Item	Table 1 Item	Notes
Heat Exchanger Tube Side (HX # 53, 56, 59, 60, 65)	LBS, PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	C
Heat Exchanger Tube Side (HX # 64, 67)	HT, PB	Stainless Steel	Treated Borated Water (Ext)	Reduction of heat transfer	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	None	None	H, 2
Heat Exchanger Tube Side (HX # 61, 62, 63, 64, 66, 67, 68)	HT, LBS, PB	Stainless Steel	Treated Borated Water (Ext)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VII.E1-5	3.3.1.08	E
Heat Exchanger Tube Side (HX # 61, 62, 63, 64, 66, 67, 68)	HT, LBS, PB	Stainless Steel	Treated Borated Water (Ext)	Loss of material	Water Chemistry (B2.1.2)	VII.E1-17	3.3.1.91	D
Heat Exchanger Tube Side (HX # 52, 55, 58, 64, 67)	HT, PB	Stainless Steel	Treated Borated Water (Int)	Reduction of heat transfer	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	None	None	H, 2

Table 3.3.2-7 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 Vol. 2 Item	Table 1 Item	Notes
Heat Exchanger Tube Side (HX # 49, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68)	HT, LBS, PB	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VII.E1-5	3.3.1.08	E
Heat Exchanger Tube Side (HX # 49, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68)	HT, LBS, PB	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2)	VII.E1-17	3.3.1.91	D
Heat Exchanger Tube Side (HX # 50)	PB	Stainless Steel Cast Austenitic	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	C
Heat Exchanger Tube Side (HX # 50)	PB	Stainless Steel Cast Austenitic	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VII.E1-5	3.3.1.08	E

Table 3.3.2-7 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 Vol. 2 Item	Table 1 Item	Notes
Heat Exchanger Tube Side (HX # 50)	PB	Stainless Steel Cast Austenitic	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2)	VII.E1-17	3.3.1.91	D
Instrument Bellows	PB	Stainless Steel	Borated Water Leakage (Int)	None	None	VII.J-16	3.3.1.99	A
Instrument Bellows	LBS	Stainless Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.C2-10	3.3.1.50	D
Instrument Bellows	LBS	Stainless Steel	Closed Cycle Cooling Water (Int)	Cracking	Closed-Cycle Cooling Water System (B2.1.10)	VII.C2-11	3.3.1.46	D
Instrument Bellows	LBS, PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	A
Instrument Bellows	LBS, PB	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2)	VII.E1-17	3.3.1.91	B
Instrument Bellows	LBS, PB	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2)	VII.E1-20	3.3.1.90	B
Insulation	INS	Aluminum	Plant Indoor Air (Ext)	None	None	None	None	J, 6
Insulation	INS	Insulation Calcium Silicate	Plant Indoor Air (Ext)	None	None	None	None	J, 6
Insulation	INS	Insulation Foamglas	Plant Indoor Air (Ext)	None	None	None	None	J, 6
Insulation	INS	Stainless Steel	Plant Indoor Air (Ext)	None	None	None	None	J, 6
Orifice	LBS	Stainless Steel	Demineralized Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VIII.E-29	3.4.1.16	B

Table 3.3.2-7 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 Vol. 2 Item	Table 1 Item	Notes
Orifice	LBS, PB, TH	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	A
Orifice	PB, TH	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2)	VII.E1-17	3.3.1.91	B
Orifice	PB, TH	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2)	VII.E1-20	3.3.1.90	B
Piping	LBS, PB, SIA	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.C2-14	3.3.1.47	B
Piping	PB	Carbon Steel	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	VII.E1-19	3.3.1.14	B
Piping	LBS, PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	A
Piping	LBS	Carbon Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.9)	VII.C1-19	3.3.1.76	A
Piping	PB, SIA	Stainless Steel	Borated Water Leakage (Int)	None	None	VII.J-16	3.3.1.99	A
Piping	PB	Stainless Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.C2-10	3.3.1.50	B
Piping	PB	Stainless Steel	Closed Cycle Cooling Water (Int)	Cracking	Closed-Cycle Cooling Water System (B2.1.10)	VII.C2-11	3.3.1.46	B
Piping	LBS, SIA	Stainless Steel	Demineralized Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VIII.E-29	3.4.1.16	B
Piping	PB, SIA	Stainless Steel	Dry Gas (Int)	None	None	VII.J-19	3.3.1.97	A

Table 3.3.2-7 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 Vol. 2 Item	Table 1 Item	Notes
Piping	LBS, PB, SIA	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	A
Piping	PB	Stainless Steel	Treated Borated Water (Int)	Cumulative fatigue damage	Time Limited Aging Analysis evaluated for the period of extended operation.	VII.E1-16	3.3.1.02	A
Piping	LBS, PB, SIA	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2)	VII.E1-17	3.3.1.91	B
Piping	LBS, PB, SIA	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2)	VII.E1-20	3.3.1.90	B
Pump	LBS	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.C2-14	3.3.1.47	B
Pump	PB	Carbon Steel	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	VII.E1-19	3.3.1.14	B
Pump	LBS, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	A
Pump	LBS, PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	A
Pump	LBS, PB	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VII.E1-7	3.3.1.09	E
Pump	LBS, PB	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2)	VII.E1-17	3.3.1.91	B
Sight Gauge	PB	Glass	Lubricating Oil (Int)	None	None	VII.J-10	3.3.1.93	A

Table 3.3.2-7 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 Vol. 2 Item	Table 1 Item	Notes
Sight Gauge	PB	Glass	Plant Indoor Air (Ext)	None	None	VII.J-8	3.3.1.93	A
Sight Gauge	PB	Copper Alloy (Brass Copper < 85%)	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	VII.E1-12	3.3.1.26	B
Sight Gauge	PB	Copper Alloy (Brass Copper < 85%)	Plant Indoor Air (Ext)	None	None	NG021	None	G,1
Tank	LBS	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.C2-14	3.3.1.47	B
Tank	LBS	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	A
Tank	LBS, PB, SIA	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	C
Tank	LBS, PB, SIA	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2)	VII.E1-17	3.3.1.91	D
Tank	LBS, PB, SIA	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2)	VII.E1-20	3.3.1.90	B
Thermowell	LBS, PB	Stainless Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.C2-10	3.3.1.50	B
Thermowell	LBS, PB	Stainless Steel	Closed Cycle Cooling Water (Int)	Cracking	Closed-Cycle Cooling Water System (B2.1.10)	VII.C2-11	3.3.1.46	B
Thermowell	LBS, PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	A

Table 3.3.2-7 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 Vol. 2 Item	Table 1 Item	Notes
Thermowell	LBS	Stainless Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.9)	VII.C1-15	3.3.1.79	A
Thermowell	LBS, PB	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2)	VII.E1-17	3.3.1.91	B
Thermowell	LBS, PB	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2)	VII.E1-20	3.3.1.90	B
Tubing	PB	Stainless Steel	Borated Water Leakage (Int)	None	None	VII.J-16	3.3.1.99	A
Tubing	LBS, PB	Stainless Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.C2-10	3.3.1.50	B
Tubing	LBS, PB	Stainless Steel	Closed Cycle Cooling Water (Int)	Cracking	Closed-Cycle Cooling Water System (B2.1.10)	VII.C2-11	3.3.1.46	B
Tubing	PB	Stainless Steel	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	VII.E1-15	3.3.1.33	B
Tubing	LBS, PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	A
Tubing	LBS, PB	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2)	VII.E1-17	3.3.1.91	B
Tubing	LBS, PB	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2)	VII.E1-20	3.3.1.90	B
Valve	LBS, PB	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.C2-14	3.3.1.47	B
Valve	PB	Carbon Steel	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	VII.E1-19	3.3.1.14	B

Table 3.3.2-7 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 Vol. 2 Item	Table 1 Item	Notes
Valve	LBS, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	A
Valve	LBS	Carbon Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.9)	VII.C1-19	3.3.1.76	A
Valve	PB	Copper Alloy (Brass Copper < 85%)	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	VII.E1-12	3.3.1.26	B
Valve	PB	Copper Alloy (Brass Copper < 85%)	Plant Indoor Air (Ext)	None	None	None	None	G, 1
Valve	PB, SIA	Stainless Steel	Borated Water Leakage (Int)	None	None	VII.J-16	3.3.1.99	A
Valve	LBS, PB, SIA	Stainless Steel	Demineralized Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VIII.E-29	3.4.1.16	B
Valve	PB	Stainless Steel	Dry Gas (Int)	None	None	VII.J-19	3.3.1.97	A
Valve	PB	Stainless Steel	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	VII.E1-15	3.3.1.33	B
Valve	LBS, PB, SIA	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	A

Table 3.3.2-7 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 Vol. 2 Item	Table 1 Item	Notes
Valve	PB	Stainless Steel	Reactor Coolant (Int)	Cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD for Class 1 components (B2.1.1) and Water Chemistry (B2.1.2)	IV.C2-5	3.1.1.68	B
Valve	PB	Stainless Steel	Reactor Coolant (Int)	Loss of material	Water Chemistry (B2.1.2)	IV.C2-15	3.1.1.83	B
Valve	LBS, PB, SIA	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2)	VII.E1-17	3.3.1.91	B
Valve	LBS, PB, SIA	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2)	VII.E1-20	3.3.1.90	B

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.

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.
J Neither the component nor the material and environment combination is evaluated in NUREG-1801.

<u>Plant Specific Notes:</u>

1 This non-NUREG-1801 line was used to account for copper alloy in plant indoor air (external) in the chemical and volume control system. See precedent of NUREG-1801, line VIII.I-2.
2 Reduction in heat transfer due to fouling is a potential aging effect for stainless steel heat exchanger components in treated borated water.
3 Loss of material due to pitting, crevice and galvanic corrosion is a potential aging effect for copper alloy in treated borated water.
4 Reduction in heat transfer due to fouling is a potential aging effect for copper alloy heat exchanger components in treated borated water.
5 This non-NUREG-1801 line was added to address stainless steel closure bolting in a borated water leakage environment.
6 NUREG-1801 does not consider mechanical insulation. The in-scope thermal insulation is located in areas with non-aggressive environments (meaning the insulation is not exposed to contaminants). Based on the review of the site operating experience, it was determined that for stainless steel insulation, closed cell foam, quilted fiberglass insulation, calcium silicate and insulation jacketing in non-aggressive environments, there were no aging effects requiring management.
7 No vessel, tank, pump, or heat exchanger designs at WCGS are supported by TLAAs except ASME Section III Class 1 components and the Class 2 portions of the steam generators. The CVCS heat exchangers designs are therefore not supported by TLAAs.

Table 3.3.2-8 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 Vol. 2 Item	Table 1 Item	Notes
Closure Bolting	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.7)	VII.I-4	3.3.1.43	B
Closure Bolting	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.7)	VII.I-5	3.3.1.45	B
Closure Bolting	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-7	3.3.1.55	A
Damper	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.F2-2	3.3.1.56	A
Damper	PB	Carbon Steel	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.F2-3	3.3.1.72	A
Damper	FB, PB	Carbon Steel (Galvanized or Coated)	Encased in Concrete (Ext)	None	None	VII.J-21	3.3.1.96	C
Damper	PB	Carbon Steel (Galvanized or Coated)	Plant Indoor Air (Ext)	None	None	VII.J-6	3.3.1.92	C
Damper	FB, PB	Carbon Steel (Galvanized or Coated)	Ventilation Atmosphere (Int)	None	None	VII.J-6	3.3.1.92	C
Damper	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	C

Table 3.3.2-8 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 Vol. 2 Item	Table 1 Item	Notes
Damper	PB	Stainless Steel	Ventilation Atmosphere (Int)	None	None	VII.J-15	3.3.1.94	C
Ductwork	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.F2-2	3.3.1.56	A
Ductwork	PB	Carbon Steel	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.F2-3	3.3.1.72	A
Ductwork	PB	Carbon Steel (Galvanized or Coated)	Plant Indoor Air (Ext)	None	None	VII.J-6	3.3.1.92	C
Ductwork	PB	Carbon Steel (Galvanized or Coated)	Ventilation Atmosphere (Int)	None	None	VII.J-6	3.3.1.92	C
Fan	PB	Carbon Steel (Galvanized or Coated)	Plant Indoor Air (Ext)	None	None	VII.J-6	3.3.1.92	C
Fan	PB	Carbon Steel (Galvanized or Coated)	Ventilation Atmosphere (Int)	None	None	VII.J-6	3.3.1.92	C
Flex Connectors	PB	Elastomer	Plant Indoor Air (Ext)	Hardening and loss of strength	External Surfaces Monitoring Program (B2.1.20)	VII.F2-7	3.3.1.11	E

Table 3.3.2-8 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 Vol. 2 Item	Table 1 Item	Notes
Flex Connectors	PB	Elastomer	Ventilation Atmosphere (Int)	Hardening and loss of strength	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.F2-7	3.3.1.11	E
Heat Exchanger Shell Side (HX # 69, 71, 73, 75, 77, 79)	HT	Aluminum	Ventilation Atmosphere (Ext)	None	None	VII.J-1	3.3.1.95	C
Heat Exchanger Shell Side (HX # 70, 72, 74, 76, 78, 80)	PB	Carbon Steel (Galvanized or Coated)	Plant Indoor Air (Ext)	None	None	VII.J-6	3.3.1.92	C
Heat Exchanger Shell Side (HX # 70, 72, 74, 76, 78, 80)	PB	Carbon Steel (Galvanized or Coated)	Ventilation Atmosphere (Int)	None	None	VII.J-6	3.3.1.92	C
Heat Exchanger Tube Side (HX # 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92)	LBS	Copper	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.F2-13	3.3.1.51	D

Table 3.3.2-8 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 Vol. 2 Item	Table 1 Item	Notes
Heat Exchanger Tube Side (HX # 81, 83, 84, 85, 86)	LBS	Copper	Plant Indoor Air (Ext)	None	None	None	None	G
Heat Exchanger Tube Side (HX # 82, 87, 88, 89, 90, 91, 92)	LBS	Copper	Ventilation Atmosphere (Ext)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.F2-14	3.3.1.25	E
Heat Exchanger Tube Side (HX # 93, 95, 97, 99, 101, 103)	PB	Copper-Nickel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.F2-14	3.3.1.25	E
Heat Exchanger Tube Side (HX # 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104)	HT, PB	Copper-Nickel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.9)	VII.C1-3	3.3.1.82	A

Table 3.3.2-8 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 Vol. 2 Item	Table 1 Item	Notes
Heat Exchanger Tube Side (HX # 94, 96, 98, 100, 102, 104)	HT, PB	Copper-Nickel	Raw Water (Int)	Reduction of heat transfer	Open-Cycle Cooling Water System (B2.1.9)	VII.C1-6	3.3.1.83	A
Heat Exchanger Tube Side (HX # 94, 96, 98, 100, 102, 104)	HT, PB	Copper-Nickel	Ventilation Atmosphere (Ext)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.F2-14	3.3.1.25	E
Piping	LBS	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.F2-18	3.3.1.47	B
Piping	LBS, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	A
Piping	PB	Carbon Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.9)	VII.C1-19	3.3.1.76	A
Piping	LBS	Carbon Steel	Wetted Gas (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.F2-3	3.3.1.72	A
Piping	LBS	Stainless Steel	Demineralized Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	V.C-4	3.2.1.03	D

Table 3.3.2-8 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 Vol. 2 Item	Table 1 Item	Notes
Piping	LBS, PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	A
Piping	PB	Stainless Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.9)	VII.C1-15	3.3.1.79	A
Pump	LBS	Cast Iron (Gray Cast Iron)	Closed Cycle Cooling Water (Int)	Loss of material	Selective Leaching of Materials (B2.1.17)	VII.C2-8	3.3.1.85	B
Pump	LBS	Cast Iron (Gray Cast Iron)	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.F2-18	3.3.1.47	B
Pump	LBS	Cast Iron (Gray Cast Iron)	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	A
Tank	LBS	Stainless Steel	Demineralized Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	V.C-4	3.2.1.03	D
Tank	LBS	Stainless Steel	Ventilation Atmosphere (Ext)	None	None	VII.J-15	3.3.1.94	C, 1
Tubing	PB	Stainless Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.C2-10	3.3.1.50	B
Tubing	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	A
Valve	LBS	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.F2-18	3.3.1.47	B
Valve	LBS	Carbon Steel	Demineralized Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	V.C-6	3.2.1.15	D

Table 3.3.2-8 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 Vol. 2 Item	Table 1 Item	Notes
Valve	LBS, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	A
Valve	PB	Carbon Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.9)	VII.C1-19	3.3.1.76	A
Valve	LBS	Cast Iron (Gray Cast Iron)	Closed Cycle Cooling Water (Int)	Loss of material	Selective Leaching of Materials (B2.1.17)	VII.C2-8	3.3.1.85	B
Valve	LBS	Cast Iron (Gray Cast Iron)	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.F2-18	3.3.1.47	B
Valve	LBS	Cast Iron (Gray Cast Iron)	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	A
Valve	LBS	Copper Alloys	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.F2-13	3.3.1.51	B
Valve	LBS	Copper Alloys	Demineralized Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	None	None	G
Valve	LBS	Copper Alloys	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.F2-14	3.3.1.25	E
Valve	LBS	Stainless Steel	Demineralized Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	V.C-4	3.2.1.03	D
Valve	LBS	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	A

Notes for Table 3.3.2-8:

Standard Note Text

- 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 Note

1 The NUREG-1801 component type "piping" is used to evaluate the material and environment combination for the component "tank." The tanks evaluated are actually exhaust scrubbers.

Table 3.3.2-9 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 Vol. 2 Item	Table 1 Item	Notes
Adsorber	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.F1-2	3.3.1.56	A
Adsorber	PB	Carbon Steel	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.F1-3	3.3.1.72	A
Closure Bolting	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.F1-4	3.3.1.55	A
Closure Bolting	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.7)	VII.I-4	3.3.1.43	B
Closure Bolting	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.7)	VII.I-5	3.3.1.45	B
Compressor	PB	Cast Iron	Dry Gas (Int)	None	None	VII.J-23	3.3.1.97	C
Compressor	PB	Cast Iron	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	A
Damper	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.F1-2	3.3.1.56	A

Table 3.3.2-9 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 Vol. 2 Item	Table 1 Item	Notes
Damper	PB	Carbon Steel	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.F1-3	3.3.1.72	A
Damper	FB, PB	Carbon Steel (Galvanized or Coated)	Encased in Concrete (Ext)	None	None	VII.J-21	3.3.1.96	C
Damper	PB	Carbon Steel (Galvanized or Coated)	Plant Indoor Air (Ext)	None	None	VII.J-6	3.3.1.92	C
Damper	FB, PB	Carbon Steel (Galvanized or Coated)	Ventilation Atmosphere (Int)	None	None	VII.J-6	3.3.1.92	C
Ductwork	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.F1-2	3.3.1.56	A
Ductwork	PB	Carbon Steel	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.F1-3	3.3.1.72	A
Ductwork	PB	Carbon Steel (Galvanized or Coated)	Plant Indoor Air (Ext)	None	None	VII.J-6	3.3.1.92	C

Table 3.3.2-9 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 Vol. 2 Item	Table 1 Item	Notes
Ductwork	PB	Carbon Steel (Galvanized or Coated)	Ventilation Atmosphere (Int)	None	None	VII.J-6	3.3.1.92	C
Fan	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.F1-2	3.3.1.56	A
Fan	PB	Carbon Steel	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.F1-3	3.3.1.72	A
Fan	PB	Carbon Steel (Galvanized or Coated)	Plant Indoor Air (Ext)	None	None	VII.J-6	3.3.1.92	C
Fan	PB	Carbon Steel (Galvanized or Coated)	Ventilation Atmosphere (Int)	None	None	VII.J-6	3.3.1.92	C
Flex Connectors	PB	Elastomer	Plant Indoor Air (Ext)	None	None	VII.F1-7	3.3.1.11	I, 1
Flex Connectors	PB	Elastomer	Ventilation Atmosphere (Int)	None	None	VII.F1-7	3.3.1.11	I, 1
Heat Exchanger Shell Side (HX # 105, 108)	HT	Aluminum	Ventilation Atmosphere (Ext)	None	None	VII.J-1	3.3.1.95	C

Table 3.3.2-9 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 Vol. 2 Item	Table 1 Item	Notes
Heat Exchanger Shell Side (HX # 106, 109)	PB	Carbon Steel	Dry Gas (Int)	None	None	VII.J-23	3.3.1.97	C
Heat Exchanger Shell Side (HX # 106, 109)	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.F1-10	3.3.1.59	A
Heat Exchanger Shell Side (HX # 107, 110)	PB	Carbon Steel (Galvanized or Coated)	Plant Indoor Air (Ext)	None	None	VII.J-6	3.3.1.92	C
Heat Exchanger Shell Side (HX # 107, 110)	PB	Carbon Steel (Galvanized or Coated)	Ventilation Atmosphere (Int)	None	None	VII.J-6	3.3.1.92	C
Heat Exchanger Tube Side (HX # 116, 121)	PB	Carbon Steel	Dry Gas (Int)	None	None	VII.J-23	3.3.1.97	C

Table 3.3.2-9 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 Vol. 2 Item	Table 1 Item	Notes
Heat Exchanger Tube Side (HX # 116, 121)	PB	Carbon Steel	Raw Water (Ext)	Loss of material	Open-Cycle Cooling Water System (B2.1.9)	VII.C1-5	3.3.1.77	A
Heat Exchanger Tube Side (HX # 111, 112, 113)	LBS	Copper	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.F1-8	3.3.1.51	B
Heat Exchanger Tube Side (HX # 114, 119)	HT, PB	Copper	Dry Gas (Int)	None	None	VII.J-4	3.3.1.97	C
Heat Exchanger Tube Side (HX # 111, 112, 113, 114, 119)	HT, LBS, PB	Copper	Ventilation Atmosphere (Ext)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.F1-16	3.3.1.25	E
Heat Exchanger Tube Side (HX # 115, 120)	HT, PB	Copper Alloys	Dry Gas (Ext)	None	None	VII.J-4	3.3.1.97	C

Table 3.3.2-9 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 Vol. 2 Item	Table 1 Item	Notes
Heat Exchanger Tube Side (HX # 118, 123)	PB	Copper Alloys	Dry Gas (Int)	None	None	VII.J-4	3.3.1.97	C
Heat Exchanger Tube Side (HX # 117, 122, 123)	PB	Copper Alloys	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.F1-16	3.3.1.25	E
Heat Exchanger Tube Side (HX # 115, 117, 120, 122)	HT, PB	Copper Alloys	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.9)	VII.C1-3	3.3.1.82	A
Heat Exchanger Tube Side (HX # 115, 120)	HT, PB	Copper Alloys	Raw Water (Int)	Reduction of heat transfer	Open-Cycle Cooling Water System (B2.1.9)	VII.C1-6	3.3.1.83	A
Heat Exchanger Tube Side (HX # 118, 123)	PB	Copper Alloys	Ventilation Atmosphere (Ext)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.F1-16	3.3.1.25	E
Piping	LBS	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.F1-20	3.3.1.47	B

Table 3.3.2-9 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 Vol. 2 Item	Table 1 Item	Notes
Piping	LBS, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	A
Piping	PB	Carbon Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.9)	VII.C1-19	3.3.1.76	A
Piping	LBS	Carbon Steel	Wetted Gas (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.F1-3	3.3.1.72	A
Piping	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	A
Piping	PB	Stainless Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.9)	VII.C1-15	3.3.1.79	A
Pump	LBS	Cast Iron (Gray Cast Iron)	Closed Cycle Cooling Water (Int)	Loss of material	Selective Leaching of Materials (B2.1.17)	VII.C2-8	3.3.1.85	B
Pump	LBS	Cast Iron (Gray Cast Iron)	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.F1-20	3.3.1.47	B
Pump	LBS	Cast Iron (Gray Cast Iron)	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	A
Tubing	LBS	Stainless Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.C2-10	3.3.1.50	B
Tubing	LBS, PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	A

Table 3.3.2-9 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 Vol. 2 Item	Table 1 Item	Notes
Tubing	PB	Stainless Steel	Ventilation Atmosphere (Int)	None	None	VII.J-15	3.3.1.94	A, 2
Valve	LBS	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.F1-20	3.3.1.47	B
Valve	LBS, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	A
Valve	PB	Carbon Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.9)	VII.C1-19	3.3.1.76	A
Valve	LBS	Cast Iron (Gray Cast Iron)	Closed Cycle Cooling Water (Int)	Loss of material	Selective Leaching of Materials (B2.1.17)	VII.C2-8	3.3.1.85	B
Valve	LBS	Cast Iron (Gray Cast Iron)	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.F1-20	3.3.1.47	B
Valve	LBS	Cast Iron (Gray Cast Iron)	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	A
Valve	LBS	Copper Alloys	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.F1-15	3.3.1.51	B
Valve	LBS	Copper Alloys	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.F1-16	3.3.1.25	E
Valve	PB	Stainless Steel	Dry Gas (Int)	None	None	VII.J-19	3.3.1.97	A
Valve	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	A

Table 3.3.2-9 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 Vol. 2 Item	Table 1 Item	Notes
Valve	PB	Stainless Steel	Ventilation Atmosphere (Int)	None	None	VII.J-15	3.3.1.94	A, 2

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.
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.
I Aging effect in NUREG-1801 for this component, material and environment combination is not applicable.

Plant Specific Notes:
1 Ambient temperature in HVAC equipment spaces is expected to be below 95 degrees. Below 95 degrees, thermal aging of elastomers is not considered significant.
2 Stainless steel valves and tubing in HVAC systems with an internal environment of Ventilation Atmosphere are used for air sampling and as differential pressure instrument lines. Condensation is not expected in these applications. The NUREG-1801 line referenced for the aging evaluation is VII.J-15 which is for Air-Uncontrolled (external). In ventilation systems, the internal and external air environments are evaluated as equivalent.

Table 3.3.2-10 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 Vol. 2 Item	Table 1 Item	Notes
Adsorber	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.F2-2	3.3.1.56	A
Adsorber	PB	Carbon Steel	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	None	None	A
Closure Bolting	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.F2-4	3.3.1.55	A
Closure Bolting	LBS, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.7)	VII.I-4	3.3.1.43	B
Closure Bolting	LBS, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.7)	VII.I-5	3.3.1.45	B
Damper	FB, PB	Carbon Steel (Galvanized or Coated)	Encased in Concrete (Ext)	None	None	VII.J-21	3.3.1.96	C
Damper	PB	Carbon Steel (Galvanized or Coated)	Plant Indoor Air (Ext)	None	None	VII.J-6	3.3.1.92	C
Damper	FB, PB	Carbon Steel (Galvanized or Coated)	Ventilation Atmosphere (Int)	None	None	VII.J-6	3.3.1.92	C

Table 3.3.2-10 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 Vol. 2 Item	Table 1 Item	Notes
Ductwork	PB	Carbon Steel	Encased in Concrete (Ext)	None	None	VII.J-21	3.3.1.96	C
Ductwork	PB	Carbon Steel	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.F2-3	3.3.1.72	A
Ductwork	PB	Carbon Steel (Galvanized or Coated)	Plant Indoor Air (Ext)	None	None	VII.J-6	3.3.1.92	C
Ductwork	PB	Carbon Steel (Galvanized or Coated)	Ventilation Atmosphere (Int)	None	None	VII.J-6	3.3.1.92	C
Fan	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.F2-2	3.3.1.56	A
Fan	PB	Carbon Steel	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.F2-3	3.3.1.72	A
Fan	PB	Carbon Steel (Galvanized or Coated)	Plant Indoor Air (Ext)	None	None	VII.J-6	3.3.1.92	C

Table 3.3.2-10 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 Vol. 2 Item	Table 1 Item	Notes
Fan	PB	Carbon Steel (Galvanized or Coated)	Ventilation Atmosphere (Int)	None	None	VII.J-6	3.3.1.92	C
Flex Connectors	PB	Elastomer	Plant Indoor Air (Ext)	Hardening and loss of strength	External Surfaces Monitoring Program (B2.1.20)	VII.F2-7	3.3.1.11	E
Flex Connectors	PB	Elastomer	Ventilation Atmosphere (Int)	Hardening and loss of strength	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.F2-7	3.3.1.11	E
Heat Exchanger Shell Side (HX # 124)	HT	Aluminum	Ventilation Atmosphere (Ext)	None	None	VII.J-1	3.3.1.95	C
Heat Exchanger Shell Side (HX # 125)	PB	Carbon Steel (Galvanized or Coated)	Plant Indoor Air (Ext)	None	None	VII.J-6	3.3.1.92	C
Heat Exchanger Shell Side (HX # 125)	PB	Carbon Steel (Galvanized or Coated)	Ventilation Atmosphere (Int)	None	None	VII.J-6	3.3.1.92	C

Table 3.3.2-10 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 Vol. 2 Item	Table 1 Item	Notes
Heat Exchanger Tube Side (HX # 126, 127, 128, 129, 130)	LBS	Copper	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.F2-13	3.3.1.51	D
Heat Exchanger Tube Side (HX # 126, 127, 128, 129, 130)	LBS	Copper	Ventilation Atmosphere (Ext)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.F2-14	3.3.1.25	E
Heat Exchanger Tube Side (HX # 131)	PB	Copper-Nickel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.F2-14	3.3.1.25	E
Heat Exchanger Tube Side (HX # 131, 132)	HT, PB	Copper-Nickel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.9)	VII.C1-3	3.3.1.82	A
Heat Exchanger Tube Side (HX # 132)	HT, PB	Copper-Nickel	Raw Water (Int)	Reduction of heat transfer	Open-Cycle Cooling Water System (B2.1.9)	VII.C1-6	3.3.1.83	A

Table 3.3.2-10 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 Vol. 2 Item	Table 1 Item	Notes
Heat Exchanger Tube Side (HX # 132)	HT, PB	Copper-Nickel	Ventilation Atmosphere (Ext)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.F2-14	3.3.1.25	E
Heater	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	C
Heater	PB	Stainless Steel	Ventilation Atmosphere (Int)	None	None	VII.J-15	3.3.1.94	A, 2
Piping	LBS	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.F2-18	3.3.1.47	B
Piping	LBS, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	A
Piping	PB	Carbon Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.9)	VII.C1-19	3.3.1.76	A
Piping	LBS	Carbon Steel	Wetted Gas (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.F2-3	3.3.1.72	A
Piping	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	A
Piping	PB	Stainless Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.9)	VII.C1-15	3.3.1.79	A

Table 3.3.2-10 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 Vol. 2 Item	Table 1 Item	Notes
Pump	LBS	Cast Iron (Gray Cast Iron)	Closed Cycle Cooling Water (Int)	Loss of material	Selective Leaching of Materials (B2.1.17)	VII.C2-8	3.3.1.85	B
Pump	LBS	Cast Iron (Gray Cast Iron)	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.F2-18	3.3.1.47	B
Pump	LBS	Cast Iron (Gray Cast Iron)	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	A
Tubing	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	A
Tubing	PB	Stainless Steel	Ventilation Atmosphere (Int)	None	None	VII.J-15	3.3.1.94	A, 1
Valve	LBS	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.F2-18	3.3.1.47	B
Valve	LBS, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	A
Valve	PB	Carbon Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.9)	VII.C1-19	3.3.1.76	A
Valve	LBS	Cast Iron (Gray Cast Iron)	Closed Cycle Cooling Water (Int)	Loss of material	Selective Leaching of Materials (B2.1.17)	VII.C2-8	3.3.1.85	B
Valve	LBS	Cast Iron (Gray Cast Iron)	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.F2-18	3.3.1.47	B

Table 3.3.2-10 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 Vol. 2 Item	Table 1 Item	Notes
Valve	LBS	Cast Iron (Gray Cast Iron)	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	A
Valve	LBS	Copper Alloys	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.F2-13	3.3.1.51	B
Valve	LBS	Copper Alloys	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.F2-14	3.3.1.25	E
Valve	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	A
Valve	PB	Stainless Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.9)	VII.C1-15	3.3.1.79	A
Valve	PB	Stainless Steel	Ventilation Atmosphere (Int)	None	None	VII.J-15	3.3.1.94	A, 1

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.

Plant Specific Notes:

1 Stainless steel valves and tubing in HVAC systems with an internal environment of Ventilation Atmosphere are used for air sampling and as differential pressure instrument lines. Condensation is not expected in these applications. The NUREG-1801 line referenced for the aging evaluation is VII.J-15 which is for Air-Uncontrolled (external). In ventilation systems, the internal and external air environments are evaluated as equivalent.

2 The component is a stainless steel electric heater housing with an internal environment of Ventilation Atmosphere. Condensation is not expected. NUREG-1801 line VII.J-15 is for Air-Uncontrolled (external). In ventilation systems, the internal and external air environments are evaluated as equivalent.

Table 3.3.2-11 Auxiliary Systems – Summary of Aging Management Evaluation - Essential Service Water Pumphouse Building HVAC System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Closure Bolting	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.F2-4	3.3.1.55	A
Closure Bolting	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.7)	VII.I-4	3.3.1.43	B
Closure Bolting	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.7)	VII.I-5	3.3.1.45	B
Damper	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.F2-2	3.3.1.56	A
Damper	PB	Carbon Steel	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.F2-3	3.3.1.72	A
Damper	PB	Carbon Steel (Galvanized or Coated)	Plant Indoor Air (Ext)	None	None	VII.J-6	3.3.1.92	C
Damper	PB	Carbon Steel (Galvanized or Coated)	Ventilation Atmosphere (Int)	None	None	VII.J-6	3.3.1.92	C
Ductwork	PB	Carbon Steel (Galvanized or Coated)	Plant Indoor Air (Ext)	None	None	VII.J-6	3.3.1.92	C

Table 3.3.2-11 Auxiliary Systems – Summary of Aging Management Evaluation - Essential Service Water Pumphouse Building HVAC System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Ductwork	PB	Carbon Steel (Galvanized or Coated)	Ventilation Atmosphere (Int)	None	None	VII.J-6	3.3.1.92	C
Fan	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.F2-2	3.3.1.56	A
Fan	PB	Carbon Steel	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.F2-3	3.3.1.72	A
Flex Connectors	PB	Elastomer	Plant Indoor Air (Ext)	Hardening and loss of strength	External Surfaces Monitoring Program (B2.1.20)	VII.F2-7	3.3.1.11	E
Flex Connectors	PB	Elastomer	Ventilation Atmosphere (Int)	Hardening and loss of strength	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.F2-7	3.3.1.11	E

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.

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:

None

Table 3.3.2-12 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 Vol. 2 Item	Table 1 Item	Notes
Closure Bolting	LBS, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.7)	VII.I-4	3.3.1.43	B
Closure Bolting	LBS, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.7)	VII.I-5	3.3.1.45	B
Closure Bolting	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-7	3.3.1.55	A
Damper	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.F2-2	3.3.1.56	A
Damper	PB	Carbon Steel	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.F2-3	3.3.1.72	A
Damper	FB	Carbon Steel (Galvanized or Coated)	Encased in Concrete (Ext)	None	None	VII.J-21	3.3.1.96	C
Damper	PB	Carbon Steel (Galvanized or Coated)	Plant Indoor Air (Ext)	None	None	VII.J-6	3.3.1.92	C
Damper	FB, PB	Carbon Steel (Galvanized or Coated)	Ventilation Atmosphere (Int)	None	None	VII.J-6	3.3.1.92	C

Table 3.3.2-12 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 Vol. 2 Item	Table 1 Item	Notes
Ductwork	PB	Carbon Steel (Galvanized or Coated)	Plant Indoor Air (Ext)	None	None	VII.J-6	3.3.1.92	C
Ductwork	PB	Carbon Steel (Galvanized or Coated)	Ventilation Atmosphere (Int)	None	None	VII.J-6	3.3.1.92	C
Fan	PB	Carbon Steel (Galvanized or Coated)	Plant Indoor Air (Ext)	None	None	VII.J-6	3.3.1.92	C
Fan	PB	Carbon Steel (Galvanized or Coated)	Ventilation Atmosphere (Int)	None	None	VII.J-6	3.3.1.92	C
Flex Connectors	PB	Elastomer	Plant Indoor Air (Ext)	Hardening and loss of strength	External Surfaces Monitoring Program (B2.1.20)	VII.F2-7	3.3.1.11	E
Flex Connectors	PB	Elastomer	Ventilation Atmosphere (Int)	Hardening and loss of strength	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.F2-7	3.3.1.11	E
Heat Exchanger Shell Side (HX # 133)	HT	Aluminum	Ventilation Atmosphere (Ext)	None	None	VII.J-1	3.3.1.95	C

Table 3.3.2-12 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 Vol. 2 Item	Table 1 Item	Notes
Heat Exchanger Shell Side (HX # 134)	PB	Carbon Steel (Galvanized or Coated)	Plant Indoor Air (Ext)	None	None	VII.J-6	3.3.1.92	C
Heat Exchanger Shell Side (HX # 134)	PB	Carbon Steel (Galvanized or Coated)	Ventilation Atmosphere (Int)	None	None	VII.J-6	3.3.1.92	C
Heat Exchanger Tube Side (HX # 135, 136)	LBS	Copper	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.F2-13	3.3.1.51	B
Heat Exchanger Tube Side (HX # 135, 136)	LBS	Copper	Ventilation Atmosphere (Ext)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.F2-14	3.3.1.25	E
Heat Exchanger Tube Side (HX # 137)	PB	Copper-Nickel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.F2-14	3.3.1.25	E
Heat Exchanger Tube Side (HX # 137, 138)	HT, PB	Copper-Nickel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.9)	VII.C1-3	3.3.1.82	A

Table 3.3.2-12 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 Vol. 2 Item	Table 1 Item	Notes
Heat Exchanger Tube Side (HX # 138)	HT, PB	Copper-Nickel	Raw Water (Int)	Reduction of heat transfer	Open-Cycle Cooling Water System (B2.1.9)	VII.C1-6	3.3.1.83	A
Heat Exchanger Tube Side (HX # 138)	HT, PB	Copper-Nickel	Ventilation Atmosphere (Ext)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.F2-14	3.3.1.25	E
Piping	LBS	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.F2-18	3.3.1.47	B
Piping	LBS, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	A
Piping	PB	Carbon Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.9)	VII.C1-19	3.3.1.76	A
Piping	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	A
Piping	PB	Stainless Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.9)	VII.C1-15	3.3.1.79	A
Pump	LBS	Cast Iron (Gray Cast Iron)	Closed Cycle Cooling Water (Int)	Loss of material	Selective Leaching of Materials (B2.1.17)	VII.C2-8	3.3.1.85	B
Pump	LBS	Cast Iron (Gray Cast Iron)	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.F2-18	3.3.1.47	B

Table 3.3.2-12 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 Vol. 2 Item	Table 1 Item	Notes
Pump	LBS	Cast Iron (Gray Cast Iron)	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	A
Tubing	LBS	Stainless Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.C2-10	3.3.1.50	B
Tubing	LBS	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	A
Valve	LBS	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.F2-18	3.3.1.47	B
Valve	LBS, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	A
Valve	PB	Carbon Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.9)	VII.C1-19	3.3.1.76	A
Valve	LBS	Cast Iron (Gray Cast Iron)	Closed Cycle Cooling Water (Int)	Loss of material	Selective Leaching of Materials (B2.1.17)	VII.C2-8	3.3.1.85	B
Valve	LBS	Cast Iron (Gray Cast Iron)	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.F2-18	3.3.1.47	B
Valve	LBS	Cast Iron (Gray Cast Iron)	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	A
Valve	LBS	Copper Alloy (Brass Copper < 85%)	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.F2-13	3.3.1.51	B

Table 3.3.2-12 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 Vol. 2 Item	Table 1 Item	Notes
Valve	LBS	Copper Alloy (Brass Copper < 85%)	Closed Cycle Cooling Water (Int)	Loss of material	Selective Leaching of Materials (B2.1.17)	VII.F2-15	3.3.1.84	B
Valve	LBS	Copper Alloy (Brass Copper < 85%)	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.F2-14	3.3.1.25	E

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.

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:

None

Table 3.3.2-13 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 Vol. 2 Item	Table 1 Item	Notes
Closure Bolting	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.7)	VII.I-4	3.3.1.43	B
Closure Bolting	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.7)	VII.I-5	3.3.1.45	B
Closure Bolting	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-7	3.3.1.55	A
Damper	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.F4-1	3.3.1.56	A
Damper	PB	Carbon Steel	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.F4-2	3.3.1.72	A
Damper	PB	Carbon Steel (Galvanized or Coated)	Plant Indoor Air (Ext)	None	None	VII.J-6	3.3.1.92	C
Damper	PB	Carbon Steel (Galvanized or Coated)	Ventilation Atmosphere (Int)	None	None	VII.J-6	3.3.1.92	C
Ductwork	PB	Carbon Steel (Galvanized or Coated)	Plant Indoor Air (Ext)	None	None	VII.J-6	3.3.1.92	C

Table 3.3.2-13 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 Vol. 2 Item	Table 1 Item	Notes
Ductwork	PB	Carbon Steel (Galvanized or Coated)	Ventilation Atmosphere (Int)	None	None	VII.J-6	3.3.1.92	C
Fan	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.F4-1	3.3.1.56	A
Fan	PB	Carbon Steel	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.F4-2	3.3.1.72	A
Flex Connectors	PB	Elastomer	Plant Indoor Air (Ext)	Hardening and loss of strength	External Surfaces Monitoring Program (B2.1.20)	VII.F4-6	3.3.1.11	E
Flex Connectors	PB	Elastomer	Ventilation Atmosphere (Int)	Hardening and loss of strength	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.F4-6	3.3.1.11	E

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.

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.

<u>Plant Specific Notes:</u>

None

Table 3.3.2-14 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 Vol. 2 Item	Table 1 Item	Notes
Closure Bolting	PB	Carbon Steel	Buried (Ext)	Loss of material	Buried Piping and Tanks Inspection (B2.1.18)	VII.G-25	3.3.1.19	C
Closure Bolting	LBS, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.7)	VII.I-4	3.3.1.43	B
Closure Bolting	LBS, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.7)	VII.I-5	3.3.1.45	B
Filter	FIL, PB	Carbon Steel	Fuel Oil (Int)	Loss of material	Fire Protection (B2.1.12) and Fuel Oil Chemistry (B2.1.14)	VII.G-21	3.3.1.64	B
Filter	FIL, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	A
Flexible Hoses	PB	Elastomer	Dry Gas (Int)	None	None	None	None	J, 1
Flexible Hoses	PB	Elastomer	Plant Indoor Air (Ext)	None	None	None	None	J, 1
Hose Station	PB	Copper Alloy (Brass Copper < 85%)	Plant Indoor Air (Ext)	None	None	VIII.I-2	3.4.1.41	A
Hose Station	PB	Copper Alloy (Brass Copper < 85%)	Raw Water (Int)	Loss of material	Fire Water System (B2.1.13) and Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.G-12	3.3.1.70	E, 2

Table 3.3.2-14 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 Vol. 2 Item	Table 1 Item	Notes
Hose Station	PB	Copper Alloy (Brass Copper < 85%)	Raw Water (Int)	Loss of material	Selective Leaching of Materials (B2.1.17)	VII.G-13	3.3.1.84	B
Piping	PB	Carbon Steel	Buried (Ext)	Loss of material	Buried Piping and Tanks Inspection (B2.1.18)	VII.G-25	3.3.1.19	A
Piping	PB	Carbon Steel	Fuel Oil (Int)	Loss of material	Fire Protection (B2.1.12) and Fuel Oil Chemistry (B2.1.14)	VII.G-21	3.3.1.64	B
Piping	LBS, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	A
Piping	LBS, PB	Carbon Steel	Raw Water (Int)	Loss of material	Fire Water System (B2.1.13) and Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.G-24	3.3.1.68	E, 2
Piping	PB	Carbon Steel	Wetted Gas (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.G-23	3.3.1.71	A
Piping	PB	Carbon Steel (Galvanized or Coated)	Dry Gas (Int)	None	None	VII.J-23	3.3.1.97	A

Table 3.3.2-14 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 Vol. 2 Item	Table 1 Item	Notes
Piping	PB	Carbon Steel (Galvanized or Coated)	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	VII.G-22	3.3.1.14	B
Piping	PB	Carbon Steel (Galvanized or Coated)	Plant Indoor Air (Ext)	None	None	VII.J-6	3.3.1.92	A
Piping	PB	Carbon Steel (Galvanized or Coated)	Plant Indoor Air (Int)	None	None	VII.J-6	3.3.1.92	A
Piping	PB	Carbon Steel (Galvanized or Coated)	Raw Water (Ext)	Loss of material	Fire Water System (B2.1.13)	VII.G-24	3.3.1.68	B
Piping	PB	Carbon Steel (Galvanized or Coated)	Raw Water (Int)	Loss of material	Fire Water System (B2.1.13) and Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.G-24	3.3.1.68	E, 2
Piping	PB	Cast Iron	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	A
Piping	PB	Cast Iron	Raw Water (Int)	Loss of material	Fire Water System (B2.1.13) and Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.G-24	3.3.1.68	E, 2

Table 3.3.2-14 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 Vol. 2 Item	Table 1 Item	Notes
Piping	PB	Cast Iron (Galvanized or Coated)	Dry Gas (Int)	None	None	VII.J-23	3.3.1.97	A
Piping	PB	Cast Iron (Galvanized or Coated)	Plant Indoor Air (Ext)	None	None	VII.J-6	3.3.1.92	A
Piping	PB	Copper	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	VII.G-11	3.3.1.26	B
Piping	PB	Copper	Plant Indoor Air (Ext)	None	None	VIII.I-2	3.4.1.41	A
Piping	PB	Copper	Raw Water (Int)	Loss of material	Fire Water System (B2.1.13) and Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.G-12	3.3.1.70	E, 2
Piping	PB	Copper Alloy (Brass Copper < 85%)	Fuel Oil (Int)	Loss of material	Fuel Oil Chemistry (B2.1.14) and One-Time Inspection (B2.1.16)	VII.G-10	3.3.1.32	B
Piping	PB	Copper Alloy (Brass Copper < 85%)	Plant Indoor Air (Ext)	None	None	VIII.I-2	3.4.1.41	A
Piping	PB	Ductile Iron	Buried (Ext)	Loss of material	Buried Piping and Tanks Inspection (B2.1.18)	VII.G-25	3.3.1.19	A

Table 3.3.2-14 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 Vol. 2 Item	Table 1 Item	Notes
Piping	PB	Ductile Iron	Raw Water (Int)	Loss of material	Fire Water System (B2.1.13) and Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.G-24	3.3.1.68	E, 2
Pump	PB	Carbon Steel	Fuel Oil (Int)	Loss of material	Fire Protection (B2.1.12) and Fuel Oil Chemistry (B2.1.14)	VII.G-21	3.3.1.64	B
Pump	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	A
Pump	PB	Carbon Steel	Raw Water (Int)	Loss of material	Fire Water System (B2.1.13) and Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.G-24	3.3.1.68	E, 2
Pump	PB	Cast Iron	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	A
Pump	PB	Cast Iron	Raw Water (Int)	Loss of material	Fire Water System (B2.1.13) and Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.G-24	3.3.1.68	E, 2

Table 3.3.2-14 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 Vol. 2 Item	Table 1 Item	Notes
Pump	PB	Cast Iron (Gray Cast Iron)	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	A
Pump	PB	Cast Iron (Gray Cast Iron)	Raw Water (Ext)	Loss of material	Selective Leaching of Materials (B2.1.17)	VII.G-14	3.3.1.85	B
Pump	PB	Cast Iron (Gray Cast Iron)	Raw Water (Ext)	Loss of material	Fire Water System (B2.1.13)	VII.G-24	3.3.1.68	B
Pump	PB	Cast Iron (Gray Cast Iron)	Raw Water (Int)	Loss of material	Selective Leaching of Materials (B2.1.17)	VII.G-14	3.3.1.85	B
Pump	PB	Cast Iron (Gray Cast Iron)	Raw Water (Int)	Loss of material	Fire Water System (B2.1.13) and Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.G-24	3.3.1.68	E, 2
Pump	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	A
Pump	PB	Stainless Steel	Raw Water (Int)	Loss of material	Fire Water System (B2.1.13) and Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.G-19	3.3.1.69	E, 2
Spray Nozzle	SP	Bronze	Plant Indoor Air (Ext)	None	None	VIII.I-2	3.4.1.41	A

Table 3.3.2-14 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 Vol. 2 Item	Table 1 Item	Notes
Spray Nozzle	SP	Bronze	Plant Indoor Air (Int)	None	None	None	None	G
Spray Nozzle	SP	Copper Alloy (Brass Copper < 85%)	Plant Indoor Air (Ext)	None	None	VIII.I-2	3.4.1.41	A
Spray Nozzle	SP	Copper Alloy (Brass Copper < 85%)	Plant Indoor Air (Int)	None	None	None	None	G
Sprinkler Head	PB, SP	Copper Alloy (Brass Copper < 85%)	Plant Indoor Air (Ext)	None	None	VIII.I-2	3.4.1.41	A
Sprinkler Head	PB, SP	Copper Alloy (Brass Copper < 85%)	Raw Water (Int)	Loss of material	Fire Water System (B2.1.13)	VII.G-12	3.3.1.70	B
Sprinkler Head	PB, SP	Copper Alloy (Brass Copper < 85%)	Raw Water (Int)	Loss of material	Selective Leaching of Materials (B2.1.17)	VII.G-13	3.3.1.84	B
Strainer	FIL, PB	Carbon Steel	Fuel Oil (Int)	Loss of material	Fire Protection (B2.1.12) and Fuel Oil Chemistry (B2.1.14)	VII.G-21	3.3.1.64	B
Strainer	FIL, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	A

Table 3.3.2-14 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 Vol. 2 Item	Table 1 Item	Notes
Strainer	FIL, PB	Carbon Steel (Galvanized or Coated)	Plant Indoor Air (Ext)	None	None	VII.J-6	3.3.1.92	A
Strainer	FIL, PB	Carbon Steel (Galvanized or Coated)	Raw Water (Int)	Loss of material	Fire Water System (B2.1.13) and Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.G-24	3.3.1.68	E, 2
Strainer	FIL, PB	Cast Iron	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	A
Strainer	FIL, PB	Cast Iron	Plant Indoor Air (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	None	None	G
Strainer	FIL, PB	Cast Iron	Raw Water (Int)	Loss of material	Fire Water System (B2.1.13) and Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.G-24	3.3.1.68	E, 2
Tank	PB	Carbon Steel	Dry Gas (Int)	None	None	VII.J-23	3.3.1.97	C
Tank	PB	Carbon Steel	Fuel Oil (Int)	Loss of material	Fire Protection (B2.1.12) and Fuel Oil Chemistry (B2.1.14)	VII.G-21	3.3.1.64	D

Table 3.3.2-14 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 Vol. 2 Item	Table 1 Item	Notes
Tank	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	A
Tubing	PB	Copper	Plant Indoor Air (Ext)	None	None	VIII.I-2	3.4.1.41	A
Tubing	PB	Copper	Raw Water (Int)	Loss of material	Fire Water System (B2.1.13) and Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.G-12	3.3.1.70	E, 2
Tubing	PB	Stainless Steel	Dry Gas (Int)	None	None	VII.J-19	3.3.1.97	A
Tubing	PB	Stainless Steel	Fuel Oil (Int)	Loss of material	Fuel Oil Chemistry (B2.1.14) and One-Time Inspection (B2.1.16)	VII.G-17	3.3.1.32	B
Tubing	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	A
Tubing	PB	Stainless Steel	Raw Water (Int)	Loss of material	Fire Water System (B2.1.13) and Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.G-19	3.3.1.69	E, 2
Valve	PB	Bronze	Dry Gas (Int)	None	None	VII.J-4	3.3.1.97	A
Valve	PB	Bronze	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	VII.G-11	3.3.1.26	B

Table 3.3.2-14 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 Vol. 2 Item	Table 1 Item	Notes
Valve	PB	Bronze	Plant Indoor Air (Ext)	None	None	VIII.I-2	3.4.1.41	A
Valve	PB	Bronze	Raw Water (Int)	Loss of material	Fire Water System (B2.1.13) and Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.G-12	3.3.1.70	E, 2
Valve	PB	Bronze	Wetted Gas (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.G-9	3.3.1.28	E
Valve	PB	Carbon Steel	Fuel Oil (Int)	Loss of material	Fire Protection (B2.1.12) and Fuel Oil Chemistry (B2.1.14)	VII.G-21	3.3.1.64	B
Valve	LBS, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	A
Valve	LBS, PB	Carbon Steel	Raw Water (Int)	Loss of material	Fire Water System (B2.1.13) and Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.G-24	3.3.1.68	E, 2

Table 3.3.2-14 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 Vol. 2 Item	Table 1 Item	Notes
Valve	PB	Carbon Steel	Wetted Gas (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.G-23	3.3.1.71	A
Valve	PB	Carbon Steel (Galvanized or Coated)	Dry Gas (Int)	None	None	VII.J-23	3.3.1.97	A
Valve	PB	Carbon Steel (Galvanized or Coated)	Plant Indoor Air (Ext)	None	None	VII.J-6	3.3.1.92	A
Valve	PB	Carbon Steel (Galvanized or Coated)	Plant Indoor Air (Int)	None	None	VII.J-6	3.3.1.92	A
Valve (including fire hydrant)	PB	Cast Iron	Atmosphere/ Weather (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-9	3.3.1.58	A
Valve	LBS, PB	Cast Iron	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	A
Valve (including fire hydrant)	LBS, PB	Cast Iron	Raw Water (Int)	Loss of material	Fire Water System (B2.1.13) and Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.G-24	3.3.1.68	E, 2

Table 3.3.2-14 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 Vol. 2 Item	Table 1 Item	Notes
Valve	PB	Cast Iron	Wetted Gas (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.G-23	3.3.1.71	A
Valve	PB	Cast Iron (Gray Cast Iron)	Atmosphere/ Weather (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-9	3.3.1.58	A
Valve	PB	Cast Iron (Gray Cast Iron)	Buried (Ext)	Loss of material	Selective Leaching of Materials (B2.1.17)	VII.G-15	3.3.1.85	B
Valve	PB	Cast Iron (Gray Cast Iron)	Buried (Ext)	Loss of material	Buried Piping and Tanks Inspection (B2.1.18)	VII.G-25	3.3.1.19	A
Valve	PB	Cast Iron (Gray Cast Iron)	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	A
Valve	PB	Cast Iron (Gray Cast Iron)	Raw Water (Int)	Loss of material	Selective Leaching of Materials (B2.1.17)	VII.G-14	3.3.1.85	B
Valve	PB	Cast Iron (Gray Cast Iron)	Raw Water (Int)	Loss of material	Fire Water System (B2.1.13) and Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.G-24	3.3.1.68	E, 2

Table 3.3.2-14 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 Vol. 2 Item	Table 1 Item	Notes
Valve	PB	Cast Iron (Gray Cast Iron)	Wetted Gas (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.G-23	3.3.1.71	A
Valve	PB	Copper Alloy (Brass Copper < 85%)	Dry Gas (Int)	None	None	VII.J-4	3.3.1.97	A
Valve	PB	Copper Alloy (Brass Copper < 85%)	Plant Indoor Air (Ext)	None	None	VIII.I-2	3.4.1.41	A
Valve	PB	Copper Alloy (Brass Copper < 85%)	Plant Indoor Air (Int)	None	None	None	None	G
Valve	PB	Copper Alloy (Brass Copper < 85%)	Raw Water (Int)	Loss of material	Fire Water System (B2.1.13) and Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.G-12	3.3.1.70	E, 2
Valve	PB	Copper Alloy (Brass Copper < 85%)	Raw Water (Int)	Loss of material	Selective Leaching of Materials (B2.1.17)	VII.G-13	3.3.1.84	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.
- G Environment not in NUREG-1801 for this component and material.
- J Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant Specific Notes:

1 Ambient temperature in these spaces is expected to be below 95 degrees. Below 95 degrees, thermal aging of elastomers is not considered significant.

2 NUREG-1801 recommends that the aging of this component, with an internal environment of raw water, be managed by Section XI.M27, “Fire Water System.” The aging management of the internal surfaces exposed to raw water for this component is managed by both Fire Water System program (B2.1.13) and Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program (B2.1.22).

Table 3.3.2-15 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 Vol. 2 Item	Table 1 Item	Notes
Closure Bolting	PB	Carbon Steel	Atmosphere/ Weather (Ext)	Loss of preload	Bolting Integrity (B2.1.7)	None	None	H, 1
Closure Bolting	PB	Carbon Steel	Atmosphere/ Weather (Ext)	Loss of material	Bolting Integrity (B2.1.7)	VII.I-1	3.3.1.43	B
Closure Bolting	PB	Carbon Steel	Fuel Oil (Ext)	Loss of preload	Bolting Integrity (B2.1.7)	None	None	G, 2
Closure Bolting	PB	Carbon Steel	Fuel Oil (Ext)	Loss of material	Fuel Oil Chemistry (B2.1.14) and One-Time Inspection (B2.1.16)	VII.H1-10	3.3.1.20	D
Closure Bolting	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.7)	VII.I-4	3.3.1.43	B
Closure Bolting	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.7)	VII.I-5	3.3.1.45	B
Instrument	PB	Glass	Fuel Oil (Int)	None	None	VII.J-9	3.3.1.93	A
Instrument	PB	Glass	Plant Indoor Air (Ext)	None	None	VII.J-8	3.3.1.93	A
Piping	PB	Carbon Steel	Atmosphere/ Weather (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.H1-8	3.3.1.60	A
Piping	PB	Carbon Steel	Buried (Ext)	Loss of material	Buried Piping and Tanks Inspection (B2.1.18)	VII.H1-9	3.3.1.19	A
Piping	PB	Carbon Steel	Fuel Oil (Ext)	Loss of material	Fuel Oil Chemistry (B2.1.14) and One-Time Inspection (B2.1.16)	VII.H1-10	3.3.1.20	B

Table 3.3.2-15 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 Vol. 2 Item	Table 1 Item	Notes
Piping	PB, SIA	Carbon Steel	Fuel Oil (Int)	Loss of material	Fuel Oil Chemistry (B2.1.14) and One-Time Inspection (B2.1.16)	VII.H1-10	3.3.1.20	B
Piping	PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	A
Pump	PB	Stainless Steel	Fuel Oil (Ext)	Loss of material	Fuel Oil Chemistry (B2.1.14) and One-Time Inspection (B2.1.16)	VII.H1-6	3.3.1.32	B
Pump	PB	Stainless Steel	Fuel Oil (Int)	Loss of material	Fuel Oil Chemistry (B2.1.14) and One-Time Inspection (B2.1.16)	VII.H1-6	3.3.1.32	B
Strainer	FIL, PB	Carbon Steel	Fuel Oil (Int)	Loss of material	Fuel Oil Chemistry (B2.1.14) and One-Time Inspection (B2.1.16)	VII.H1-10	3.3.1.20	B
Strainer	FIL, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	A
Tank	PB	Carbon Steel	Buried (Ext)	Loss of material	Buried Piping and Tanks Inspection (B2.1.18)	VII.H1-9	3.3.1.19	C
Tank	PB	Carbon Steel	Fuel Oil (Int)	Loss of material	Fuel Oil Chemistry (B2.1.14) and One-Time Inspection (B2.1.16)	VII.H1-10	3.3.1.20	B
Tank	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	A

Table 3.3.2-15 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 Vol. 2 Item	Table 1 Item	Notes
Tubing	PB	Stainless Steel	Fuel Oil (Int)	Loss of material	Fuel Oil Chemistry (B2.1.14) and One-Time Inspection (B2.1.16)	VII.H1-6	3.3.1.32	B
Tubing	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	A
Valve	PB	Carbon Steel	Fuel Oil (Int)	Loss of material	Fuel Oil Chemistry (B2.1.14) and One-Time Inspection (B2.1.16)	VII.H1-10	3.3.1.20	B
Valve	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	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.

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 NUREG-1801 line VII.I-5 has loss of preload/thermal effects, gasket creep, and self-loosening for steel closure bolting in indoor uncontrolled (external) air. This aging effect/mechanism would also exist in the environment or outdoor (external) air, therefore this non-NUREG-1801 line has been added to also address loss of preload for the component/material/environment of NUREG-1801 line VII.I-1.

2 NUREG-1801 line VII.I-5 has loss of preload/thermal effects, gasket creep, and self-loosening for steel closure bolting in indoor uncontrolled (external) air. This aging effect/mechanism would also exist in the environment of fuel oil (external), therefore this non-NUREG-1801 line has been added.

Table 3.3.2-16 Auxiliary Systems – Summary of Aging Management Evaluation - Emergency Diesel Engine System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Expansion Joint	PB	Stainless Steel	Diesel Exhaust (Int)	Cracking	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.H2-1	3.3.1.06	E
Expansion Joint	PB	Stainless Steel	Diesel Exhaust (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.H2-2	3.3.1.18	E
Expansion Joint	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	A
Filter	FIL, PB	Carbon Steel	Dry Gas (Int)	None	None	VII.J-23	3.3.1.97	A
Filter	PB	Carbon Steel	Fuel Oil (Int)	Loss of material	Fuel Oil Chemistry (B2.1.14) and One-Time Inspection (B2.1.16)	VII.H2-24	3.3.1.20	B
Filter	FIL, PB	Carbon Steel	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	VII.H2-20	3.3.1.14	B
Filter	FIL, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	A

Table 3.3.2-16 Auxiliary Systems – Summary of Aging Management Evaluation - Emergency Diesel Engine System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Filter	FIL, PB	Carbon Steel	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.F4-2	3.3.1.72	A
Heat Exchanger Shell Side (HX # 139, 140)	PB	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.H2-23	3.3.1.47	D
Heat Exchanger Shell Side (HX # 141)	PB	Carbon Steel	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	VII.H2-5	3.3.1.21	B
Heat Exchanger Shell Side (HX # 139, 140, 141)	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	A
Heat Exchanger Tube Side (HX # 142, 145, 148)	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	A

Table 3.3.2-16 Auxiliary Systems – Summary of Aging Management Evaluation - Emergency Diesel Engine System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Heat Exchanger Tube Side (HX # 142, 145, 148)	PB	Carbon Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.9)	VII.C1-5	3.3.1.77	A
Heat Exchanger Tube Side (HX # 144, 147)	HT, PB	Copper Alloy (Brass Copper < 85%)	Closed Cycle Cooling Water (Ext)	Reduction of heat transfer	Closed-Cycle Cooling Water System (B2.1.10)	VII.C2-2	3.3.1.52	B
Heat Exchanger Tube Side (HX # 143, 144, 146, 147)	HT, PB	Copper Alloy (Brass Copper < 85%)	Closed Cycle Cooling Water (Ext)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.H2-8	3.3.1.51	D
Heat Exchanger Tube Side (HX # 143, 144, 146, 147)	HT, PB	Copper Alloy (Brass Copper < 85%)	Closed Cycle Cooling Water (Ext)	Loss of material	Selective Leaching of Materials (B2.1.17)	VII.H2-12	3.3.1.84	D
Heat Exchanger Tube Side (HX # 150)	HT, PB	Copper Alloy (Brass Copper < 85%)	Lubricating Oil (Ext)	Reduction of heat transfer	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	None	None	D, 4
Heat Exchanger Tube Side (HX # 149, 150)	HT, PB	Copper Alloy (Brass Copper < 85%)	Lubricating Oil (Ext)	Loss of material	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	VII.H2-10	3.3.1.26	D

Table 3.3.2-16 Auxiliary Systems – Summary of Aging Management Evaluation - Emergency Diesel Engine System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Heat Exchanger Tube Side (HX # 144, 147, 150)	HT, PB	Copper Alloy (Brass Copper < 85%)	Raw Water (Int)	Reduction of heat transfer	Open-Cycle Cooling Water System (B2.1.9)	VII.C1-6	3.3.1.83	A
Heat Exchanger Tube Side (HX # 143, 144, 146, 147, 149, 150)	HT, PB	Copper Alloy (Brass Copper < 85%)	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.9)	VII.H2-11	3.3.1.80	C
Heat Exchanger Tube Side (HX # 143, 144, 146, 147, 149, 150)	HT, PB	Copper Alloy (Brass Copper < 85%)	Raw Water (Int)	Loss of material	Selective Leaching of Materials (B2.1.17)	VII.H2-13	3.3.1.84	D
Heater	PB	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.H2-23	3.3.1.47	D
Heater	PB	Carbon Steel	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	VII.H2-20	3.3.1.14	D
Heater	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	A
Insulation	INS	Insulation Ceramic Fibers	Plant Indoor Air (Ext)	None	None	None	None	J, 2

Table 3.3.2-16 Auxiliary Systems – Summary of Aging Management Evaluation - Emergency Diesel Engine System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Piping	PB, SIA	Carbon Steel	Atmosphere/ weather (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-9	3.3.1.58	A
Piping	PB	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.H2-23	3.3.1.47	B
Piping	SIA	Carbon Steel	Diesel Exhaust (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.H2-2	3.3.1.18	E
Piping	PB, SIA	Carbon Steel	Dry Gas (Int)	None	None	VII.J-23	3.3.1.97	A
Piping	PB	Carbon Steel	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	VII.H2-20	3.3.1.14	B
Piping	PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	A
Piping	PB	Carbon Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.9)	VII.H2-22	3.3.1.76	A
Piping	PB	Carbon Steel	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.F4-2	3.3.1.72	C

Table 3.3.2-16 Auxiliary Systems – Summary of Aging Management Evaluation - Emergency Diesel Engine System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Piping	PB, SIA	Carbon Steel	Wetted Gas (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.H2-21	3.3.1.71	A
Pump	PB	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.H2-23	3.3.1.47	B
Pump	PB	Carbon Steel	Fuel Oil (Int)	Loss of material	Fuel Oil Chemistry (B2.1.14) and One-Time Inspection (B2.1.16)	VII.H2-24	3.3.1.20	B
Pump	PB	Carbon Steel	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	VII.H2-20	3.3.1.14	B
Pump	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	A
Pump	PB	Carbon Steel	Wetted Gas (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.H2-21	3.3.1.71	A
Pump	PB	Stainless Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.C2-10	3.3.1.50	B
Pump	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	A
Separator	PB	Carbon Steel	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	VII.H2-20	3.3.1.14	B

Table 3.3.2-16 Auxiliary Systems – Summary of Aging Management Evaluation - Emergency Diesel Engine System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Separator	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	A
Sight Gauge	PB	Glass	Lubricating Oil (Int)	None	None	VII.J-10	3.3.1.93	A
Sight Gauge	PB	Glass	Plant Indoor Air (Ext)	None	None	VII.J-8	3.3.1.93	A
Silencer	PB	Carbon Steel	Diesel Exhaust (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.H2-2	3.3.1.18	E
Silencer	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	A
Silencer	PB	Carbon Steel	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.F4-2	3.3.1.72	C
Strainer	FIL, PB	Carbon Steel	Dry Gas (Int)	None	None	VII.J-23	3.3.1.97	A
Strainer	FIL, PB	Carbon Steel	Fuel Oil (Int)	Loss of material	Fuel Oil Chemistry (B2.1.14) and One-Time Inspection (B2.1.16)	VII.H2-24	3.3.1.20	B
Strainer	FIL, PB	Carbon Steel	Lubricating Oil (Ext)	Loss of material	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	VII.H2-20	3.3.1.14	B

Table 3.3.2-16 Auxiliary Systems – Summary of Aging Management Evaluation - Emergency Diesel Engine System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Strainer	FIL, PB	Carbon Steel	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	VII.H2-20	3.3.1.14	B
Strainer	FIL, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	A
Strainer	FIL, PB	Carbon Steel	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.F4-2	3.3.1.72	C
Tank	PB	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.H2-23	3.3.1.47	B
Tank	PB	Carbon Steel	Dry Gas (Int)	None	None	VII.J-23	3.3.1.97	C
Tank	PB	Carbon Steel	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	VII.H2-20	3.3.1.14	D
Tank	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	A
Thermowell	PB	Stainless Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.C2-10	3.3.1.50	B
Thermowell	PB	Stainless Steel	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	VII.H2-17	3.3.1.33	B
Thermowell	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	A

Table 3.3.2-16 Auxiliary Systems – Summary of Aging Management Evaluation - Emergency Diesel Engine System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Tubing	PB	Stainless Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.C2-10	3.3.1.50	B
Tubing	PB	Stainless Steel	Dry Gas (Int)	None	None	VII.J-19	3.3.1.97	A
Tubing	PB	Stainless Steel	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	VII.H2-17	3.3.1.33	B
Tubing	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	A
Valve	PB	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.H2-23	3.3.1.47	B
Valve	LBS	Carbon Steel	Demineralized Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VIII.E-34	3.4.1.04	B
Valve	PB	Carbon Steel	Dry Gas (Int)	None	None	VII.J-23	3.3.1.97	A
Valve	PB	Carbon Steel	Fuel Oil (Int)	Loss of material	Fuel Oil Chemistry (B2.1.14) and One-Time Inspection (B2.1.16)	VII.H2-24	3.3.1.20	B
Valve	PB	Carbon Steel	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	VII.H2-20	3.3.1.14	B
Valve	LBS, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	A
Valve	PB	Carbon Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.9)	VII.H2-22	3.3.1.76	A

Table 3.3.2-16 Auxiliary Systems – Summary of Aging Management Evaluation - Emergency Diesel Engine System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Valve	PB	Copper Alloy (Brass Copper < 85%)	Dry Gas (Int)	None	None	VII.J-4	3.3.1.97	A
Valve	PB	Copper Alloy (Brass Copper < 85%)	Plant Indoor Air (Ext)	None	None	None	None	G, 3
Valve	PB	Stainless Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.C2-10	3.3.1.50	B
Valve	PB	Stainless Steel	Dry Gas (Int)	None	None	VII.J-19	3.3.1.97	A
Valve	PB	Stainless Steel	Fuel Oil (Int)	Loss of material	Fuel Oil Chemistry (B2.1.14) and One-Time Inspection (B2.1.16)	VII.H2-16	3.3.1.32	B
Valve	PB	Stainless Steel	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	VII.H2-17	3.3.1.33	B
Valve	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	A
Valve	PB	Stainless Steel	Wetted Gas (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	None	None	A, 1

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.

G Environment not in NUREG-1801 for this component and material.

J Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant Specific Notes:

1 This non-NUREG-1801 line is based upon NUREG-1801 line VII.F2-1 with a selected aging management program Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program (B2.1.22) for the evaluation of stainless steel piping with an internal environment of condensation.

2 NUREG-1801 does not consider mechanical insulation. The in-scope thermal insulation is located in areas with non-aggressive environments (meaning the insulation is not exposed to contaminants). Based on the review of the site operating experience, it was determined that for stainless steel insulation, closed cell foam, quilted fiberglass insulation, calcium silicate and insulation jacketing in non-aggressive environments, there were no aging effects requiring management.

3 This non-NUREG-1801 line is based upon the material, environment and aging effects combination found in NUREG-1801 line V.F-3. NUREG-1801 does not consider copper alloy components in an environment of indoor air for Auxiliary Systems.

4 This non-NUREG-1801 line is based upon NUREG-1801 line V.A-12. NUREG-1801 does not consider copper alloy heat exchanger tubes in lubricating oil for Auxiliary Systems.

Table 3.3.2-17 Auxiliary Systems – Summary of Aging Management Evaluation - Floor and Equipment Drains System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Bellows	PB	Stainless Steel	Lubricating Oil (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.G-18	3.3.1.33	E, 2
Bellows	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	A
Closure Bolting	LBS, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.7)	VII.I-4	3.3.1.43	B
Closure Bolting	LBS, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.7)	VII.I-5	3.3.1.45	B
Flame Arrestor	PB	Carbon Steel	Lubricating Oil (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.G-26	3.3.1.15	E, 2
Flame Arrestor	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	A
Piping	PB	Carbon Steel	Lubricating Oil (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.G-26	3.3.1.15	E, 2

Table 3.3.2-17 Auxiliary Systems – Summary of Aging Management Evaluation - Floor and Equipment Drains System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Piping	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	A
Piping	SIA	Stainless Steel	Plant Indoor Air (Ext)	None	None	V.F-12	3.2.1.53	A
Piping	LBS, PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	A
Piping	LBS, PB	Stainless Steel	Raw Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.G-19	3.3.1.69	E, 4
Piping	SIA	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2)	VII.E1-17	3.3.1.91	B
Piping	LBS	Stainless Steel	Treated Borated Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.E1-17	3.3.1.91	E, 3
Piping	SIA	Stainless Steel	Wetted Gas (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	None	None	G, 1

Table 3.3.2-17 Auxiliary Systems – Summary of Aging Management Evaluation - Floor and Equipment Drains System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Sight Gauge	PB	Glass	Lubricating Oil (Int)	None	None	VII.J-10	3.3.1.93	A
Sight Gauge	PB	Glass	Plant Indoor Air (Ext)	None	None	VII.J-8	3.3.1.93	A
Tank	PB	Stainless Steel	Lubricating Oil (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.G-18	3.3.1.33	E, 2
Tank	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	C
Tubing	LBS	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	A
Tubing	LBS	Stainless Steel	Treated Borated Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.E1-17	3.3.1.91	E, 3
Valve	PB	Carbon Steel	Lubricating Oil (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.G-26	3.3.1.15	E, 2
Valve	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	A

Table 3.3.2-17 Auxiliary Systems – Summary of Aging Management Evaluation - Floor and Equipment Drains System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Valve	LBS, PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	A
Valve	LBS, PB	Stainless Steel	Raw Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.G-19	3.3.1.69	E, 4
Valve	LBS	Stainless Steel	Treated Borated Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.E1-17	3.3.1.91	E, 3

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.

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 This non-NUREG-1801 line is based upon NUREG-1801 line VII.F2-1 with a selected aging management program Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program (B2.1.22) for the evaluation of stainless steel piping with an internal environment of condensation.

2 Loss of material on internal component surface exposed to contaminated oil environment is managed by Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22) instead of Lubricating Oil Analysis program (B2.1.23)

3 Loss of material on internal component surface exposed to borated water leaking from spent fuel pool is managed by Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22) instead of Water Chemistry (B2.1.2).

4 Loss of material on internal component surface exposed to contaminated sump water is managed by Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22) instead of Fire Water System program (B2.1.13).

Table 3.3.2-18 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 Vol. 2 Item	Table 1 Item	Notes
Closure Bolting	LBS	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.7)	VII.I-4	3.3.1.43	B
Closure Bolting	LBS	Carbon Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.7)	VII.I-5	3.3.1.45	B
Piping	LBS	Carbon Steel (Galvanized or Coated)	Plant Indoor Air (Ext)	None	None	VII.J-6	3.3.1.92	A
Piping	LBS	Carbon Steel (Galvanized or Coated)	Raw Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.C1-19	3.3.1.76	E, 1
Piping	LBS	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	A
Piping	LBS	Stainless Steel	Raw Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.C1-15	3.3.1.79	E, 1
Valve	LBS	Cast Iron (Gray Cast Iron)	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	A

Table 3.3.2-18 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 Vol. 2 Item	Table 1 Item	Notes
Valve	LBS	Cast Iron (Gray Cast Iron)	Raw Water (Int)	Loss of material	Selective Leaching of Materials (B2.1.17)	VII.C1-11	3.3.1.85	B
Valve	LBS	Cast Iron (Gray Cast Iron)	Raw Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.C1-19	3.3.1.76	E, 1

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.

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 component environment is floor and equipment drains that has been evaluated as a raw water environment. Loss of material on internal component surface exposed to floor and equipment drains environment is managed by Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22) instead of Open-Cycle Cooling Water System program (B2.1.9).

Table 3.3.2-19 Auxiliary Systems – Summary of Aging Management Evaluation - Cranes, Hoists and Elevator Systems

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Crane	NSRS	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B2.1.11)	VII.B-1	3.3.1.74	A
Crane	SS	Carbon Steel	Plant Indoor Air (Ext)	Cumulative fatigue damage	Time Limited Aging Analysis evaluated for the period of extended operation.	VII.B-2	3.3.1.01	A
Crane	NSRS	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B2.1.11)	VII.B-3	3.3.1.73	A
Hoist (including monorail)	NSRS	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B2.1.11)	VII.B-1	3.3.1.74	A
Hoist (including monorail)	NSRS	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B2.1.11)	VII.B-3	3.3.1.73	A
Trolley	SS	Carbon Steel	Atmosphere/ weather (Ext)	Loss of material	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B2.1.11)	VII.I-9	3.3.1.58	E, 1

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.

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 Inspection of Overhead Heavy and Light Load (Related to Refueling) Handling Systems program (B2.1.11) inspects the containment equipment hatch and radiation missile shield hand trolleys for corrosion as this component is evaluated as a crane component.

Table 3.3.2-20 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 Vol. 2 Item	Table 1 Item	Notes
Closure Bolting	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.F2-4	3.3.1.55	A
Closure Bolting	LBS, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.7)	VII.I-4	3.3.1.43	B
Closure Bolting	LBS, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.7)	VII.I-5	3.3.1.45	B
Damper	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.F2-2	3.3.1.56	A
Damper	PB	Carbon Steel	Ventilation Atmosphere (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.F2-3	3.3.1.72	A
Damper	FB	Carbon Steel (Galvanized or Coated)	Encased in Concrete (Ext)	None	None	VII.J-21	3.3.1.96	C
Damper	PB	Carbon Steel (Galvanized or Coated)	Plant Indoor Air (Ext)	None	None	VII.J-6	3.3.1.92	C
Damper	FB, PB	Carbon Steel (Galvanized or Coated)	Ventilation Atmosphere (Int)	None	None	VII.J-6	3.3.1.92	C

Table 3.3.2-20 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 Vol. 2 Item	Table 1 Item	Notes
Ductwork	PB	Carbon Steel (Galvanized or Coated)	Plant Indoor Air (Ext)	None	None	VII.J-6	3.3.1.92	C
Ductwork	PB	Carbon Steel (Galvanized or Coated)	Ventilation Atmosphere (Int)	None	None	VII.J-6	3.3.1.92	C
Flex Connectors	PB	Elastomer	Plant Indoor Air (Ext)	Hardening and loss of strength	External Surfaces Monitoring Program (B2.1.20)	VII.F2-7	3.3.1.11	E
Flex Connectors	PB	Elastomer	Ventilation Atmosphere (Int)	Hardening and loss of strength	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.F2-7	3.3.1.11	E

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.

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:

None

Table 3.3.2-21 Auxiliary Systems – Summary of Aging Management Evaluation - Miscellaneous Auxiliary Systems In-Scope ONLY based on Criterion 10 CFR 54.4(a)(2)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Closure Bolting	LBS, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.7)	VII.I-4	3.3.1.43	B
Closure Bolting	LBS, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.7)	VII.I-5	3.3.1.45	B
Closure Bolting	LBS	Copper Alloys	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.7)	None	None	F
Closure Bolting	LBS	Copper Alloys	Plant Indoor Air (Ext)	None	None	VIII.I-2	3.4.1.41	C
Closure Bolting	LBS	Stainless Steel	Borated Water Leakage (Ext)	Loss of preload	Bolting Integrity (B2.1.7)	None	None	F
Flow Element	LBS, SIA	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	A
Flow Element	LBS	Stainless Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.9)	VII.C1-15	3.3.1.79	A
Flow Element	SIA	Stainless Steel	Wetted Gas (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.F2-1	3.3.1.27	E
Orifice	LBS	Stainless Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.C2-10	3.3.1.50	B
Orifice	LBS	Stainless Steel	Closed Cycle Cooling Water (Int)	Cracking	Closed-Cycle Cooling Water System (B2.1.10)	VII.C2-11	3.3.1.46	B

Table 3.3.2-21 Auxiliary Systems – Summary of Aging Management Evaluation - Miscellaneous Auxiliary Systems In-Scope ONLY based on Criterion 10 CFR 54.4(a)(2) (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Orifice	LBS	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	A
Orifice	LBS	Stainless Steel	Raw Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.C1-15	3.3.1.79	E, 3
Piping	LBS	Bronze	Plant Indoor Air (Ext)	None	None	VIII.I-2	3.4.1.41	A
Piping	LBS	Bronze	Potable Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	None	None	G
Piping	LBS, SS	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.C2-14	3.3.1.47	B
Piping	LBS	Carbon Steel	Demineralized Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VIII.E-34	3.4.1.04	B
Piping	LBS, SIA, SS	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	A
Piping	LBS	Carbon Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.9)	VII.C1-19	3.3.1.76	A

Table 3.3.2-21 Auxiliary Systems – Summary of Aging Management Evaluation - Miscellaneous Auxiliary Systems In-Scope ONLY based on Criterion 10 CFR 54.4(a)(2) (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Piping	LBS	Carbon Steel	Raw Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.C1-19	3.3.1.76	E, 1
Piping	SIA	Carbon Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.9)	VII.C1-19	3.3.1.76	A
Piping	LBS	Carbon Steel (Galvanized or Coated)	Plant Indoor Air (Ext)	None	None	VII.J-6	3.3.1.92	A
Piping	LBS	Carbon Steel (Galvanized or Coated)	Potable Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	None	None	G
Piping	LBS	Copper Alloy (Brass Copper < 85%)	Plant Indoor Air (Ext)	None	None	VIII.I-2	3.4.1.41	A
Piping	LBS	Copper Alloy (Brass Copper < 85%)	Potable Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	None	None	G
Piping	LBS	Polyvinyl Chloride (PVC)	Atmosphere/ Weather (Ext)	None	None	None	None	F

Table 3.3.2-21 Auxiliary Systems – Summary of Aging Management Evaluation - Miscellaneous Auxiliary Systems In-Scope ONLY based on Criterion 10 CFR 54.4(a)(2) (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Piping	LBS	Polyvinyl Chloride (PVC)	Raw Water (Int)	None	None	None	None	F
Piping	LBS	Stainless Steel	Demineralized Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VIII.E-29	3.4.1.16	B
Piping	LBS, SIA	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	A
Piping	LBS	Stainless Steel	Raw Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.C1-15	3.3.1.79	E, 1
Piping	LBS	Stainless Steel	Raw Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.C1-15	3.3.1.79	E, 3
Piping	SIA	Stainless Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.9)	VII.C1-15	3.3.1.79	A
Piping	LBS, SIA	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2)	VII.E1-17	3.3.1.91	B
Piping	LBS, SIA	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2)	VII.E1-20	3.3.1.90	B

Table 3.3.2-21 Auxiliary Systems – Summary of Aging Management Evaluation - Miscellaneous Auxiliary Systems In-Scope ONLY based on Criterion 10 CFR 54.4(a)(2) (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Piping	SIA	Stainless Steel	Wetted Gas (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	None	None	G, 2
Piping	SIA	Stainless Steel	Wetted Gas (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.F2-1	3.3.1.27	E
Pump	LBS	Cast Iron	Atmosphere/ Weather (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-9	3.3.1.58	A
Pump	LBS	Cast Iron	Raw Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.C1-15	3.3.1.79	E, 4
Pump	LBS	Stainless Steel Cast Austenitic	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	A
Pump	LBS	Stainless Steel Cast Austenitic	Raw Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.C1-15	3.3.1.79	E, 3

Table 3.3.2-21 Auxiliary Systems – Summary of Aging Management Evaluation - Miscellaneous Auxiliary Systems In-Scope ONLY based on Criterion 10 CFR 54.4(a)(2) (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Strainer	LBS	Stainless Steel Cast Austenitic	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	A
Strainer	LBS	Stainless Steel Cast Austenitic	Raw Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.C1-15	3.3.1.79	E, 3
Tank	LBS	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	C
Tank	LBS	Stainless Steel	Raw Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.C1-15	3.3.1.79	E, 3
Tubing	LBS	Copper	Plant Indoor Air (Ext)	None	None	VIII.I-2	3.4.1.41	A
Tubing	LBS	Copper	Potable Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	None	None	G
Tubing	LBS	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	A
Tubing	LBS	Stainless Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.9)	VII.C1-15	3.3.1.79	A

Table 3.3.2-21 Auxiliary Systems – Summary of Aging Management Evaluation - Miscellaneous Auxiliary Systems In-Scope ONLY based on Criterion 10 CFR 54.4(a)(2) (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Tubing	LBS	Stainless Steel	Raw Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.C1-15	3.3.1.79	E, 3
Valve	LBS	Bronze	Plant Indoor Air (Ext)	None	None	VIII.I-2	3.4.1.41	A
Valve	LBS	Bronze	Potable Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	None	None	G
Valve	LBS	Carbon Steel	Closed Cycle Cooling Water (Int)	Loss of material	Closed-Cycle Cooling Water System (B2.1.10)	VII.C2-14	3.3.1.47	B
Valve	LBS	Carbon Steel	Demineralized Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VIII.E-34	3.4.1.04	B
Valve	LBS	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VII.I-8	3.3.1.58	A
Valve	LBS	Carbon Steel	Raw Water (Int)	Loss of material	Open-Cycle Cooling Water System (B2.1.9)	VII.C1-19	3.3.1.76	A
Valve	LBS	Carbon Steel	Raw Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.C1-19	3.3.1.76	E, 1

Table 3.3.2-21 Auxiliary Systems – Summary of Aging Management Evaluation - Miscellaneous Auxiliary Systems In-Scope ONLY based on Criterion 10 CFR 54.4(a)(2) (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Valve	LBS	Copper Alloy (Brass Copper < 85%)	Plant Indoor Air (Ext)	None	None	VIII.I-2	3.4.1.41	A
Valve	LBS	Copper Alloy (Brass Copper < 85%)	Potable Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	None	None	G
Valve	LBS	Polyvinyl Chloride (PVC)	Atmosphere/ Weather (Ext)	None	None	None	None	F
Valve	LBS	Polyvinyl Chloride (PVC)	Raw Water (Int)	None	None	None	None	F
Valve	LBS	Stainless Steel	Demineralized Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VIII.E-29	3.4.1.16	B
Valve	LBS, SIA	Stainless Steel	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	A
Valve	LBS	Stainless Steel	Raw Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.C1-15	3.3.1.79	E, 3

Table 3.3.2-21 Auxiliary Systems – Summary of Aging Management Evaluation - Miscellaneous Auxiliary Systems In-Scope ONLY based on Criterion 10 CFR 54.4(a)(2) (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Valve	LBS	Stainless Steel	Raw Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.C1-15	3.3.1.79	E, 1
Valve	LBS, SIA	Stainless Steel	Treated Borated Water (Int)	Loss of material	Water Chemistry (B2.1.2)	VII.E1-17	3.3.1.91	B
Valve	LBS, SIA	Stainless Steel	Treated Borated Water (Int)	Cracking	Water Chemistry (B2.1.2)	VII.E1-20	3.3.1.90	B
Valve	SIA	Stainless Steel	Wetted Gas (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.F2-1	3.3.1.27	E
Valve	LBS	Stainless Steel Cast Austenitic	Plant Indoor Air (Ext)	None	None	VII.J-15	3.3.1.94	A
Valve	LBS	Stainless Steel Cast Austenitic	Raw Water (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VII.C1-15	3.3.1.79	E, 3

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.

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.

G Environment not in NUREG-1801 for this component and material.

Plant Specific Notes:

1 The component environment is secondary liquid waste that has been evaluated as a raw water environment. Loss of material on internal component surface exposed to a secondary liquid waste environment will be managed by Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program (B2.1.22) instead of Open-Cycle Cooling Water program (B2.1.9).

2 This non-NUREG-1801 line is based upon NUREG-1801 line VII.F2-1 with a selected aging management program Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program (B2.1.22) for the evaluation of stainless steel piping with an internal environment of condensation.

3 The component environment is chemical and detergent drains and has been evaluated as a raw water environment. Loss of material on internal component surfaces exposed to a chemical and detergent drains environment will be managed by Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program (B2.1.22) instead of Open-Cycle Cooling Water program (B2.1.9).

4 The component environment is yard drains. Yard drains consists of rain and ground water and has been evaluated as a raw water environment. Loss of material on internal component surfaces exposed to a yard drains environment is managed by Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program (B2.1.22) instead of Open-Cycle Cooling Water program (B2.1.9).

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 for those component types identified in Section 2.3.4, Steam and Power Conversion System, subject to aging management review. These systems are described in the following sections:

- Main turbine system (Section 2.3.4.1)
- Main steam (Section 2.3.4.2)
- Feedwater system (Section 2.3.4.3)
- Condensate system (Section 3.4.4)
- Steam generator blowdown system (Section 2.3.4.5)
- Auxiliary feedwater system (Section 2.3.4.6)

Table 3.4.1, Summary of Aging Management Evaluations 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 3.x.1 (Table 1) described in Section 3.0.

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 System
- Table 3.4.2-3, Steam and Power Conversion System – Summary of Aging Management Evaluation – Feedwater System
- Table 3.4.2-4, Steam and Power Conversion System – Summary of Aging Management Evaluation – Condensate System
- Table 3.4.2-5, Steam and Power Conversion System – Summary of Aging Management Evaluation – Steam Generator Blowdown System
- Table 3.4.2-6, Steam and Power Conversion System – Summary of Aging Management Evaluation – Auxiliary Feedwater System

These tables use the format of Table 2 discussed in Section 3.0.

3.4.2.1 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 systems in the following subsections.

3.4.2.1.1 Main Turbine System

Materials

The materials of construction for the main turbine system component types are:

- Carbon Steel

Environment

The main turbine system component types are exposed to the following environments:

- Plant Indoor Air
- Secondary Water

Aging Effects Requiring Management

The following main turbine 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 main turbine system component types:

- Bolting Integrity (B2.1.7)
- External Surfaces Monitoring Program (B2.1.20)
- Flow-Accelerated Corrosion (B2.1.6)
- One-Time Inspection (B2.1.16)
- Water Chemistry (B2.1.2)

3.4.2.1.2 Main Steam System

Materials

The materials of construction for the main steam system component types are:

- Aluminum
- Carbon Steel
- Copper
- Insulation Calcium Silicate
- Stainless Steel

Environment

The main steam system component types are exposed to the following environments:

- Dry Gas
- Plant Indoor Air
- Secondary Water
- Wetted Gas

Aging Effects Requiring Management

The following main steam 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 system component types:

- Bolting Integrity (B2.1.7)
- External Surfaces Monitoring Program (B2.1.20)
- Flow-Accelerated Corrosion (B2.1.6)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)
- One-Time Inspection (B2.1.16)

- Water Chemistry (B2.1.2)

3.4.2.1.3 Feedwater System

Materials

The materials of construction for the feedwater system component types are:

- Aluminum
- Carbon Steel
- Insulation Calcium Silicate
- Stainless Steel

Environment

The feedwater system component types are exposed to the following environments:

- Plant Indoor Air
- Secondary Water

Aging Effects Requiring Management

The following 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 feedwater system component types:

- Bolting Integrity (B2.1.7)
- External Surfaces Monitoring Program (B2.1.20)
- Flow-Accelerated Corrosion (B2.1.6)
- One-Time Inspection (B2.1.16)
- Water Chemistry (B2.1.2)

3.4.2.1.4 Condensate System

Materials

The materials of construction for the condensate system component types are:

- Carbon Steel
- Stainless Steel

Environment

The condensate system components are exposed to the following environments:

- Atmosphere / Weather
- Plant Indoor Air
- Secondary Water

Aging Effects Requiring Management

The following condensate 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 condensate system component types:

- Bolting Integrity (B2.1.7)
- External Surfaces Monitoring Program (B2.1.20)
- Flow-Accelerated Corrosion (B2.1.6)
- One-Time Inspection (B2.1.16)
- Water Chemistry (B2.1.2)

3.4.2.1.5 Steam Generator Blowdown System

Materials

The materials of construction for the steam generator blowdown system component types are:

- Carbon Steel

- Insulation Calcium Silicate
- Insulation Foamglas
- Stainless Steel
- Stainless Steel Cast Austenitic

Environment

The steam generator blowdown system components are exposed to the following environments:

- Plant Indoor Air
- Secondary Water

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 (B2.1.7)
- External Surfaces Monitoring Program (B2.1.20)
- Flow-Accelerated Corrosion (B2.1.6)
- One-Time Inspection (B2.1.16)
- Water Chemistry (B2.1.2)

3.4.2.1.6 Auxiliary Feedwater System

Materials

The materials of construction for the auxiliary feedwater system component types are:

- Carbon Steel
- Stainless Steel

Environment

The auxiliary feedwater system component types are exposed to the following environments:

- Buried
- Dry Gas
- Lubricating Oil
- Plant Indoor Air
- Secondary Water

Aging Effects Requiring Management

The following auxiliary feedwater 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 auxiliary feedwater system component types:

- Bolting Integrity (B2.1.7)
- Buried Piping and Tanks Inspection (B2.1.18)
- External Surfaces Monitoring Program (B2.1.20)
- Lubricating Oil Analysis (B2.1.23)
- One-Time Inspection (B2.1.16)
- 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 subsections.

3.4.2.2.1 Cumulative Fatigue Damage

Evaluation of fatigue is a time-limited aging analysis (TLAA) as defined in 10 CFR 54.3. TLAAs are evaluated in accordance with 10 CFR 54.21(c)(1). WCGS piping designed to ASME Section III Class 2, Class 3, and ANSI B31.1 assumes 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 Loss of Material due to General, Pitting, and Crevice Corrosion

3.4.2.2.2.1 Steel piping and components, tanks, and heat exchangers exposed to treated water and steel piping and components exposed to steam

The Water Chemistry Program (B2.1.2) and the One-Time Inspection (B2.1.16) will manage loss of material due to general, pitting, and crevice corrosion for carbon steel components exposed to secondary water. The one-time inspection will include selected components at susceptible locations where contaminants could accumulate (e.g. stagnant flow locations and tank bottoms).

3.4.2.2.2.2 Steel piping and components exposed to lubricating oil

The Lubricating Oil Analysis (B2.1.23) and the One-Time Inspection (B2.1.16) will manage loss of material due to general, pitting, and crevice corrosion for carbon steel components exposed to lubricating oil. The one-time inspection will include selected components at susceptible locations where contaminants such as water could accumulate.

3.4.2.2.3 Loss of Material due to General, Pitting, Crevice, and Microbiologically-Influenced Corrosion (MIC), and Fouling

Not applicable. WCGS has no in-scope components exposed to raw water in the auxiliary feedwater system.

3.4.2.2.4 Reduction of Heat Transfer due to Fouling

3.4.2.2.4.1 Stainless steel and copper alloy heat exchanger tubes exposed to treated water

Not applicable. WCGS has no in-scope heat exchangers in the condensate or blowdown systems, and no in-scope heat exchangers with a heat transfer intended function in the auxiliary feedwater system.

3.4.2.2.4.2 Stainless steel and copper alloy heat exchanger tubes exposed to lubricating oil

The Lubricating Oil Analysis (B2.1.23) and the One-Time Inspection (B2.1.16) will manage reduction of heat transfer due to fouling for carbon steel components exposed to lubricating oil. The one-time inspection will include selected components at susceptible locations where contaminants such as water could accumulate.

3.4.2.2.5 Loss of Material due to General, Pitting, Crevice, and Microbiologically-Influenced Corrosion

3.4.2.2.5.1 Steel piping and components and tanks exposed to soil

The Buried Piping and Tanks Inspection program (B2.1.18) will manage the loss of material due to general, pitting, crevice and microbiologically influenced corrosion for the carbon steel external surfaces of buried components.

WCGS buried steel piping is coated and/or wrapped in accordance with industry standards. A review of WCGS operating history indicates a single case of a pin hole leak failure of in-scope buried protection system piping that resulted from loss of material due to external pitting corrosion underneath a holiday in the protective coating, which was subsequently weld repaired. Additionally, WCGS does not have any documented below grade aggressive environment conditions. Although all WCGS in-scope buried piping is protected by the cathodic protection system, no credit is taken for this for aging management. Based upon the above, WCGS maintains that application of the wrapping/coating and programmatic inspection of the wrapping/coating condition will be adequate to manage loss of material due to external corrosion.

The Buried Piping and Tanks Inspection program is a new program that will be implemented within the ten year period prior to the period of extended operation, during which time an opportunistic or planned inspection will be performed. Upon entering the period of extended operation the WCGS Buried Piping and Tanks Inspection program will require a planned inspection within ten years unless an opportunistic inspection has occurred with in this ten year period.

3.4.2.2.5.2 Steel heat exchanger components exposed to lubricating oil

The Lubricating Oil Analysis (B2.1.23) and the One-Time Inspection (B2.1.16) will manage loss of material due to general, pitting, crevice and microbiologically influenced corrosion for carbon steel components exposed to lubricating oil. The one-time inspection will include selected components at susceptible locations where contaminants such as water could accumulate.

3.4.2.2.6 Cracking due to Stress Corrosion Cracking

The Water Chemistry program (B2.1.2) and the One-Time Inspection (B2.1.16) will manage cracking due to stress corrosion cracking for stainless steel components exposed to secondary water. The one-time inspection will include selected components at susceptible locations where contaminants could accumulate (e.g. stagnant flow locations).

3.4.2.2.7 Loss of Material due to Pitting and Crevice Corrosion

3.4.2.2.7.1 Stainless steel, aluminum, and copper alloy piping and components and stainless steel tanks and heat exchangers exposed to treated water

The Water Chemistry program (B2.1.2) and the One-Time Inspection (B2.1.16) will manage loss of material due to pitting and crevice corrosion for stainless steel components exposed to secondary water. The one-time inspection will include selected components at susceptible locations where contaminants could accumulate such as stagnant flow locations and tank bottoms.

3.4.2.2.7.2 Stainless steel piping and components exposed to soil

Not applicable. WCGS has no in-scope stainless steel components exposed to soil in the condensate or auxiliary feedwater system.

3.4.2.2.7.3 Copper alloy piping and components exposed to lubricating oil

Not applicable. WCGS has no in-scope copper alloy components exposed to lubricating oil in the main steam, main turbine, feedwater, condensate, steam generator blowdown, or auxiliary feedwater systems.

3.4.2.2.8 Loss of Material due to Pitting, Crevice, and Microbiologically-Influenced Corrosion

Not applicable. WCGS has no in-scope stainless steel components exposed to lube oil in the steam turbine, feedwater, condensate, or auxiliary feedwater systems.

3.4.2.2.9 Loss of Material due to General, Pitting, Crevice, and Galvanic Corrosion

Not applicable to WCGS, applicable to BWR only.

3.4.2.2.10 Quality Assurance for Aging Management of Nonsafety-Related Components

Quality Assurance Program and Administrative Controls are discussed in Section B1.3.

3.4.2.3 Time-Limited Aging Analysis

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 Analysis)

3.4.3 Conclusions

The Steam and Power Conversion System component types that are subject to aging management review 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, 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, 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 Evaluations 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
3.4.1.01	Steel piping, piping components, and piping elements exposed to steam or treated water	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes, TLAA	Fatigue of metal components is a TLAA. See further evaluation in subsection 3.4.2.2.1.
3.4.1.02	Steel piping, piping components, and piping elements exposed to steam	Loss of material due to general, pitting and crevice corrosion	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	Yes	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Water Chemistry (B2.1.2). See further evaluation in subsection 3.4.2.2.2.1.

Table 3.4.1 Summary of Aging Management Evaluations 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
3.4.1.03	Steel heat exchanger components exposed to treated water	Loss of material due to general, pitting and crevice corrosion	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	Yes	Not applicable. WCGS has no in-scope heat exchangers in the condensate or blowdown systems, so the applicable NUREG-1801 lines were not used.
3.4.1.04	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 (B2.1.16)	Yes	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Water Chemistry (B2.1.2). See further evaluation in subsection 3.4.2.2.2.1.
3.4.1.05					Not applicable - BWR only

Table 3.4.1 Summary of Aging Management Evaluations 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
3.4.1.06	Steel and 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 (B2.1.16)	Yes	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Water Chemistry (B2.1.2). See further evaluation in subsection 3.4.2.2.7.1.
3.4.1.07	Steel piping, piping components, and piping elements exposed to lubricating oil	Loss of material due to general, pitting and crevice corrosion	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	Yes	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Lubricating Oil Analysis (B2.1.23). See further evaluation in subsection 3.4.2.2.2.2.
3.4.1.08	Steel piping, piping components, and piping elements exposed to raw water	Loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion, and fouling	A plant-specific aging management program is to be evaluated.	Yes	Not applicable. WCGS has no in-scope components exposed to raw water in the auxiliary feedwater system, so the applicable NUREG-1801 line was not used.

Table 3.4.1 Summary of Aging Management Evaluations 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
3.4.1.09	Stainless steel and 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 (B2.1.16)	Yes	Not applicable. WCGS has no in-scope heat exchangers in the condensate or blowdown systems, and no in-scope heat exchangers with a heat transfer intended function in the auxiliary feedwater system, so the applicable NUREG-1801 lines were not used.
3.4.1.10	Steel, stainless steel, and copper alloy heat exchanger tubes exposed to lubricating oil	Reduction of heat transfer due to fouling	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	Yes	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Lubricating Oil Analysis (B2.1.23). See further evaluation in subsection 3.4.2.2.4.2.
3.4.1.11	Buried steel piping, piping components, piping elements, and tanks (with or without coating or wrapping) exposed to soil	Loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion	Buried Piping and Tanks Inspection (B2.1.18)	Yes	Consistent with NUREG-1801. See further evaluation in subsection 3.4.2.2.5.1.

Table 3.4.1 Summary of Aging Management Evaluations 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
3.4.1.12	Steel heat exchanger components exposed to lubricating oil	Loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	Yes	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Lubricating Oil Analysis (B2.1.23). See further evaluation in subsection 3.4.2.2.5.2.
3.4.1.13					Not applicable - BWR only
3.4.1.14	Stainless steel piping, piping components, piping elements, tanks, and 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 (B2.1.16)	Yes	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Water Chemistry (B2.1.2). See further evaluation in subsection 3.4.2.2.6.

Table 3.4.1 Summary of Aging Management Evaluations 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
3.4.1.15	Aluminum and copper alloy 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 (B2.1.16)	Yes	Not applicable. WCGS has no in-scope aluminum or copper alloy components in the steam turbine, feedwater, condensate, blowdown, or auxiliary feedwater systems, so the applicable NUREG-1801 lines were not used.
3.4.1.16	Stainless steel piping, piping components, and piping elements; tanks, and heat exchanger components exposed to treated water	Loss of material due to pitting and crevice corrosion	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	Yes	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Water Chemistry (B2.1.2). See further evaluation in subsection 3.4.2.2.7.1.
3.4.1.17	Stainless steel piping, piping components, and piping elements exposed to soil	Loss of material due to pitting and crevice corrosion	A plant-specific aging management program is to be evaluated.	Yes	Not applicable. WCGS has no in-scope stainless steel components exposed to soil in the condensate or auxiliary feedwater system, so the applicable NUREG-1801 lines were not used.

Table 3.4.1 Summary of Aging Management Evaluations 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
3.4.1.18	Copper alloy piping, piping components, and piping elements exposed to lubricating oil	Loss of material due to pitting and crevice corrosion	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	Yes	Not applicable. WCGS has no in-scope copper alloy components exposed to lube oil in the steam turbine, feedwater, condensate, or auxiliary feedwater systems, so the applicable NUREG-1801 lines were not used.
3.4.1.19	Stainless steel piping, piping components, piping elements, and heat exchanger components exposed to lubricating oil	Loss of material due to pitting, crevice, and microbiologically-influenced corrosion	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	Yes	Not applicable. WCGS has no in-scope stainless steel components exposed to lube oil in the steam turbine, feedwater, condensate, or auxiliary feedwater systems, so the applicable NUREG-1801 lines were not used.
3.4.1.20	Steel tanks exposed to air – outdoor (external)	Loss of material/ general, pitting, and crevice corrosion	Aboveground Steel Tanks	No	Not applicable. WCGS has no in-scope steel tanks in the condensate or auxiliary feedwater systems, so the applicable NUREG-1801 lines were not used.
3.4.1.21	High-strength steel closure bolting exposed to air with steam or water leakage	Cracking due to cyclic loading, stress corrosion cracking	Bolting Integrity (B2.1.7)	No	Not applicable. WCGS has no in-scope high strength bolting in the steam and power conversion system, so the applicable NUREG-1801 line was not used.

Table 3.4.1 Summary of Aging Management Evaluations 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
3.4.1.22	Steel bolting and closure bolting exposed to air with steam or water leakage, air – outdoor (external), or air – indoor uncontrolled (external);	Loss of material due to general, pitting and crevice corrosion; loss of preload due to thermal effects, gasket creep, and self-loosening	Bolting Integrity (B2.1.7)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Bolting Integrity (B2.1.7).
3.4.1.23	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-Cycle Cooling Water System (B2.1.10)	No	Not applicable. WCGS has no in-scope stainless steel components exposed to closed cycle cooling water in the condensate, blowdown, or auxiliary feedwater systems, so the applicable NUREG-1801 lines were not used.
3.4.1.24	Steel heat exchanger components exposed to closed cycle cooling water	Loss of material due to general, pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System (B2.1.10)	No	Not applicable. WCGS has no in-scope steel components exposed to closed cycle cooling water in the feedwater, condensate, blowdown, or auxiliary feedwater systems, so the applicable NUREG-1801 lines were not used.

Table 3.4.1 Summary of Aging Management Evaluations 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
3.4.1.25	Stainless steel piping, piping components, piping elements, and heat exchanger components exposed to closed cycle cooling water	Loss of material due to pitting and crevice corrosion	Closed-Cycle Cooling Water System (B2.1.10)	No	Not applicable. WCGS has no in-scope stainless steel components exposed to closed cycle cooling water in the condensate, blowdown, or auxiliary feedwater systems, so the applicable NUREG-1801 lines were not used.
3.4.1.26	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-Cycle Cooling Water System (B2.1.10)	No	Not applicable. WCGS has no in-scope copper alloy components exposed to closed cycle cooling water in the condensate, blowdown, or auxiliary feedwater systems, so the applicable NUREG-1801 lines were not used.
3.4.1.27	Steel, stainless steel, and copper alloy heat exchanger tubes exposed to closed cycle cooling water	Reduction of heat transfer due to fouling	Closed-Cycle Cooling Water System (B2.1.10)	No	Not applicable. WCGS has no in-scope steel, stainless steel, or copper alloy components exposed to closed cycle cooling water in the steam turbine, condensate, blowdown, or auxiliary feedwater systems, so the applicable NUREG-1801 lines were not used.

Table 3.4.1 Summary of Aging Management Evaluations 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
3.4.1.28	Steel external surfaces exposed to air – indoor uncontrolled (external), condensation (external), or air outdoor (external)	Loss of material due to general corrosion	External Surfaces Monitoring (B2.1.20)	No	Consistent with NUREG-1801.
3.4.1.29	Steel piping, piping components, and piping elements exposed to steam or treated water	Wall thinning due to flow-accelerated corrosion	Flow-Accelerated Corrosion (B2.1.6)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Flow-Accelerated Corrosion (B2.1.6).
3.4.1.30	Steel piping, piping components, and piping elements exposed to air outdoor (internal) or condensation (internal)	Loss of material due to general, pitting, and crevice corrosion	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	No	Consistent with NUREG-1801.
3.4.1.31	Steel heat exchanger components exposed to raw water	Loss of material due to general, pitting, crevice, galvanic, and microbiologically-influenced corrosion, and fouling	Open-Cycle Cooling Water System (B2.1.9)	No	Not applicable. WCGS has no in-scope components exposed to raw water in the condensate, blowdown, or auxiliary feedwater systems, so the applicable NUREG-1801 lines were not used.

Table 3.4.1 Summary of Aging Management Evaluations 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
3.4.1.32	Stainless steel and copper alloy 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 (B2.1.9)	No	Not applicable. WCGS has no in-scope components exposed to raw water in the feedwater, condensate, blowdown, or auxiliary feedwater systems, so the applicable NUREG-1801 lines were not used.
3.4.1.33	Stainless steel heat exchanger components exposed to raw water	Loss of material due to pitting, crevice, and microbiologically-influenced corrosion, and fouling	Open-Cycle Cooling Water System (B2.1.9)	No	Not applicable. WCGS has no in-scope components exposed to raw water in the condensate, blowdown, or auxiliary feedwater systems, so the applicable NUREG-1801 lines were not used.
3.4.1.34	Steel, stainless steel, and copper alloy heat exchanger tubes exposed to raw water	Reduction of heat transfer due to fouling	Open-Cycle Cooling Water System (B2.1.9)	No	Not applicable. WCGS has no in-scope components exposed to raw water in the condensate, blowdown, or auxiliary feedwater systems, so the applicable NUREG-1801 lines were not used.
3.4.1.35	Copper alloy >15% Zn piping, piping components, and piping elements exposed to closed cycle cooling water, raw water, or treated water	Loss of material due to selective leaching	Selective Leaching of Materials (B2.1.17)	No	Not applicable. WCGS has no in-scope copper alloy >15% Zn components in the feedwater, condensate, blowdown, or auxiliary feedwater systems, so the applicable NUREG-1801 lines were not used.

Table 3.4.1 Summary of Aging Management Evaluations 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
3.4.1.36	Gray cast iron piping, piping components, and piping elements exposed to soil, treated water, or raw water	Loss of material due to selective leaching	Selective Leaching of Materials (B2.1.17)	No	Not applicable. WCGS has no in-scope gray cast iron components in the feedwater, condensate, blowdown, or auxiliary feedwater systems, so the applicable NUREG-1801 lines were not used.
3.4.1.37	Steel, stainless steel, and nickel-based alloy piping, piping components, and piping elements exposed to steam	Loss of material due to pitting and crevice corrosion	Water Chemistry (B2.1.2)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Water Chemistry (B2.1.2).
3.4.1.38	Steel bolting and external surfaces exposed to air with borated water leakage	Loss of material due to boric acid corrosion	Boric Acid Corrosion (B2.1.4)	No	Not applicable. WCGS 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.
3.4.1.39	Stainless steel piping, piping components, and piping elements exposed to steam	Cracking due to stress corrosion cracking	Water Chemistry (B2.1.2)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Water Chemistry (B2.1.2).

Table 3.4.1 Summary of Aging Management Evaluations 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
3.4.1.40	Glass piping elements exposed to air, lubricating oil, raw water, and treated water	None	None	No	Not applicable. WCGS has no in-scope glass components in the steam and power conversion systems, so the applicable NUREG-1801 lines were not used.
3.4.1.41	Stainless steel, copper alloy, and nickel alloy piping, piping components, and piping elements exposed to air – indoor uncontrolled (external)	None	None	No	Consistent with NUREG-1801.
3.4.1.42	Steel piping, piping components, and piping elements exposed to air – indoor controlled (external)	None	None	No	Not applicable. WCGS has no in-scope components in air – indoor controlled (external) in the steam and power conversion systems, so the applicable NUREG-1801 line was not used.
3.4.1.43	Steel and stainless steel piping, piping components, and piping elements in concrete	None	None	No	Not applicable. WCGS has no in-scope components in concrete in the steam and power conversion systems, so the applicable NUREG-1801 lines were not used.

Table 3.4.1 Summary of Aging Management Evaluations 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
3.4.1.44	Steel, stainless steel, aluminum, and copper alloy piping, piping components, and piping elements exposed to gas	None	None	No	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 Vol. 2 Item	Table 1 Item	Notes
Closure Bolting	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.7)	VIII.H-4	3.4.1.22	B
Closure Bolting	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.7)	VIII.H-5	3.4.1.22	B
Piping	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VIII.H-7	3.4.1.28	A
Piping	PB	Carbon Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VIII.A-16	3.4.1.02	B
Valve	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VIII.H-7	3.4.1.28	A
Valve	PB	Carbon Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VIII.A-16	3.4.1.02	B
Valve	PB	Carbon Steel	Secondary Water (Int)	Wall thinning	Flow-Accelerated Corrosion (B2.1.6)	VIII.A-17	3.4.1.29	B

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.

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 3.4.2-2 Steam and Power Conversion System – Summary of Aging Management Evaluation – Main Steam System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Closure Bolting	LBS, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.7)	VIII.H-4	3.4.1.22	B
Closure Bolting	LBS, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.7)	VIII.H-5	3.4.1.22	B
Insulation	INS	Aluminum	Plant Indoor Air (Ext)	None	None	None	None	J
Insulation	INS	Insulation Calcium Silicate	Plant Indoor Air (Ext)	None	None	None	None	J
Orifice	PB, TH	Stainless Steel	Plant Indoor Air (Ext)	None	None	VIII.I-10	3.4.1.41	A
Orifice	PB, TH	Stainless Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VIII.B1-4	3.4.1.16	B
Orifice	PB, TH	Stainless Steel	Secondary Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VIII.B1-5	3.4.1.14	B
Piping	LBS, PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VIII.H-7	3.4.1.28	A
Piping	LBS, PB, SIA	Carbon Steel	Secondary Water (Int)	Wall thinning	Flow-Accelerated Corrosion (B2.1.6)	VIII.B1-9	3.4.1.29	B

Table 3.4.2-2 Steam and Power Conversion System – Summary of Aging Management Evaluation – Main Steam System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Piping	PB	Carbon Steel	Secondary Water (Int)	Cumulative fatigue damage	Time Limited Aging Analysis evaluated for the period of extended operation.	VIII.B1-10	3.4.1.01	A
Piping	LBS, PB, SIA	Carbon Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VIII.B1-11	3.4.1.04	B
Piping	LBS	Carbon Steel	Wetted Gas (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VIII.B1-7	3.4.1.30	A
Strainer	FIL, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VIII.H-7	3.4.1.28	A
Strainer	FIL, PB	Carbon Steel	Secondary Water (Int)	Wall thinning	Flow-Accelerated Corrosion (B2.1.6)	VIII.B1-9	3.4.1.29	B
Strainer	FIL, PB	Carbon Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VIII.B1-11	3.4.1.04	B
Trap	LBS, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VIII.H-7	3.4.1.28	A

Table 3.4.2-2 Steam and Power Conversion System – Summary of Aging Management Evaluation – Main Steam System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Trap	PB	Carbon Steel	Secondary Water (Int)	Wall thinning	Flow-Accelerated Corrosion (B2.1.6)	VIII.B1-9	3.4.1.29	B
Trap	PB	Carbon Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VIII.B1-11	3.4.1.04	B
Trap	LBS	Carbon Steel	Wetted Gas (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VIII.B1-7	3.4.1.30	A
Tubing	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VIII.I-10	3.4.1.41	A
Tubing	PB	Stainless Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VIII.B1-4	3.4.1.16	B
Turbine	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VIII.H-7	3.4.1.28	A
Turbine	PB	Carbon Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VIII.B1-11	3.4.1.04	D
Valve	LBS, PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VIII.H-7	3.4.1.28	A

Table 3.4.2-2 Steam and Power Conversion System – Summary of Aging Management Evaluation – Main Steam System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Valve	LBS, PB, SIA	Carbon Steel	Secondary Water (Int)	Wall thinning	Flow-Accelerated Corrosion (B2.1.6)	VIII.B1-9	3.4.1.29	B
Valve	LBS, PB, SIA	Carbon Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VIII.B1-11	3.4.1.04	B
Valve	LBS, PB	Carbon Steel	Wetted Gas (Int)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	VIII.B1-7	3.4.1.30	A
Valve	PB	Copper	Dry Gas (Int)	None	None	VIII.I-3	3.4.1.44	A
Valve	PB	Copper	Plant Indoor Air (Ext)	None	None	VIII.I-2	3.4.1.41	A
Valve	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VIII.I-10	3.4.1.41	A
Valve	PB	Stainless Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VIII.B1-4	3.4.1.16	B

Notes for Table 3.4.2-2:

<u>Standard Notes:</u>

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.

J Neither the component nor the material and environment combination is evaluated in NUREG-1801.

<u>Plant Specific Notes:</u>

None

Table 3.4.2-3 Steam and Power Conversion System – Summary of Aging Management Evaluation – Feedwater System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Closure Bolting	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.7)	VIII.H-4	3.4.1.22	B
Closure Bolting	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.7)	VIII.H-5	3.4.1.22	B
Flow Element	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VIII.H-7	3.4.1.28	A
Flow Element	PB	Carbon Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VIII.D1-8	3.4.1.04	B
Flow Element	PB	Carbon Steel	Secondary Water (Int)	Wall thinning	Flow-Accelerated Corrosion (B2.1.6)	VIII.D1-9	3.4.1.29	B
Heat Exchanger Tube Side (HX # 151)	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VIII.H-7	3.4.1.28	A
Heat Exchanger Tube Side (HX # 152)	PB	Carbon Steel	Secondary Water (Ext)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VIII.D1-8	3.4.1.04	D
Heat Exchanger Tube Side (HX # 151, 152)	PB	Carbon Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VIII.D1-8	3.4.1.04	D

Table 3.4.2-3 Steam and Power Conversion System – Summary of Aging Management Evaluation – Feedwater System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Heat Exchanger Shell Side (HX # 158)	NSRS	Carbon Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VIII.D1-8	3.4.1.04	D
Heat Exchanger Shell Side (HX # 158)	NSRS	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VIII.H-7	3.4.1.28	A
Heat Exchanger Tube Side (HX # 153)	PB	Stainless Steel	Secondary Water (Ext)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VIII.D1-4	3.4.1.16	D
Heat Exchanger Tube Side (HX # 153)	PB	Stainless Steel	Secondary Water (Ext)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VIII.D1-5	3.4.1.14	D
Heat Exchanger Tube Side (HX # 153)	PB	Stainless Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VIII.D1-4	3.4.1.16	D
Insulation	INS	Aluminum	Plant Indoor Air (Ext)	None	None	None	None	J

Table 3.4.2-3 Steam and Power Conversion System – Summary of Aging Management Evaluation – Feedwater System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Insulation	INS	Insulation Calcium Silicate	Plant Indoor Air (Ext)	None	None	None	None	J
Orifice	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VIII.H-7	3.4.1.28	A
Orifice	PB	Carbon Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VIII.D1-8	3.4.1.04	B
Orifice	PB	Carbon Steel	Secondary Water (Int)	Wall thinning	Flow-Accelerated Corrosion (B2.1.6)	VIII.D1-9	3.4.1.29	B
Piping	PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VIII.H-7	3.4.1.28	A
Piping	PB	Carbon Steel	Secondary Water (Int)	Cumulative fatigue damage	Time Limited Aging Analysis evaluated for the period of extended operation.	VIII.D1-7	3.4.1.01	A
Piping	PB, SIA	Carbon Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VIII.D1-8	3.4.1.04	B
Piping	PB	Carbon Steel	Secondary Water (Int)	Wall thinning	Flow-Accelerated Corrosion (B2.1.6)	VIII.D1-9	3.4.1.29	B
Thermowell	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VIII.I-10	3.4.1.41	A

Table 3.4.2-3 Steam and Power Conversion System – Summary of Aging Management Evaluation – Feedwater System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Thermowell	PB	Stainless Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VIII.D1-4	3.4.1.16	B
Thermowell	PB	Stainless Steel	Secondary Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VIII.D1-5	3.4.1.14	B
Tubing	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VIII.I-10	3.4.1.41	A
Tubing	PB	Stainless Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VIII.D1-4	3.4.1.16	B
Valve	PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VIII.H-7	3.4.1.28	A
Valve	PB, SIA	Carbon Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VIII.D1-8	3.4.1.04	B
Valve	PB	Carbon Steel	Secondary Water (Int)	Wall thinning	Flow-Accelerated Corrosion (B2.1.6)	VIII.D1-9	3.4.1.29	B
Valve	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VIII.I-10	3.4.1.41	A
Valve	PB	Stainless Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VIII.D1-4	3.4.1.16	B

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.

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:

None

Table 3.4.2-4 Steam and Power Conversion System – Summary of Aging Management Evaluation – Condensate System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Closure Bolting	PB	Carbon Steel	Atmosphere/Weather (Ext)	Loss of preload	Bolting Integrity (B2.1.7)	None	None	H, 1
Closure Bolting	PB	Carbon Steel	Atmosphere/Weather (Ext)	Loss of material	Bolting Integrity (B2.1.7)	VIII.H-1	3.4.1.22	B
Closure Bolting	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.7)	VIII.H-4	3.4.1.22	B
Closure Bolting	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.7)	VIII.H-5	3.4.1.22	B
Piping	PB	Carbon Steel	Atmosphere/Weather (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VIII.H-8	3.4.1.28	A
Piping	LBS, PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VIII.H-7	3.4.1.28	A
Piping	LBS, PB, SIA	Carbon Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VIII.E-34	3.4.1.04	B
Piping	LBS, PB, SIA	Carbon Steel	Secondary Water (Int)	Wall thinning	Flow-Accelerated Corrosion (B2.1.6)	VIII.E-35	3.4.1.29	B
Tank	PB	Stainless Steel	Atmosphere/Weather (Ext)	None	None	None	None	G
Tank	PB	Stainless Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VIII.E-40	3.4.1.06	B

Table 3.4.2-4 Steam and Power Conversion System – Summary of Aging Management Evaluation – Condensate System (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Valve	LBS, PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VIII.H-7	3.4.1.28	A
Valve	LBS, PB, SIA	Carbon Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VIII.E-34	3.4.1.04	B
Valve	LBS, PB, SIA	Carbon Steel	Secondary Water (Int)	Wall thinning	Flow-Accelerated Corrosion (B2.1.6)	VIII.E-35	3.4.1.29	B

<u>Notes for Table 3.4.2-4:</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.
B Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP takes some exceptions to NUREG-1801 AMP.
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.

<u>Plant Specific Notes:</u>
1 Loss of preload is conservatively considered to be applicable for all closure bolting. NUREG-1801 only addresses loss of preload for bolting of "Steel in Air-Indoor Uncontrolled."

Table 3.4.2-5 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 Vol. 2 Item	Table 1 Item	Notes
Closure Bolting	LBS, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.7)	VIII.H-4	3.4.1.22	B
Closure Bolting	LBS, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.7)	VIII.H-5	3.4.1.22	B
Instrument Bellows	LBS	Stainless Steel	Plant Indoor Air (Ext)	None	None	VIII.I-10	3.4.1.41	A
Instrument Bellows	LBS	Stainless Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VIII.F-23	3.4.1.16	B
Instrument Bellows	LBS	Stainless Steel	Secondary Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VIII.F-24	3.4.1.14	B
Insulation	INS	Insulation Calcium Silicate	Plant Indoor Air (Ext)	None	None	None	None	J
Insulation	INS	Insulation Foamglas	Plant Indoor Air (Ext)	None	None	None	None	J
Piping	LBS, PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VIII.H-7	3.4.1.28	A
Piping	LBS, PB, SIA	Carbon Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VIII.F-25	3.4.1.04	B

Table 3.4.2-5 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 Vol. 2 Item	Table 1 Item	Notes
Piping	LBS, PB, SIA	Carbon Steel	Secondary Water (Int)	Wall thinning	Flow-Accelerated Corrosion (B2.1.6)	VIII.F-26	3.4.1.29	B
Pump	LBS	Stainless Steel Cast Austenitic	Plant Indoor Air (Ext)	None	None	VIII.I-10	3.4.1.41	A
Pump	LBS	Stainless Steel Cast Austenitic	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VIII.F-23	3.4.1.16	B
Strainer	SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VIII.H-7	3.4.1.28	A
Strainer	SIA	Carbon Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VIII.F-25	3.4.1.04	B
Strainer	SIA	Carbon Steel	Secondary Water (Int)	Wall thinning	Flow-Accelerated Corrosion (B2.1.6)	VIII.F-26	3.4.1.29	B
Tank	SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VIII.H-7	3.4.1.28	A
Tank	SIA	Carbon Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VIII.F-25	3.4.1.04	D
Tubing	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VIII.I-10	3.4.1.41	A

Table 3.4.2-5 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 Vol. 2 Item	Table 1 Item	Notes
Tubing	PB	Stainless Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VIII.F-23	3.4.1.16	B
Tubing	PB	Stainless Steel	Secondary Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VIII.F-24	3.4.1.14	B
Valve	LBS, PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VIII.H-7	3.4.1.28	A
Valve	LBS, PB, SIA	Carbon Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VIII.F-25	3.4.1.04	B
Valve	LBS, PB, SIA	Carbon Steel	Secondary Water (Int)	Wall thinning	Flow-Accelerated Corrosion (B2.1.6)	VIII.F-26	3.4.1.29	B
Valve	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VIII.I-10	3.4.1.41	A
Valve	PB	Stainless Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VIII.F-23	3.4.1.16	B
Valve	PB	Stainless Steel	Secondary Water (Int)	Cracking	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VIII.F-24	3.4.1.14	B

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.
- 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:

None

Table 3.4.2-6 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 Vol. 2 Item	Table 1 Item	Notes
Closure Bolting	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	Bolting Integrity (B2.1.7)	VIII.H-4	3.4.1.22	B
Closure Bolting	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of preload	Bolting Integrity (B2.1.7)	VIII.H-5	3.4.1.22	B
Filter	FIL, PB	Carbon Steel	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	VIII.G-35	3.4.1.07	B
Filter	FIL, PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VIII.H-7	3.4.1.28	A
Heat Exchanger Shell Side (HX # 154)	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VIII.H-7	3.4.1.28	A
Heat Exchanger Shell Side (HX # 154)	PB	Carbon Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VIII.G-38	3.4.1.04	D

Table 3.4.2-6 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 Vol. 2 Item	Table 1 Item	Notes
Heat Exchanger Tube Side (HX # 155, 156, 157)	HT, PB	Carbon Steel	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	VIII.G-6	3.4.1.12	B
Heat Exchanger Tube Side (HX # 157)	HT, PB	Carbon Steel	Lubricating Oil (Int)	Reduction of heat transfer	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	VIII.G-15	3.4.1.10	B
Heat Exchanger Tube Side	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VIII.H-7	3.4.1.28	A
Heat Exchanger Tube Side	HT, PB	Carbon Steel	Secondary Water (Ext)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VIII.G-38	3.4.1.04	D
Orifice	PB, TH	Carbon Steel	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	VIII.G-35	3.4.1.07	B
Orifice	PB, TH	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VIII.H-7	3.4.1.28	A
Orifice	PB, TH	Stainless Steel	Plant Indoor Air (Ext)	None	None	VIII.I-10	3.4.1.41	A

Table 3.4.2-6 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 Vol. 2 Item	Table 1 Item	Notes
Orifice	PB, TH	Stainless Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VIII.G-32	3.4.1.16	B
Piping	PB	Carbon Steel	Buried (Ext)	Loss of material	Buried Piping and Tanks Inspection (B2.1.18)	VIII.G-1	3.4.1.11	A
Piping	PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VIII.H-7	3.4.1.28	A
Piping	PB	Carbon Steel	Secondary Water (Int)	Cumulative fatigue damage	Time Limited Aging Analysis evaluated for the period of extended operation.	VIII.G-37	3.4.1.01	A
Piping	PB, SIA	Carbon Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VIII.G-38	3.4.1.04	B
Pump	PB	Carbon Steel	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	VIII.G-35	3.4.1.07	B
Pump	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VIII.H-7	3.4.1.28	A
Pump	PB	Carbon Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VIII.G-38	3.4.1.04	B

Table 3.4.2-6 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 Vol. 2 Item	Table 1 Item	Notes
Tubing	PB	Carbon Steel	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	VIII.G-35	3.4.1.07	B
Tubing	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VIII.H-7	3.4.1.28	A
Tubing	PB	Stainless Steel	Plant Indoor Air (Ext)	None	None	VIII.I-10	3.4.1.41	A
Tubing	PB	Stainless Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VIII.G-32	3.4.1.16	B
Turbine	PB	Carbon Steel	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	VIII.G-35	3.4.1.07	D
Turbine	PB	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VIII.H-7	3.4.1.28	A
Valve	PB	Carbon Steel	Dry Gas (Int)	None	None	VIII.I-15	3.4.1.44	A
Valve	PB	Carbon Steel	Lubricating Oil (Int)	Loss of material	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	VIII.G-35	3.4.1.07	B
Valve	PB, SIA	Carbon Steel	Plant Indoor Air (Ext)	Loss of material	External Surfaces Monitoring Program (B2.1.20)	VIII.H-7	3.4.1.28	A

Table 3.4.2-6 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 Vol. 2 Item	Table 1 Item	Notes
Valve	PB, SIA	Carbon Steel	Secondary Water (Int)	Loss of material	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	VIII.G-38	3.4.1.04	B

Notes to 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.
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

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 for those component types identified in Section 2.4, Scoping and Screening Results – Structures, subject to aging management review. The structures are described in the following sections:

- Reactor building (Section 2.4.1)
- Control building (Section 2.4.2)
- Diesel generator building (Section 2.4.3)
- Turbine building (Section 2.4.4)
- Auxiliary building (Section 2.4.5)
- Radwaste building (Section 2.4.6)
- Emergency fuel oil tank vaults (Section 2.4.7)
- Essential service water electrical duct banks and manways (Section 2.4.8)
- Communications corridor (Section 2.4.9)
- Transmission towers (Section 2.4.10)
- Essential service water access vaults (Section 2.4.11)
- Fuel building (Section 2.4.12)
- Essential service water pumphouse building (Section 2.4.13)
- Circulating water screenhouse (Section 2.4.14)
- Ultimate heat sink (Section 2.4.15)
- Essential service water discharge structure (Section 2.4.16)
- Main dam and auxiliary spillway (Section 2.4.17)
- Essential service water valve house (Section 2.4.18)
- Refueling water storage tank foundation and valve house (Section 2.4.19)
- Condensate storage tank foundation and valve house (Section 2.4.20)
- Concrete support structures for station transformers (Section 2.4.21)
- Supports (Section 2.4.22)

Table 3.5.1, Summary of Aging Management Evaluations in Chapter 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

3.5.2 Results

The following tables summarize the results of the aging management review for the systems 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 - Diesel Generator 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 - Auxiliary Building
- Table 3.5.2-6 Containments, Structures, and Component Supports - Summary of Aging Management Evaluation - Radwaste Building
- Table 3.5.2-7 Containments, Structures, and Component Supports - Summary of Aging Management Evaluation - Emergency Fuel Oil Tank Vaults
- Table 3.5.2-8 Containments, Structures, and Component Supports - Summary of Aging Management Evaluation - Essential Service Water Electrical Duct Banks and Manways
- Table 3.5.2-9 Containments, Structures, and Component Supports - Summary of Aging Management Evaluation - Communications Corridor
- Table 3.5.2-10 Containments, Structures, and Component Supports - Summary of Aging Management Evaluation - Transmission Towers
- Table 3.5.2-11 Containments, Structures, and Component Supports - Summary of Aging Management Evaluation - Essential Service Water Access Vaults
- Table 3.5.2-12 Containments, Structures, and Component Supports - Summary of Aging Management Evaluation - Fuel Building
- Table 3.5.2-13 Containments, Structures, and Component Supports - Summary of Aging Management Evaluation - Essential Service Water Pumphouse Building

- Table 3.5.2-14 Containments, Structures, and Component Supports - Summary of Aging Management Evaluation - Circulating Water Screenhouse
- Table 3.5.2-15 Containments, Structures, and Component Supports - Summary of Aging Management Evaluation - Ultimate Heat Sink
- Table 3.5.2-16 Containments, Structures, and Component Supports - Summary of Aging Management Evaluation - Essential Service Water Discharge Structure
- Table 3.5.2-17 Containments, Structures, and Component Supports - Summary of Aging Management Evaluation - Main Dam and Auxiliary Spillway
- Table 3.5.2-18 Containments, Structures, and Component Supports - Summary of Aging Management Evaluation - Essential Service Water Valve House
- Table 3.5.2-19 Containments, Structures, and Component Supports - Summary of Aging Management Evaluation - Refueling Water Storage Tank Foundation and Valve House
- Table 3.5.2-20 Containments, Structures, and Component Supports - Summary of Aging Management Evaluation - Condensate Storage Tank Foundation and Valve House
- Table 3.5.2-21 Containments, Structures, and Component Supports - Summary of Aging Management Evaluation - Concrete Support Structures for Station Transformers
- Table 3.5.2-22 Containments, Structures, and Component Supports - Summary of Aging Management Evaluation - Supports

These tables use the format of Table 2 discussed in Section 3.0.

3.5.2.1 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 structures and commodities in the following subsections.

3.5.2.1.1 Reactor Building

Materials

The materials of construction for the reactor building component types are:

- Carbon Steel
- Concrete

- Elastomer
- Fire Barrier (Ceramic Fiber)
- Stainless Steel

Environment

The reactor building components are exposed to the following environments:

- Atmosphere/ Weather (Structural)
- Buried (Structural)
- Encased in Concrete
- Plant Indoor Air (Structural)
- Submerged (Structural)

Aging Effects Requiring Management

The following reactor building aging effects require management:

- Concrete cracking and spalling
- Cracking
- Cracking due to expansion
- Cracking, loss of bond, and loss of material (spalling, scaling)
- Cracks and distortion
- Increase in porosity and permeability, cracking, loss of material (spalling, scaling)
- Increase in porosity, permeability
- Increased hardness, shrinkage and loss of strength
- Loss of leak tightness
- Loss of material
- Loss of material, cracking
- Loss of material (spalling, scaling) and cracking
- Loss of sealing
- Loss of sealing; leakage through containment
- Reduction of strength and modulus

Aging Management Programs

The following aging management programs manage the aging effects for the reactor building component types:

- 10 CFR Part 50, Appendix J (B2.1.30)
- ASME Section XI, Subsection IWE (B2.1.27)
- ASME Section XI, Subsection IWL (B2.1.28)
- Fire Protection (B2.1.12)
- Masonry Wall Program (B2.1.31)
- Structures Monitoring Program (B2.1.32)
- 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
- Carbon Steel (Galvanized or Coated)
- Concrete
- Concrete Block (Masonry Walls)
- Elastomer
- Fire Barrier (Cementitious Coating)
- Roofing Membrane

Environment

The control building component types are exposed to the following environments:

- Atmosphere/ Weather (Structural)
- Buried (Structural)
- Encased in Concrete
- Plant Indoor Air (Structural)

Aging Effects Requiring Management

The following control building aging effects require management:

- Concrete cracking and spalling
- Cracking
- Cracking due to expansion
- Cracking, loss of bond, and loss of material (spalling, scaling)
- Cracks and distortion
- Increase in porosity and permeability, cracking, loss of material (spalling, scaling)
- Increase in porosity and permeability, loss of strength
- Increased hardness, shrinkage and loss of strength
- Loss of material
- Loss of material, cracking
- Loss of material (spalling, scaling) and cracking
- Loss of sealing

Aging Management Programs

The following aging management programs manage the aging effects for the control building component types:

- Fire Protection (B2.1.12)
- Masonry Wall Program (B2.1.31)
- Structures Monitoring Program (B2.1.32)

3.5.2.1.3 Diesel Generator Building

Materials

The materials of construction for the diesel generator building component types are:

- Carbon Steel
- Carbon Steel (Galvanized or Coated)
- Concrete
- Elastomer
- Fire Barrier (Ceramic Fiber)

- Roofing Membrane

Environment

The diesel generator building component types are exposed to the following environments:

- Atmosphere/ Weather (Structural)
- Buried (Structural)
- Encased in Concrete
- Plant Indoor Air (Structural)

Aging Effects Requiring Management

The following diesel generator building aging effects require management:

- Concrete cracking and spalling
- Cracking due to expansion
- Cracking, loss of bond, and loss of material (spalling, scaling)
- Cracks and distortion
- Increase in porosity and permeability, cracking, loss of material (spalling, scaling)
- Increase in porosity and permeability, loss of strength
- Increased hardness, shrinkage and loss of strength
- Loss of material
- Loss of material, cracking
- Loss of material (spalling, scaling) and cracking
- Loss of sealing

Aging Management Programs

The following aging management programs manage the aging effects for the diesel generator building component types:

- Fire Protection (B2.1.12)
- Masonry Wall Program (B2.1.31)
- Structures Monitoring Program (B2.1.32)

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)

Environment

The turbine building component types are exposed to the following environments:

- Atmosphere/ Weather (Structural)
- Buried (Structural)
- Encased in Concrete
- Plant Indoor Air (Structural)

Aging Effects Requiring Management

The following turbine building aging effects require management:

- Concrete cracking and spalling
- Cracking
- Cracking due to expansion
- Cracking, loss of bond, and loss of material (spalling, scaling)
- Cracks and distortion
- Increase in porosity and permeability, cracking, loss of material (spalling, scaling)
- Increase in porosity and permeability, loss of strength
- Increased hardness, shrinkage and loss of strength
- Loss of material
- Loss of material, cracking
- Loss of material (spalling, scaling) and cracking
- Loss of sealing

Aging Management Programs

The following aging management programs manage the aging effects for the turbine building component types:

- Fire Protection (B2.1.12)
- Masonry Wall Program (B2.1.31)
- Structures Monitoring Program (B2.1.32)

3.5.2.1.5 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)
- Fire Barrier (Ceramic Fiber)
- Roofing Membrane

Environment

The auxiliary building component types are exposed to the following environments:

- Atmosphere/ Weather (Structural)
- Buried (Structural)
- Plant Indoor Air (Structural)

Aging Effects Requiring Management

The following auxiliary building aging effects require management:

- Concrete cracking and spalling
- Cracking
- Cracking due to expansion
- Cracking, loss of bond, and loss of material (spalling, scaling)

- Cracks and distortion
- Increase in porosity and permeability, cracking, loss of material (spalling, scaling)
- Increase in porosity and permeability, loss of strength
- Increased hardness, shrinkage and loss of strength
- Loss of material
- Loss of material, cracking
- Loss of material (spalling, scaling) and cracking
- Loss of sealing

Aging Management Programs

The following aging management programs manage the aging effects for the auxiliary building component types:

- Fire Protection (B2.1.12)
- Masonry Wall Program (B2.1.31)
- Structures Monitoring Program (B2.1.32)

3.5.2.1.6 Radwaste Building

Materials

The materials of construction for the radwaste building component types are:

- Carbon Steel
- Concrete
- Concrete Block (Masonry Walls)
- Elastomer
- Roofing Membrane

Environment

The radwaste building component types are exposed to the following environments:

- Atmosphere/ Weather (Structural)
- Buried (Structural)
- Plant Indoor Air (Structural)

Aging Effects Requiring Management

The following radwaste building aging effects require management:

- Cracking
- Cracking due to expansion
- Cracking, loss of bond, and loss of material (spalling, scaling)
- Cracks and distortion
- 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 sealing

Aging Management Programs

The following aging management programs manage the aging effects for the radwaste building component types:

- Fire Protection (B2.1.12)
- Masonry Wall Program (B2.1.31)
- Structures Monitoring Program (B2.1.32)

3.5.2.1.7 Emergency Fuel Oil Tank Vaults

Materials

The materials of construction for the emergency fuel oil tank vaults component types are:

- Carbon Steel
- Concrete
- Elastomer

Environment

The emergency fuel oil tank vaults component types are exposed to the following environments:

- Atmosphere/ Weather (Structural)
- Buried (Structural)

- Plant Indoor Air (Structural)

Aging Effects Requiring Management

The following emergency fuel oil tank vaults aging effects require management:

- Cracking due to expansion
- Cracking, loss of bond, and loss of material (spalling, scaling)
- Cracks and distortion
- 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 sealing

Aging Management Programs

The following aging management program manages the aging effects for the emergency fuel oil tank vaults component types:

- Structures Monitoring Program (B2.1.32)

3.5.2.1.8 Essential Service Water Electrical Duct Banks and Manways

Materials

The materials of construction for the essential service water electrical duct banks and manways component types are:

- Carbon Steel
- Concrete
- Elastomer

Environment

The essential service water electrical duct banks and manways component types are exposed to the following environments:

- Atmosphere/ Weather (Structural)
- Buried (Structural)
- Plant Indoor Air (Structural)

Aging Effects Requiring Management

The following essential service water electrical duct banks and manways aging effects require management:

- Cracking due to expansion
- Cracking, loss of bond, and loss of material (spalling, scaling)
- Cracks and distortion
- 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 sealing

Aging Management Programs

The following aging management program manages the aging effects for the essential service water electrical duct banks and manways component types:

- Structures Monitoring Program (B2.1.32)

3.5.2.1.9 Communications Corridor

Materials

The materials of construction for the communications corridor component types are:

- Carbon Steel
- Concrete
- Concrete Block (Masonry Walls)
- Elastomer
- Fire Barrier (Cementitious Coating)

Environment

The communications corridor component types are exposed to the following environments:

- Buried (Structural)
- Plant Indoor Air (Structural)

Aging Effects Requiring Management

The following communications corridor aging effects require management:

- Concrete cracking and spalling
- Cracking
- Cracking due to expansion
- Cracking, loss of bond, and loss of material (spalling, scaling)
- Cracks and distortion
- Increase in porosity and permeability, cracking, loss of material (spalling, scaling)
- Increase in porosity and permeability, loss of strength
- Increased hardness, shrinkage and loss of strength
- Loss of material
- Loss of material, cracking
- Loss of material (spalling, scaling) and cracking

Aging Management Programs

The following aging management programs manage the aging effects for the communications corridor component types:

- Fire Protection (B2.1.12)
- Masonry Wall Program (B2.1.31)
- Structures Monitoring Program (B2.1.32)

3.5.2.1.10 Transmission Towers

Materials

The materials of construction for the transmission tower component types are:

- Carbon Steel (Galvanized or Coated)
- Concrete
- Treated Wood

Environment

The transmission tower component types are exposed to the following environments:

- Atmosphere/ Weather (Structural)
- Buried (Structural)

Aging Effects Requiring Management

The following transmission tower aging effects require management:

- Cracking due to expansion
- Cracking, loss of bond, and loss of material (spalling, scaling)
- Cracks and distortion
- 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

Aging Management Programs

The following aging management program manages the aging effects for the transmission tower component types:

- Structures Monitoring Program (B2.1.32)

3.5.2.1.11 Essential Service Water Access Vaults

Materials

The materials of construction for the essential service water access vaults component types are:

- Carbon Steel
- Concrete
- Elastomer

Environment

The essential service water access vaults component types are exposed to the following environments:

- Atmosphere/ Weather (Structural)
- Buried (Structural)
- Plant Indoor Air (Structural)

Aging Effects Requiring Management

The following essential service water access vaults aging effects require management:

- Cracking due to expansion
- Cracking, loss of bond, and loss of material (spalling, scaling)
- Cracks and distortion
- 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 sealing

Aging Management Programs

The following aging management program manages the aging effects for the essential service water access vaults component types:

- Structures Monitoring Program (B2.1.32)

3.5.2.1.12 Fuel Building

Materials

The materials of construction for the fuel building component types are:

- Carbon Steel
- Carbon Steel (Galvanized or Coated)
- Concrete
- Elastomer
- Fire Barrier (Ceramic Fiber)
- Roofing Membrane
- Stainless Steel

Environment

The fuel building component types are exposed to the following environments:

- Atmosphere/ Weather (Structural)

- Buried (Structural)
- Encased in Concrete
- Plant Indoor Air (Structural)
- Submerged (Structural)

Aging Effects Requiring Management

The following fuel building aging effects require management:

- Concrete cracking and spalling
- Cracking
- Cracking due to expansion
- Cracking, loss of bond, and loss of material (spalling, scaling)
- Cracks and distortion
- Increase in porosity and permeability, cracking, loss of material (spalling, scaling)
- Increase in porosity and permeability, loss of strength
- Increased hardness, shrinkage and loss of strength
- Loss of material
- Loss of material, cracking
- Loss of material (spalling, scaling) and cracking
- Loss of sealing

Aging Management Programs

The following aging management programs manage the aging effects for the fuel building component types:

- Fire Protection (B2.1.12)
- Masonry Wall Program (B2.1.31)
- Structures Monitoring Program (B2.1.32)
- Water Chemistry (B2.1.2)

3.5.2.1.13 Essential Service Water Pumphouse Building

Materials

The materials of construction for the essential service water pumphouse building component types are:

- Carbon Steel
- Carbon Steel (Galvanized or Coated)
- Concrete
- Elastomer
- Stainless Steel

Environment

The essential service water pumphouse building component types are exposed to the following environments:

- Atmosphere/ Weather (Structural)
- Buried (Structural)
- Encased in Concrete
- Plant Indoor Air
- Plant Indoor Air (Structural)
- Submerged (Structural)

Aging Effects Requiring Management

The following essential service water pumphouse building aging effects require management:

- Concrete cracking and spalling
- Cracking due to expansion
- Cracking, loss of bond, and loss of material (spalling, scaling)
- Cracks and distortion
- 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 sealing

Aging Management Programs

The following aging management programs manage the aging effects for the essential service water pumphouse building component types:

- Fire Protection (B2.1.12)
- Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.33)
- Structures Monitoring Program (B2.1.32)

3.5.2.1.14 Circulating Water Screenhouse

Materials

The materials of construction for the circulating water screenhouse component types are:

- Carbon Steel
- Carbon Steel (Galvanized or Coated)
- Concrete
- Concrete Block (Masonry Walls)
- Elastomer
- Fire Barrier (Cementitious Coating)
- Fire Barrier (Ceramic Fiber)
- Roofing Membrane

Environment

The circulating water screenhouse component types are exposed to the following environments:

- Atmosphere/ Weather (Structural)
- Buried (Structural)
- Encased in Concrete
- Plant Indoor Air (Structural)
- Submerged (Structural)

Aging Effects Requiring Management

The following circulating water screenhouse aging effects require management:

- Concrete cracking and spalling
- Cracking
- Cracking due to expansion
- Cracking, loss of bond, and loss of material (spalling, scaling)
- Cracks and distortion
- Increase in porosity and permeability, cracking, loss of material (spalling, scaling)
- Increase in porosity and permeability, loss of strength
- Increased hardness, shrinkage and loss of strength
- Loss of material
- Loss of material (spalling, scaling) and cracking
- Loss of sealing

Aging Management Programs

The following aging management programs manage the aging effects for the circulating water screenhouse component types:

- Fire Protection (B2.1.12)
- Masonry Wall Program (B2.1.31)
- Structures Monitoring Program (B2.1.32)

3.5.2.1.15 Ultimate Heat Sink

Materials

The material of construction for the ultimate heat sink component types is:

- Earthfill (rip-rap, stone, soil)

Environment

The ultimate heat sink component types are exposed to the following environment:

- Submerged (Structural)

Aging Effects Requiring Management

The following ultimate heat sink aging effect requires management:

- Loss of material, loss of form

Aging Management Programs

The following aging management program manages the aging effects for the ultimate heat sink component types:

- Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.33)

3.5.2.1.16 Essential Service Water Discharge Structure

Materials

The materials of construction for the essential service water discharge structure component types are:

- Carbon Steel (Galvanized or Coated)
- Concrete

Environment

The essential service water discharge structure component types are exposed to the following environments:

- Buried (Structural)
- Encased in Concrete
- Submerged (Structural)

Aging Effects Requiring Management

The following essential service water discharge structure aging effects require management:

- Cracking due to expansion
- Cracks and distortion
- 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

Aging Management Programs

The following aging management programs manage the aging effects for the essential service water discharge structure component types:

- Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.33)
- Structures Monitoring Program (B2.1.32)

3.5.2.1.17 Main Dam and Auxiliary Spillway

Materials

The material of construction for the main dam and auxiliary spillway component types is:

- Earthfill (rip-rap, stone, soil)

Environment

The main dam and auxiliary spillway component types are exposed to the following environment:

- Atmosphere/ Weather (Structural)

Aging Effects Requiring Management

The following main dam and auxiliary spillway aging effect requires management:

- Loss of material, loss of form

Aging Management Programs

The following aging management program manages the aging effects for the main dam and auxiliary spillway component types:

- Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.33)

3.5.2.1.18 Essential Service Water Valve House

Materials

The materials of construction for the essential service water valve house component types are:

- Carbon Steel
- Concrete

- Elastomer

Environment

The essential service water valve house component types are exposed to the following environments:

- Atmosphere/ Weather (Structural)
- Buried (Structural)
- Encased in Concrete
- Plant Indoor Air (Structural)

Aging Effects Requiring Management

The following essential service water valve house aging effects require management:

- Cracking due to expansion
- Cracking, loss of bond, and loss of material (spalling, scaling)
- Cracks and distortion
- 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 sealing

Aging Management Programs

The following aging management program manages the aging effects for the essential service water valve house component types:

- Structures Monitoring Program (B2.1.32)

3.5.2.1.19 Refueling Water Storage Tank Foundation and Valve House

Materials

The materials of construction for the refueling water storage tank foundation and valve house component types are:

- Carbon Steel
- Carbon Steel (Galvanized or Coated)

- Concrete
- Elastomer
- Roofing Membrane

Environment

The refueling water storage tank foundation and valve house component types are exposed to the following environments:

- Atmosphere/ Weather (Structural)
- Buried (Structural)
- Encased in Concrete
- Plant Indoor Air (Structural)

Aging Effects Requiring Management

The following refueling water storage tank foundation and valve house aging effects require management:

- Cracking due to expansion
- Cracking, loss of bond, and loss of material (spalling, scaling)
- Cracks and distortion
- 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 sealing

Aging Management Programs

The following aging management program manages the aging effects for the refueling water storage tank foundation and valve house component types:

- Structures Monitoring Program (B2.1.32)

3.5.2.1.20 Condensate Storage Tank Foundation and Valve House

Materials

The materials of construction for the condensate storage tank foundation and valve house component types are:

- Carbon Steel
- Carbon Steel (Galvanized or Coated)
- Concrete
- Concrete Block (Masonry Walls)
- Elastomer
- Roofing Membrane

Environment

The condensate storage tank foundation and valve house component types are exposed to the following environments:

- Atmosphere/ Weather
- Atmosphere/ Weather (Structural)
- Buried (Structural)
- Encased in Concrete
- Plant Indoor Air (Structural)

Aging Effects Requiring Management

The following condensate storage tank foundation and valve house aging effects require management:

- Cracking
- Cracking due to expansion
- Cracking, loss of bond, and loss of material (spalling, scaling)
- Cracks and distortion
- 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 sealing

Aging Management Programs

The following aging management programs manage the aging effects for the condensate storage tank foundation and valve house component types:

- Fire Protection (B2.1.12)
- Masonry Wall Program (B2.1.31)
- Structures Monitoring Program (B2.1.32)

3.5.2.1.21 Concrete Support Structures for Station Transformers

Materials

The materials of construction for the concrete support structures for station transformers component types are:

- Carbon Steel (Galvanized or Coated)
- Concrete
- Elastomer

Environment

The concrete support structures for station transformers component types are exposed to the following environments:

- Atmosphere/ Weather (Structural)
- Buried (Structural)
- Encased in Concrete

Aging Effects Requiring Management

The following concrete support structures for station transformers aging effects require management:

- Cracking due to expansion
- Cracking, loss of bond, and loss of material (spalling, scaling)
- Cracks and distortion
- 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 sealing

Aging Management Programs

The following aging management program manages the aging effects for the concrete support structures for station transformers component types:

- Structures Monitoring Program (B2.1.32)

3.5.2.1.22 Supports

Materials

The materials of construction for the supports component types are:

- Aluminum
- Carbon Steel
- Carbon Steel (Galvanized or Coated)
- Concrete
- Graphitic Tool Steel
- 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)
- Raw Water

Aging Effects Requiring Management

The following supports aging effects require management:

- Cracking

- Loss of material
- Loss of mechanical function
- 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 (B2.1.29)
- Bolting Integrity (B2.1.7)
- Boric Acid Corrosion (B2.1.4)
- Structures Monitoring Program (B2.1.32)

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 subsections.

3.5.2.2.1 PWR and BWR Containments

3.5.2.2.1.1 Aging of Inaccessible Concrete Areas

Corrosion of Embedded Steel:

Reinforced concrete structures at WCGS 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. The mixes were designed with entrained air content between 3% and 6%, and the concrete slumps were controlled throughout the batching, mixing, and placement processes. USAR Section 3.8 discusses the design requirements for each major structure. Crack control was achieved through proper sizing, spacing, and distribution of reinforcing steel in accordance with ACI 318-71. Tests conducted monthly at WCGS from June 2005 to May 2006 show the groundwater and soil to have pH values between 7.0 and 8.7, which are well above the recommended minimum pH of 5.5. These tests also show that Chloride solutions range from 5.0 ppm to 41.2 ppm, and Sulfate solutions from 30 ppm to 717 ppm. These results compare favorably to the recommended limits of Chloride solutions < 500 ppm and Sulfate solutions < 1500 ppm. WCGS is located in a geologically and environmentally stable area. Groundwater chemistry is not expected to change significantly in the future. Therefore, further evaluation for the effects of corrosion of embedded steel is not required.

Aggressive Chemical Attack:

Reinforced concrete structures at WCGS 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. The mixes were designed with entrained air content between 3% and 6%, and the concrete slumps were controlled throughout the batching, mixing, and placement processes. USAR Section 3.8 discusses the design requirements for each major structure. Crack control was achieved through proper sizing, spacing, and distribution of reinforcing steel in accordance with ACI 318-71. Tests conducted monthly at WCGS from June 2005 to May 2006 show the groundwater and soil to have pH values between 7.0 and 8.7, which are well above the recommended minimum pH of 5.5. These tests also show that Chloride solutions range from 5.0 ppm to 41.2 ppm, and Sulfate solutions from 30 ppm to 717 ppm. These results compare favorably to the recommended limits of Chloride solutions < 500 ppm and Sulfate solutions < 1500 ppm. WCGS is located in a geologically and environmentally stable area. Groundwater chemistry is not expected to change significantly in the future. Therefore, further evaluation for the effects of aggressive chemical attack is not required.

3.5.2.2.1.2 Cracks and Distortion due to Increased Stress Levels from Settlement; Reduction of Foundation Strength, Cracking, and Differential Settlement due to Erosion of Porous Concrete Subfoundations, if not Covered by the Structures Monitoring Program

Settlement:

Competent foundation materials were found to be present at WCGS for establishing conservative design and construction criteria for support of the facilities. Major structures are founded on soil, undisturbed and/or compacted fill, over competent bedrock. USAR Table 2.5-54b shows that settlements of all major structures were measured in November 1983 and found to be well below the allowable values. No permanent de-watering system has been constructed at WCGS. Therefore, further evaluation for the effects of settlement is not required.

Porous Concrete Subfoundations:

WCGS does not have porous concrete subfoundations. Therefore, this aging effect is not applicable for WCGS and further evaluation is not required.

3.5.2.2.1.3 Reduction of Strength and Modulus of Concrete Structures due to Elevated Temperature

Not applicable. WCGS has no dome, wall, basemat, ring girder, buttresses, containment, or annulus concrete exposed to temperatures above 150^{o}F for general areas, or 200^{o}F for local areas. High energy line penetrations have been designed with flued heads to dissipate the heat from these process pipes, and insulation has been installed to further limit the exposure of the concrete.

3.5.2.2.1.4 Loss of Material due to General, Pitting, and Crevice Corrosion

Corrosion in inaccessible areas of steel containment liner:

Reinforced concrete structures at WCGS 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. Design practices and procedural controls ensured that the concrete was consistent with the recommendations and guidance provided by ACI 201.2R. The mixes were designed with entrained air content between 3% and 6%, and the concrete slumps were controlled throughout the batching, mixing, and placement processes. USAR Section 3.8 discusses the design requirements for each major structure. The Structures Monitoring Program (B2.1.32) will identify and manage any cracks in the concrete or degradation of the moister barrier that could potentially provide a pathway for water to reach inaccessible portions of the steel containment liner. Procedural controls will ensure that borated water spills are not common, and when detected are cleaned up in a timely manner. Therefore, further evaluation for corrosion in inaccessible areas of the steel containment liner is not required.

3.5.2.2.1.5 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 and BWR Mark II prestressed concrete containments is a TLAA as defined in 10 CFR 54.3. TLAAs are evaluated in accordance with 10 CFR 54.21(c). The WCGS containment is a prestressed concrete pressure vessel with ungrouted tendons. Section 4.5 describes the evaluation of this TLAA.

3.5.2.2.1.6 Cumulative Fatigue Damage

Not applicable. WCGS does not have containment penetration sleeves with bellows with dissimilar metal welds.

3.5.2.2.1.7 Cracking due to Stress Corrosion Cracking (SCC)

Not applicable. WCGS has no in-scope stainless steel penetration sleeves, penetration bellows, or dissimilar metal welds subject to stress corrosion cracking, so the applicable NUREG-1801 lines were not used.

3.5.2.2.1.8 Cracking due to Cyclic Loading

Not applicable. WCGS does not have containment penetration sleeves with bellows with dissimilar metal welds.

3.5.2.2.1.9 Loss of Material (Scaling, Cracking. And Spalling) due to Freeze Thaw

Freeze-Thaw:

As discussed in USAR Section 2.3.2.1.1, average monthly temperatures at WCGS range from 80°F in July and August to 29°F in January, with extremes recorded as high as 117°F and as low as -27°F. Reinforced concrete structures at WCGS 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 mixes were designed with entrained air content between 3% and 6%, and the concrete slumps were controlled throughout the batching, mixing, and placement processes. USAR Section 3.8 discusses the design requirements for each major structure. Therefore, further evaluation for the effects of freeze-thaw is not required.

Reaction with Aggregates:

At WCGS, testing and petrographic examination in accordance with ASTM C295 has demonstrated that the concrete aggregates are non-reactive. Therefore, further evaluation for the effects of reaction with aggregates is not required.

3.5.2.2.1.10 Cracking due to Expansion, and Reaction with Aggregate, and Increase in Porosity and Permeability due to Leaching of Calcium Hydroxide

Reaction with Aggregates:

At WCGS, testing and petrographic examination in accordance with ASTM C295 has demonstrated that the concrete aggregates are non-reactive. Therefore, further evaluation for the effects of reaction with aggregates is not required.

Leaching of Calcium Hydroxide:

Reinforced concrete structures at WCGS 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. Design practices and procedural controls ensured that the concrete was consistent with the recommendations and guidance provided by ACI 201.2R. The mixes were designed with entrained air content between 3% and 6%, and the concrete slumps were controlled throughout the batching, mixing, and placement processes. USAR Section 3.8 discusses the design requirements for each major structure. Therefore, further evaluation for the effects of leaching of calcium hydroxide is not required.

3.5.2.2.2 Safety-Related and Other Structures and Component Supports

3.5.2.2.2.1 Aging of Structures Not Covered by Structures Monitoring Program

Loss of material due to corrosion does not require further evaluation because the steel components are evaluated under the Structures Monitoring Program.

No aging management is required for the concrete elements due to the following:

Corrosion of Embedded Steel:

Reinforced concrete structures at WCGS 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. The mixes were designed with entrained air content between 3% and 6%, and the concrete slumps were controlled throughout the batching, mixing, and placement processes. USAR Section 3.8 discusses the design requirements for each major structure. Crack control was achieved through proper sizing, spacing, and distribution of reinforcing steel in accordance with ACI 318-71. Tests conducted monthly at WCGS from June 2005 to May 2006 show the groundwater and soil to have pH values between 7.0 and 8.7, which are well above the recommended minimum pH of 5.5. These tests also show that Chloride solutions range from 5.0 ppm to 41.2 ppm, and Sulfate solutions from 30 ppm to 717 ppm. These results compare favorably to the recommended limits of Chloride solutions < 500 ppm and Sulfate solutions < 1500 ppm. WCGS is located in a geologically and environmentally stable area. Groundwater chemistry is not expected to change significantly in the future. Therefore, further evaluation for the effects of corrosion of embedded steel is not required.

Reaction With Aggregates:

At WCGS, testing and petrographic examination in accordance with ASTM C295 has demonstrated that the concrete aggregates are non-reactive. Therefore, further evaluation for the effects of reaction with aggregates is not required.

Freeze-Thaw:

As discussed in USAR Section 2.3.2.1.1, average monthly temperatures at WCGS range from 80°F in July and August to 29°F in January, with extremes recorded as high as 117°F and as low as -27°F. Reinforced concrete structures at WCGS 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 mixes were designed with entrained air content between 3% and 6%, and the concrete slumps were controlled throughout the batching, mixing, and placement processes. USAR Section 3.8 discusses the design requirements for each major structure. Therefore, further evaluation for the effects of freeze-thaw is not required.

Aggressive Chemical Attack:

Reinforced concrete structures at WCGS 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. The mixes were designed with entrained air content between 3% and 6%, and the concrete slumps were controlled throughout the batching, mixing, and placement processes. USAR Section 3.8 discusses the design requirements for each major structure. Crack control was achieved through proper sizing, spacing, and distribution of reinforcing steel in accordance with ACI 318-71. Tests conducted monthly at WCGS from June 2005 to May 2006 show the groundwater and soil to have pH values between 7.0 and 8.7, which are well above the recommended minimum pH of 5.5. These tests also show that Chloride solutions range from 5.0 ppm to 41.2 ppm, and Sulfate solutions from 30 ppm to 717 ppm. These results compare favorably to the recommended limits of Chloride solutions < 500 ppm and Sulfate solutions < 1500 ppm. WCGS is located in a geologically and environmentally stable area. Groundwater chemistry is not expected to change significantly in the future. Therefore, further evaluation for the effects of aggressive chemical attack is not required.

Leaching of Calcium Hydroxide:

Reinforced concrete structures at WCGS 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. Design practices and procedural controls ensured that the concrete was consistent with the recommendations and guidance provided by ACI 201.2R. The mixes were designed with entrained air content between 3% and 6%, and the concrete slumps were controlled throughout the batching, mixing, and placement processes. USAR Section 3.8 discusses the design requirements for each major structure. Therefore, further evaluation for the effects of leaching of calcium hydroxide is not required.

Settlement:

Competent foundation materials were found to be present at WCGS for establishing conservative design and construction criteria for support of the facilities. Major structures are founded on soil, undisturbed and/or compacted fill, over competent bedrock. USAR Table 2.5-54b shows that settlements of all major structures were measured in November 1983 and found to be well below the allowable values. No permanent de-watering system has been constructed at WCGS. Therefore, further evaluation for the effects of settlement is not required.

Porous Concrete Subfoundations:

WCGS does not have porous concrete subfoundations. Therefore, this aging effect is not applicable for WCGS and further evaluation is not required.

Elevated Temperatures:

At WCGS, 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 220°F. 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. High energy line penetrations have been designed with flued heads to dissipate the heat from these process pipes, and insulation has been installed to further limit the exposure of the concrete. Accessible concrete components will be monitored by the Structures Monitoring Program (B2.1.32) to identify and manage any visible effects due to elevated temperatures.

3.5.2.2.2.2 Aging Management of Inaccessible Areas

3.5.2.2.2.2.1 Freeze-Thaw

No plant-specific aging management is required to manage the following structural aging effects for inaccessible areas:

Freeze-Thaw:

As discussed in USAR Section 2.3.2.1.1, average monthly temperatures at WCGS range from 80°F in July and August to 29°F in January, with extremes recorded as high as 117°F and as low as -27°F. Reinforced concrete structures at WCGS 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. The mixes were designed with entrained air content between 3% and 6%, and the concrete slumps were controlled throughout the batching, mixing, and placement processes. USAR Section 3.8 discusses the design requirements for each major structure. Therefore, further evaluation for the effects of freeze-thaw is not required.

3.5.2.2.2.2.2 Reaction with Aggregates

Reaction with Aggregates:

At WCGS, testing and petrographic examination in accordance with ASTM C295 has demonstrated that the concrete aggregates are non-reactive. Therefore, further evaluation for the effects of reaction with aggregates is not required.

3.5.2.2.2.2.3 Settlement and settlement due to erosion of porous concrete subfoundations

Settlement:

Competent foundation materials were found to be present at WCGS for establishing conservative design and construction criteria for support of the facilities. Major structures are founded on soil, undisturbed and/or compacted fill, over competent bedrock. USAR Table 2.5-54b shows that settlements of all major structures were measured in November 1983 and found to be well below the allowable values. No permanent de-watering system has been constructed at WCGS. Therefore, further evaluation for the effects of settlement is not required.

Porous Concrete Subfoundations:

WCGS does not have porous concrete subfoundations. Therefore, this aging effect is not applicable for WCGS and further evaluation not required.

3.5.2.2.2.2.4 Aggressive chemical attack and corrosion of embedded steel

Aggressive Chemical Attack:

Reinforced concrete structures at WCGS 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. The mixes were designed with entrained air content between 3% and 6%, and the concrete slumps were controlled throughout the batching, mixing, and placement processes. USAR Section 3.8 discusses the design requirements for each major structure. Crack control was achieved through proper sizing, spacing, and distribution of reinforcing steel in accordance with ACI 318-71. Tests conducted monthly at WCGS from June 2005 to May 2006 show the groundwater and soil to have pH values between 7.0 and 8.7, which are well above the recommended minimum pH of 5.5. These tests also show that Chloride solutions range from 5.0 ppm to 41.2 ppm, and Sulfate solutions from 30 ppm to 717 ppm. These results compare favorably to the recommended limits of Chloride solutions < 500 ppm and Sulfate solutions < 1500 ppm. WCGS is located in a geologically and environmentally stable area. Groundwater chemistry is not expected to change significantly in the future. Therefore, further evaluation for the effects of aggressive chemical attack is not required.

Corrosion of Embedded Steel:

Reinforced concrete structures at WCGS 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. The mixes were designed with entrained air content between 3% and 6%, and the concrete slumps were controlled throughout the batching, mixing, and placement processes. USAR Section 3.8 discusses the design requirements for each major structure. Crack control was achieved through proper sizing, spacing, and distribution of reinforcing steel in accordance with ACI 318-71. Tests conducted monthly at WCGS from June 2005 to May 2006 show the groundwater and soil to have pH values between 7.0 and 8.7, which are well above the recommended minimum pH of 5.5. These tests also show that Chloride solutions range from 5.0 ppm to 41.2 ppm, and Sulfate solutions from 30 ppm to 717 ppm. These results compare favorably to the recommended limits of Chloride solutions < 500 ppm and Sulfate solutions < 1500 ppm. WCGS is located in a geologically and environmentally stable area. Groundwater chemistry is not expected to change significantly in the future. Therefore, further evaluation for the effects of corrosion of embedded steel is not required.

3.5.2.2.2.2.5 Leaching of Calcium Hydroxide

Leaching of Calcium Hydroxide:

Reinforced concrete structures at WCGS 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. Design practices and procedural controls ensured that the concrete was consistent with the recommendations and guidance provided by ACI 201.2R. The mixes were designed with entrained air content between 3% and 6%, and the concrete slumps were controlled throughout the batching, mixing, and placement processes. USAR Section 3.8 discusses the design requirements for each major structure. Therefore, further evaluation for the effects of leaching of calcium hydroxide is not required.

3.5.2.2.2.3 Reduction of Strength and Modulus of Concrete Structures due to Elevated Temperature

Elevated Temperatures:

At WCGS, 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 220°F. 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. High energy line penetrations have been designed with flued heads to dissipate the heat from these process pipes, and insulation has been installed to further limit the exposure of the concrete. Accessible concrete components will be monitored by the Structures Monitoring Program (B2.1.32) to identify and manage any visible effects due to elevated temperatures.

3.5.2.2.2.4 Aging Management of Inaccessible Areas for Group 6 Structures

3.5.2.2.2.4.1 Aggressive chemical attack and corrosion of embedded steel

Aggressive Chemical Attack:

Reinforced concrete structures at WCGS 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. The mixes were designed with entrained air content between 3% and 6%, and the concrete slumps were controlled throughout the batching, mixing, and placement processes. USAR Section 3.8 discusses the design requirements for each major structure. Crack control was achieved through proper sizing, spacing, and distribution of reinforcing steel in accordance with ACI 318-71. Tests conducted monthly at WCGS from June 2005 to May 2006 show the groundwater and soil to have pH values between 7.0 and 8.7, which are well above the recommended minimum pH of 5.5. These tests also show that Chloride solutions range from 5.0 ppm to 41.2 ppm, and Sulfate solutions from 30 ppm to 717 ppm. These results compare favorably to the recommended limits of Chloride solutions < 500 ppm and Sulfate solutions < 1500 ppm. WCGS is located in a geologically and environmentally stable area. Groundwater chemistry is not expected to change significantly in the future. Therefore, further evaluation for the effects of aggressive chemical attack is not required.

Corrosion of Embedded Steel:

Reinforced concrete structures at WCGS 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. The mixes were designed with entrained air content between 3% and 6%, and the concrete slumps were controlled throughout the batching, mixing, and placement processes. USAR Section 3.8 discusses the design requirements for each major structure. Crack control was achieved through proper sizing, spacing, and distribution of reinforcing steel in accordance with ACI 318-71. Tests conducted monthly at WCGS from June 2005 to May 2006 show the groundwater and soil to have pH values between 7.0 and 8.7, which are well above the recommended minimum pH of 5.5. These tests also show that Chloride solutions range from 5.0 ppm to 41.2 ppm, and Sulfate solutions from 30 ppm to 717 ppm. These results compare favorably to the recommended limits of Chloride solutions < 500 ppm and Sulfate solutions < 1500 ppm. WCGS is located in a geologically and environmentally stable area. Groundwater chemistry is not expected to change significantly in the future. Therefore, further evaluation for the effects of corrosion of embedded steel is not required.

3.5.2.2.2.4.2 Freeze-Thaw

Freeze-Thaw:

As discussed in USAR Section 2.3.2.1.1, average monthly temperatures at WCGS range from 80°F in July and August to 29°F in January, with extremes recorded as high as 117°F and as low as -27°F. Reinforced concrete structures at WCGS 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 mixes were designed with entrained air content between 3% and 6%, and the concrete slumps were controlled throughout the batching, mixing, and placement processes. USAR Section 3.8 discusses the design requirements for each major structure. Therefore, further evaluation for the effects of freeze-thaw is not required.

3.5.2.2.2.4.3 Reaction with Aggregates and Leaching of Calcium Hydroxide

Reaction with Aggregates:

At WCGS, testing and petrographic examination in accordance with ASTM C295 has demonstrated that the concrete aggregates are non-reactive. Therefore, further evaluation for the effects of reaction with aggregates is not required.

Leaching of Calcium Hydroxide:

Reinforced concrete structures at WCGS 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. Design practices and procedural controls ensured that the concrete was consistent with the recommendations and guidance provided by ACI 201.2R. The mixes were designed with entrained air content between 3% and 6%, and the concrete slumps were controlled throughout the batching, mixing, and placement processes. USAR Section 3.8 discusses the design requirements for each major structure. Therefore, further evaluation for the effects of leaching of calcium hydroxide is not required.

3.5.2.2.2.5 Cracking due to Stress Corrosion Cracking and Loss of Material due to Pitting and Crevice Corrosion

Not applicable. WCGS has no in-scope stainless steel tank liners exposed to water-standing so the applicable NUREG-1801 lines were not used.

3.5.2.2.2.6 Aging of Supports Not Covered by the Structures Monitoring Program

Building concrete is inspected per Structures Monitoring Program (B2.1.32), therefore no further evaluation is required.

HVAC duct supports are inspected per Structures Monitoring Program (B2.1.32), therefore no further evaluation is required.

Instrument supports are inspected per Structures Monitoring Program (B2.1.32), therefore no further evaluation is required.

Non-ASME mechanical equipment supports are inspected per Structures Monitoring Program (B2.1.32), therefore no further evaluation is required.

Non-ASME supports are inspected per Structures Monitoring Program (B2.1.32), therefore no further evaluation is required.

Electrical panels and enclosures are inspected per Structures Monitoring Program (B2.1.32), therefore no further evaluation is required.

3.5.2.2.2.7 Cumulative Fatigue Damage due to Cyclic Loading

Analyses of fatigue in component support members, anchor bolts, and welds for Group B1.1, B1.2, and B1.3 component supports (for ASME Class 1, 2, and 3 piping and components, and for Class MC containment components) are TLAAs as defined in 10 CFR 54.3 only if a CLB fatigue analysis exists. TLAAs are evaluated in accordance with 10 CFR 54.21(c).

For these components at WCGS, only a time dependent analysis of reactor vessel supports for heatup operational events is a TLAA and is evaluated in Section 4.3.2.9.

WCGS ASME Class 1 piping is designed to code editions and addenda before 1986, which therefore precede cycle limits for allowable stress in supports. See Section 4.3.2.7.

WCGS 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.

WCGS contains no Class MC components. See Section 4.6.1.

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.

3.5.2.3 Time-Limited Aging Analysis

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 Damage, Section 4.6.2, Design Cycles for the Main Steam Line Penetrations, and Section 4.3.7, Fatigue Design of Class IE Electrical Raceway Support Angle Fittings for Seismic Events)
- 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 aging management review 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, 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, 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 Evaluations 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
3.5.1.01	Concrete elements: walls, dome, basemat, ring girder, buttresses, containment (as applicable)	Aging of accessible and inaccessible concrete areas due to aggressive chemical attack, and corrosion of embedded steel	ISI (IWL) (B2.1.28) and for inaccessible concrete, an examination of representative samples of below-grade concrete, and periodic monitoring of groundwater, if the environment is non-aggressive. A plant specific program is to be evaluated if environment is aggressive.	Yes	Consistent with NUREG-1801. See further evaluation in subsection 3.5.2.2.1.1.

Table 3.5.1 Summary of Aging Management Evaluations 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
3.5.1.02	Concrete elements; All	Cracks and distortion due to increased stress levels from settlement	Structures Monitoring Program (B2.1.32). 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 not within the scope of the applicant's structures monitoring program or a de-watering system is relied upon	Consistent with NUREG-1801. See further evaluation in subsection 3.5.2.2.1.2.
3.5.1.03	Concrete elements: foundation, sub-foundation	Reduction in foundation strength, cracking, differential settlement due to erosion of porous concrete subfoundation	Structures Monitoring Program (B2.1.32). If a de-watering system is relied upon for control of erosion of cement from porous concrete subfoundations, then the licensee is to ensure proper functioning of the de-watering system through the period of extended operation.	Yes, if not within the scope of the applicant's structures monitoring program or a de-watering system is relied upon	Not applicable. WCGS has no porous concrete foundations, so the applicable NUREG-1801 lines were not used.
3.5.1.04	Concrete elements: dome, wall, basemat, ring girder, buttresses, containment, concrete fill-in annulus (as applicable)	Reduction of strength and modulus of concrete due to elevated temperature	A plant-specific aging management program is to be evaluated	Yes	Not applicable. WCGS has no dome, wall, basemat, ring girder, buttresses, containment, or annulus concrete exposed to elevated temperatures, so the applicable NUREG-1801 lines were not used.

Table 3.5.1 Summary of Aging Management Evaluations 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
3.5.1.05					Not applicable - BWR only
3.5.1.06	Steel elements: steel liner, liner anchors, integral attachments	Loss of material due to general, pitting and crevice corrosion	ISI (IWE) (B2.1.27), and 10 CFR Part 50, Appendix J (B2.1.30).	Yes, if corrosion is significant for inaccessible areas	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: ASME Section XI, Subsection IWE (B2.1.27). See further evaluation in subsection 3.5.2.2.1.4.
3.5.1.07	Prestressed containment tendons	Loss of prestress due to relaxation, shrinkage, creep, and elevated temperature	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes, TLAA	Loss of prestress of containment tendons is a TLAA. See further evaluation in subsection 3.5.2.2.1.5.
3.5.1.08					Not applicable - BWR only

Table 3.5.1 Summary of Aging Management Evaluations 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
3.5.1.09	Steel, stainless steel elements, dissimilar metal welds: penetration sleeves, penetration bellows; suppression pool shell, unbraced downcomers	Cumulative fatigue damage (CLB fatigue analysis exists)	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes, TLAA	Not applicable. There are no containment penetrations for which a bellows or expansion joint is part of the containment pressure boundary at WCGS. So the applicable NUREG-1801 lines were not used. However there are containment penetrations without bellows or expansion joints as part of the containment pressure boundary. Of them, only the main steam penetration design is supported by a cyclic load evaluation TLAA, described in Section 4.6.2. See the further evaluation in subsection 3.5.2.2.1.6.
3.5.1.10	Stainless steel penetration sleeves, penetration bellows, dissimilar metal welds	Cracking due to stress corrosion cracking	ISI (IWE) (B2.1.27), and 10 CFR Part 50, Appendix J (B2.1.30), and additional appropriate examinations/evaluations for bellows assemblies and dissimilar metal welds.	Yes	Not applicable. WCGS has no in-scope stainless steel penetration sleeves, penetration bellows, or dissimilar metal welds subject to stress corrosion cracking, so the applicable NUREG-1801 lines were not used.
3.5.1.11					Not applicable - BWR only

Table 3.5.1 Summary of Aging Management Evaluations 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
3.5.1.12	Steel, stainless steel elements, dissimilar metal welds: penetration sleeves, penetration bellows; suppression pool shell, unbraced downcomers	Cracking due to cyclic loading	ISI (IWE) (B2.1.27), and 10 CFR Part 50, Appendix J (B2.1.30), and supplemented to detect fine cracks	Yes	CLB fatigue analysis does exist. See 3.5.1.09.
3.5.1.13					Not applicable - BWR only
3.5.1.14	Concrete elements: dome, wall, basemat ring girder, buttresses, containment (as applicable)	Loss of material (Scaling, cracking, and spalling) due to freeze-thaw	ISI (IWL) (B2.1.28). Evaluation is needed for plants that are located in moderate to severe weathering conditions (weathering index >100 day-inch/yr) (NUREG-1557).	Yes	Consistent with NUREG-1801. See further evaluation in subsection 3.5.2.2.1.9.
3.5.1.15	Concrete elements: walls, dome, basemat, ring girder, buttresses, containment, concrete fill-in annulus (as applicable).	Cracking due to expansion and reaction with aggregate; increase in porosity, permeability due to leaching of calcium hydroxide	ISI (IWL) (B2.1.28) for accessible areas. None for inaccessible areas if concrete was constructed in accordance with the recommendations in ACI 201.2R.	Yes, if concrete was not constructed as stated for inaccessible areas	Consistent with NUREG-1801. See further evaluation in subsection 3.5.2.2.1.10.

Table 3.5.1 Summary of Aging Management Evaluations 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
3.5.1.16	Seals, gaskets, and moisture barriers	Loss of sealing and leakage through containment due to deterioration of joint seals, gaskets, and moisture barriers (caulking, flashing, and other sealants)	ISI (IWE) (B2.1.27), and 10 CFR Part 50, Appendix J (B2.1.30).	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: ASME Section XI, Subsection IWE (B2.1.27).
3.5.1.17	Personnel airlock, equipment hatch and CRD hatch locks, hinges, and closure mechanisms	Loss of leak tightness in closed position due to mechanical wear of locks, hinges and closure mechanisms	10 CFR Part 50, Appendix J (B2.1.30) and Plant Technical Specifications	No	Consistent with NUREG-1801.
3.5.1.18	Steel penetration sleeves and dissimilar metal welds; personnel airlock, equipment hatch and CRD hatch	Loss of material due to general, pitting, and crevice corrosion	ISI (IWE) (B2.1.27), and 10 CFR Part 50, Appendix J (B2.1.30).	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: ASME Section XI, Subsection IWE (B2.1.27).
3.5.1.19					Not applicable - BWR only
3.5.1.20					Not applicable - BWR only
3.5.1.21					Not applicable - BWR only

Table 3.5.1 Summary of Aging Management Evaluations 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
3.5.1.22	Prestressed containment: tendons and anchorage components	Loss of material due to corrosion	ISI (IWL) (B2.1.28)	No	Consistent with NUREG-1801.
3.5.1.23	All Groups except Group 6: interior and above grade exterior concrete	Cracking, loss of bond, and loss of material (spalling, scaling) due to corrosion of embedded steel	Structures Monitoring Program (B2.1.32)	Yes, if not within the scope of the applicant's structures monitoring program	Consistent with NUREG-1801. See further evaluation in subsection 3.5.2.2.2.1.
3.5.1.24	All Groups except Group 6: interior and above grade exterior concrete	Increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack	Structures Monitoring Program (B2.1.32)	Yes, if not within the scope of the applicant's structures monitoring program	Consistent with NUREG-1801. See further evaluation in subsection 3.5.2.2.2.1.
3.5.1.25	All Groups except Group 6: steel components: all structural steel	Loss of material due to corrosion	Structures Monitoring Program (B2.1.32). 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.	Yes, if not within the scope of the applicant's structures monitoring program	Consistent with NUREG-1801. See further evaluation in subsection 3.5.2.2.2.1.

Table 3.5.1 Summary of Aging Management Evaluations 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
3.5.1.26	All Groups except Group 6: accessible and inaccessible concrete: foundation	Loss of material (spalling, scaling) and cracking due to freeze-thaw	Structures Monitoring Program (B2.1.32). Evaluation is needed for plants that are located in moderate to severe weathering conditions (weathering index >100 day-inch/yr) (NUREG-1557).	Yes, if not within the scope of the applicant's structures monitoring program or for inaccessible areas of plants located in moderate to severe weathering conditions	Consistent with NUREG-1801. See further evaluation in subsection 3.5.2.2.2.1.
3.5.1.27	All Groups except Group 6: accessible and inaccessible interior/exterior concrete	Cracking due to expansion due to reaction with aggregates	Structures Monitoring Program (B2.1.32)	Yes, if not within the scope of the applicant's structures monitoring program or concrete was not constructed as stated for inaccessible areas	Consistent with NUREG-1801. See further evaluation in subsection 3.5.2.2.2.1.

Table 3.5.1 Summary of Aging Management Evaluations 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
3.5.1.28	Groups 1-3, 5-9: All	Cracks and distortion due to increased stress levels from settlement	Structures Monitoring Program (B2.1.32). 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 not within the scope of the applicant's structures monitoring program or a de-watering system is relied upon	See further evaluation in subsection 3.5.2.2.2.1. ESW Discharge Structure is inspected per Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.33).
3.5.1.29	Groups 1-3, 5-9: foundation	Reduction in foundation strength, cracking, differential settlement due to erosion of porous concrete subfoundation	Structures Monitoring Program (B2.1.32). 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 not within the scope of the applicant's structures monitoring program or a de-watering system is relied upon	Not applicable. WCGS has no porous concrete foundations, so the applicable NUREG-1801 lines were not used.
3.5.1.30	Group 4: Radial beam seats in BWR drywell; RPV support shoes for PWR with nozzle supports; Steam generator supports	Lock-up due to wear	Structures Monitoring Program (B2.1.32)	Yes, if not within the scope of ISI or structures monitoring program	Not applicable. WCGS did not use Lubrite on the RPV support shoes or steam generator supports, so the applicable NUREG-1801 line was not used.

Table 3.5.1 Summary of Aging Management Evaluations 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
3.5.1.31	Groups 1-3, 5, 7-9: below-grade concrete components, such as exterior walls below grade and foundation	Increase in porosity and permeability, cracking, loss of material (spalling, scaling)/ aggressive chemical attack;	Structures Monitoring Program (B2.1.32); Examination of representative samples of below-grade concrete, and periodic monitoring of groundwater, if the environment is non-aggressive. A plant specific program is to be evaluated if environment is aggressive.	Yes	Consistent with NUREG-1801. See further evaluation in subsection 3.5.2.2.2.2.4.
3.5.1.32	Groups 1-3, 5, 7-9: exterior above and below grade reinforced concrete foundations	Increase in porosity and permeability, and loss of strength due to leaching of calcium hydroxide	Structures Monitoring Program (B2.1.32) for accessible areas. None for inaccessible areas if concrete was constructed in accordance with the recommendations in ACI 201.2R-77.	Yes, if concrete was not constructed as stated for inaccessible areas	Consistent with NUREG-1801. See further evaluation in subsection 3.5.2.2.2.2.5.
3.5.1.33	Groups 1-5: concrete	Reduction of strength and modulus of concrete due to elevated temperature	A plant-specific aging management program is to be evaluated	Yes	Consistent with NUREG-1801. The plant-specific aging management program(s) used to manage the aging include: Structures Monitoring Program (B2.1.32). See further evaluation in subsection 3.5.2.2.2.2.3.

Table 3.5.1 Summary of Aging Management Evaluations 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
3.5.1.34	Group 6: Concrete; all	Increase in porosity and permeability, cracking, loss of material due to aggressive chemical attack; cracking, loss of bond, loss of material due to corrosion of embedded steel	Inspection of Water-Control Structures (B2.1.33)	Yes	Consistent with NUREG-1801. See further evaluation in subsection 3.5.2.2.2.4.1.
3.5.1.35	Group 6: exterior above and below grade concrete foundation	Loss of material (spalling, scaling) and cracking due to freeze-thaw	Inspection of Water-Control Structures (B2.1.33)	Yes, for inaccessible areas of plants located in moderate to severe weathering conditions	Consistent with NUREG-1801. See further evaluation in subsection 3.5.2.2.2.4.2.
3.5.1.36	Group 6: all accessible/ inaccessible reinforced concrete	Cracking due to expansion/ reaction with aggregates	Inspection of Water-Control Structures (B2.1.33)	Yes, if concrete was not constructed as stated for inaccessible areas	Consistent with NUREG-1801. See further evaluation in subsection 3.5.2.2.2.4.3.

Table 3.5.1 Summary of Aging Management Evaluations 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
3.5.1.37	Group 6: exterior above and below grade reinforced concrete foundation interior slab	Increase in porosity and permeability, loss of strength due to leaching of calcium hydroxide	Inspection of Water-Control Structures (B2.1.33)	Yes, if concrete was not constructed as stated for inaccessible areas	Consistent with NUREG-1801. See further evaluation in subsection 3.5.2.2.2.4.3.
3.5.1.38	Groups 7, 8: Tank liners	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	Not applicable. WCGS has no in-scope stainless steel tank liners exposed to water-standing so the applicable NUREG-1801 lines were not used.
3.5.1.39	Support members; welds; bolted connections; support anchorage to building structure	Loss of material due to general and pitting corrosion	Structures Monitoring Program (B2.1.32)	Yes, if not within the scope of the applicant's structures monitoring program	Consistent with NUREG-1801. See further evaluation in subsection 3.5.2.2.2.6.
3.5.1.40	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 Program (B2.1.32)	Yes, if not within the scope of the applicant's structures monitoring program	Consistent with NUREG-1801. See further evaluation in subsection 3.5.2.2.2.6.

Table 3.5.1 Summary of Aging Management Evaluations 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
3.5.1.41	Vibration isolation elements	Reduction or loss of isolation function/ radiation hardening, temperature, humidity, sustained vibratory loading	Structures Monitoring Program (B2.1.32)	Yes, if not within the scope of the applicant's structures monitoring program	Not applicable. WCGS has no in-scope vibration isolation elements, so the applicable NUREG-1801 lines were not used.
3.5.1.42	Groups B1.1, B1.2, and B1.3: support members: anchor bolts, welds	Cumulative fatigue damage (CLB fatigue analysis exists)	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes, TLAA	For fluid system and component supports at WCGS, only a time-dependent analysis of reactor vessel supports for heatup operational events is a TLAA. See Section 4.3.2.9 and the further evaluation in subsection 3.5.2.2.2.7.
3.5.1.43	Groups 1-3, 5, 6: all masonry block walls	Cracking due to restraint shrinkage, creep, and aggressive environment	Masonry Wall Program (B2.1.31)	No	NUREG-1801 does not provide a line in which concrete masonry is inspected per the Fire Protection program. Therefore, for concrete masonry walls that provide a fire barrier function, the Fire Protection program (B2.1.12) has been added.

Table 3.5.1 Summary of Aging Management Evaluations 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
3.5.1.44	Group 6 elastomer seals, gaskets, and moisture barriers	Loss of sealing due to deterioration of seals, gaskets, and moisture barriers (caulking, flashing, and other sealants)	Structures Monitoring Program (B2.1.32)	No	Consistent with NUREG-1801.
3.5.1.45	Group 6: exterior above and below grade concrete foundation; interior slab	Loss of material due to abrasion, cavitation	Structures Monitoring Program (B2.1.32)	No	Consistent with NUREG-1801 for material, environment, and aging effect, but a different aging management program Structures Monitoring Program (B2.1.32) is credited.
3.5.1.46	Group 5: Fuel pool liners	Cracking due to stress corrosion cracking; loss of material due to pitting and crevice corrosion	Water Chemistry B2.1.2) and monitoring of spent fuel pool water level in accordance with technical specifications and leakage from the leak chase channels.	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Water Chemistry (B2.1.2).
3.5.1.47	Group 6: all metal structural members	Loss of material due to general (steel only), pitting and crevice corrosion	Inspection of Water-Control Structures (B2.1.33)	No	Consistent with NUREG-1801 for material, environment, and aging effect, but a different aging management program Structures Monitoring Program (B2.1.32) is credited.

Table 3.5.1 Summary of Aging Management Evaluations 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
3.5.1.48	Group 6: 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	Inspection of Water-Control Structures (B2.1.33)	No	Consistent with NUREG-1801.
3.5.1.49					Not applicable - BWR only
3.5.1.50	Groups B2, and B4: galvanized steel, aluminum, stainless steel support members; welds; bolted connections; support anchorage to building structure	Loss of material due to pitting and crevice corrosion	Structures Monitoring Program (B2.1.32)	No	Consistent with NUREG-1801.
3.5.1.51	Group B1.1: high strength low-alloy bolts	Cracking due to stress corrosion cracking; loss of material due to general corrosion	Bolting Integrity (B2.1.7)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: Bolting Integrity (B2.1.7).

Table 3.5.1 Summary of Aging Management Evaluations 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
3.5.1.52	Groups B2, and B4: sliding support bearings and sliding support surfaces	Loss of mechanical function due to corrosion, distortion, dirt, overload, fatigue due to vibratory and cyclic thermal loads	Structures Monitoring Program (B2.1.32)	No	Consistent with NUREG-1801. This item covers piping supports (Group B2). There are no equipment supports (Group B4) with sliding surfaces at WCGS.
3.5.1.53	Groups B1.1, B1.2, and B1.3: support members: welds; bolted connections; support anchorage to building structure	Loss of material due to general and pitting corrosion	ISI (IWF) (B2.1.29)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: ASME Section XI, Subsection IWF (B2.1.29).
3.5.1.54	Groups B1.1, B1.2, and B1.3: 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	ISI (IWF) (B2.1.29)	No	Consistent with NUREG-1801 with aging management program exceptions. The aging management program(s) with exceptions to NUREG-1801 include: ASME Section XI, Subsection IWF (B2.1.29).

Table 3.5.1 Summary of Aging Management Evaluations 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
3.5.1.55	Steel, galvanized steel, and aluminum 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.
3.5.1.56	Groups B1.1, B1.2, and B1.3: Sliding surfaces	Loss of mechanical function due to corrosion, distortion, dirt, overload, fatigue due to vibratory and cyclic thermal loads	ISI (IWF) (B2.1.29)	No	Not applicable. WCGS has no in-scope Group B1 sliding surfaces utilizing Lubrite, so the applicable NUREG-1801 lines were not used.
3.5.1.57	Groups B1.1, B1.2, and B1.3: Vibration isolation elements	Reduction or loss of isolation function/ radiation hardening, temperature, humidity, sustained vibratory loading	ISI (IWF) (B2.1.29)	No	Not applicable. WCGS has no in-scope vibration isolation elements, so the applicable NUREG-1801 lines were not used.
3.5.1.58	Galvanized steel and aluminum support members; welds; bolted connections; support anchorage to building structure exposed to air - indoor uncontrolled	None	None	No	Consistent with NUREG-1801.

Table 3.5.1 Summary of Aging Management Evaluations 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
3.5.1.59	Stainless steel support members; welds; bolted connections; support anchorage to building structure	None	None	No	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 Vol. 2 Item	Table 1 Item	Notes
Caulking/ Sealant	SH	Elastomer	Plant Indoor Air (Structural) (Ext)	Loss of sealing	Structures Monitoring Program (B2.1.32)	III.A6-12	3.5.1.44	A
Compressible Joints/Seals	ES, SH	Elastomer	Atmosphere/ Weather (Structural) (Ext)	Loss of sealing	Structures Monitoring Program (B2.1.32)	III.A6-12	3.5.1.44	A
Compressible Joints/Seals	SH, SPB	Elastomer	Plant Indoor Air (Structural) (Ext)	Loss of sealing; Leakage through containment	ASME Section XI, Subsection IWE (B2.1.27) and 10 CFR Part 50, Appendix J (B2.1.30)	II.A3-7	3.5.1.16	B
Compressible Joints/Seals	ES	Elastomer	Plant Indoor Air (Structural) (Ext)	Loss of sealing	Structures Monitoring Program (B2.1.32)	III.A6-12	3.5.1.44	A
Concrete Elements	FB, MB, SPB, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Loss of material (spalling, scaling) and cracking	ASME Section XI, Subsection IWL (B2.1.28)	II.A1-2	3.5.1.14	A
Concrete Elements	FB, MB, SPB, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking due to expansion	ASME Section XI, Subsection IWL (B2.1.28)	II.A1-3	3.5.1.15	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 Vol. 2 Item	Table 1 Item	Notes
Concrete Elements	FB, MB, SPB, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Increase in porosity and permeability, cracking, loss of material (spalling, scaling	ASME Section XI, Subsection IWL (B2.1.28)	II.A1-4	3.5.1.01	A
Concrete Elements	FB, MB, SPB, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracks and distortion	Structures Monitoring Program (B2.1.32)	II.A1-5	3.5.1.02	A
Concrete Elements	FB, MB, SPB, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Increase in porosity, permeability	ASME Section XI, Subsection IWL (B2.1.28)	II.A1-6	3.5.1.15	A
Concrete Elements	FB, MB, SPB, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking, loss of bond, and loss of material (spalling, scaling)	ASME Section XI, Subsection IWL (B2.1.28)	II.A1-7	3.5.1.01	A
Concrete Elements	FB, MB, SPB, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Concrete cracking and spalling	Fire Protection (B2.1.12) and Structures Monitoring Program (B2.1.32)	VII.G-30	3.3.1.66	B
Concrete Elements	FB, MB, SPB, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Fire Protection (B2.1.12) and Structures Monitoring Program (B2.1.32)	VII.G-31	3.3.1.67	B

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 Vol. 2 Item	Table 1 Item	Notes
Concrete Elements	FLB, SH, SLD, SPB, SS	Concrete	Buried (Structural) (Ext)	Loss of material (spalling, scaling) and cracking	ASME Section XI, Subsection IWL (B2.1.28)	II.A1-2	3.5.1.14	A
Concrete Elements	FLB, SH, SLD, SPB, SS	Concrete	Buried (Structural) (Ext)	Cracking due to expansion	ASME Section XI, Subsection IWL (B2.1.28)	II.A1-3	3.5.1.15	A
Concrete Elements	FLB, SH, SLD, SPB, SS	Concrete	Buried (Structural) (Ext)	Increase in porosity and permeability, cracking, loss of material (spalling, scaling	ASME Section XI, Subsection IWL (B2.1.28)	II.A1-4	3.5.1.01	A
Concrete Elements	FLB, SH, SLD, SPB, SS	Concrete	Buried (Structural) (Ext)	Cracks and distortion	Structures Monitoring Program (B2.1.32)	II.A1-5	3.5.1.02	A
Concrete Elements	FLB, SH, SLD, SPB, SS	Concrete	Buried (Structural) (Ext)	Increase in porosity, permeability	ASME Section XI, Subsection IWL (B2.1.28)	II.A1-6	3.5.1.15	A
Concrete Elements	FB, HLBS, MB, PWR, SH, SLD, SPB, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking due to expansion	ASME Section XI, Subsection IWL (B2.1.28)	II.A1-3	3.5.1.15	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 Vol. 2 Item	Table 1 Item	Notes
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 (B2.1.28)	II.A1-4	3.5.1.01	A
Concrete Elements	FB, HLBS, MB, PWR, SH, SLD, SPB, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Cracks and distortion	Structures Monitoring Program (B2.1.32)	II.A1-5	3.5.1.02	A
Concrete Elements	FB, HLBS, MB, PWR, SH, SLD, SPB, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking, loss of bond, and loss of material (spalling, scaling)	ASME Section XI, Subsection IWL (B2.1.28)	II.A1-7	3.5.1.01	A
Concrete Elements	FB, HLBS, MB, PWR, SLD, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Reduction of strength and modulus	Structures Monitoring Program (B2.1.32)	III.A4-1	3.5.1.33	E, 3
Concrete Elements	FB, HLBS, MB, PWR, SLD, SPB, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Concrete cracking and spalling	Fire Protection (B2.1.12) and Structures Monitoring Program (B2.1.32)	VII.G-28	3.3.1.65	B

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 Vol. 2 Item	Table 1 Item	Notes
Concrete Elements	FB, HLBS, MB, PWR, SLD, SPB, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Loss of material	Fire Protection (B2.1.12) and Structures Monitoring Program (B2.1.32)	VII.G-29	3.3.1.67	B
Fire Barrier Coatings/ Wraps	FB	Fire Barrier (Ceramic Fiber)	Plant Indoor Air (Structural) (Ext)	Loss of material, cracking	Fire Protection (B2.1.12	None	None	J, 2
Fire Barrier Doors	FB, SH	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Fire Protection (B2.1.12)	VII.G-3	3.3.1.63	B
Fire Barrier Seals	FB, SH	Elastomer	Plant Indoor Air (Structural) (Ext)	Increased hardness, shrinkage and loss of strength	Fire Protection (B2.1.12)	VII.G-1	3.3.1.61	B
Hatch	FB, SH, SPB, SS	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of leak tightness	10 CFR Part 50, Appendix J (B2.1.30)	II.A3-5	3.5.1.17	A
Hatch	FB, SH, SPB, SS	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	ASME Section XI, Subsection IWE (B2.1.27) and 10 CFR Part 50, Appendix J (B2.1.30)	II.A3-6	3.5.1.18	B
Hatch	FB, SH, SPB, SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of leak tightness	10 CFR Part 50, Appendix J (B2.1.30)	II.A3-5	3.5.1.17	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 Vol. 2 Item	Table 1 Item	Notes
Hatch	FB, SH, SPB, SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	ASME Section XI, Subsection IWE (B2.1.27) and 10 CFR Part 50, Appendix J (B2.1.30)	II.A3-6	3.5.1.18	B
Hatch	MB, SLD	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking due to expansion	Structures Monitoring Program (B2.1.32)	III.A7-1	3.5.1.27	A
Hatch	MB, SLD	Concrete	Atmosphere/ Weather (Structural) (Ext)	Loss of material (spalling, scaling) and cracking	Structures Monitoring Program (B2.1.32)	III.A7-5	3.5.1.26	A
Hatch	MB, SLD	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring Program (B2.1.32)	III.A7-8	3.5.1.23	A
Hatch	MB, SLD	Concrete	Atmosphere/ Weather (Structural) (Ext)	Increase in porosity and permeability, cracking, loss of material (spalling, scaling	Structures Monitoring Program (B2.1.32)	III.A7-9	3.5.1.24	A
Hatch	FB, SH, SPB, SS	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Fire Protection (B2.1.12)	VII.G-4	3.3.1.63	D
Hatch	FB, SH, SPB, SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Fire Protection (B2.1.12)	VII.G-3	3.3.1.63	D

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 Vol. 2 Item	Table 1 Item	Notes
Hatches/Plugs	MB, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking due to expansion	Structures Monitoring Program (B2.1.32)	III.A4-2	3.5.1.27	A
Hatches/Plugs	MB, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Increase in porosity and permeability, cracking, loss of material (spalling, scaling	Structures Monitoring Program (B2.1.32)	III.A4-4	3.5.1.24	A
Hatches/Plugs	MB, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring Program (B2.1.32)	III.A4-3	3.5.1.23	A
Liner Containment	SH, SLD, SPB	Carbon Steel	Encased in Concrete (Ext)	None	None	VII.J-21	3.3.1.96	C
Liner Containment	SH, SLD, SPB	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	ASME Section XI, Subsection IWE (B2.1.27)	II.A1-11	3.5.1.06	B
Liner Refueling	SH	Stainless Steel	Encased in Concrete (Ext)	None	None	VII.J-17	3.3.1.96	C
Liner Refueling	SH	Stainless Steel	Plant Indoor Air (Structural) (Ext)	None	None	VII.J-15	3.3.1.94	C
Liner Refueling	SH	Stainless Steel	Submerged (Structural) (Ext)	Cracking	Water Chemistry (B2.1.2) and Monitoring of the Spent Fuel Pool Water Level	III.A5-13	3.5.1.46	B

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 Vol. 2 Item	Table 1 Item	Notes
Penetration	PB	Carbon Steel	Plant Indoor Air (Ext)	Cumulative fatigue damage	Time Limited Aging Analysis evaluated for the period of extended operation.	None	None	H, 1
Penetration	FLB, SPB, SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	ASME Section XI, Subsection IWE (B2.1.27) and 10 CFR Part 50, Appendix J (B2.1.30)	II.A3-1	3.5.1.18	B
Penetrations Electrical	FLB, SPB, SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	ASME Section XI, Subsection IWE (B2.1.27) and 10 CFR Part 50, Appendix J (B2.1.30)	II.A3-1	3.5.1.18	B
Pipe Whip Restraints & Jet Shields	HLBS, MB, PWR, SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A4-5	3.5.1.25	A
Stairs/ Platforms/ Grates	NSRS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A4-5	3.5.1.25	A
Structural Steel (Tendons and Anchorage Components)	SS	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	ASME Section XI, Subsection IWL (B2.1.28)	II.A1-10	3.5.1.22	A
Structural Steel	SS	Carbon Steel	Encased in Concrete (Ext)	None	None	VII.J-21	3.3.1.96	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 Vol. 2 Item	Table 1 Item	Notes
Structural Steel	NSRS, SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A4-5	3.5.1.25	A
Tendons	SPB	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of prestress	Time Limited Aging Analysis evaluated for the period of extended operation.	II.A1-9	3.5.1.07	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.

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 cyclic load evaluation of the main steam penetrations is a TLAA as defined in 10 CFR 54.3. TLAAs are evaluated in accordance with 10 CFR 54.21(c)(1). Section 4.6.2 describes the evaluation of this TLAA for the cyclic load evaluation of the main steam penetrations.

2 NUREG-1801 does not provide a line in which Fire Barriers (Ceramic Fiber or Cementitious Coating) are inspected per the Fire Protection program (B2.1.12).

3 Concrete is monitored for visible signs of aging effects due to increased temperature by Structures Monitoring Program (B2.1.32).

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 Vol. 2 Item	Table 1 Item	Notes
Caulking/ Sealant	FLB	Elastomer	Buried (Structural) (Ext)	Loss of sealing	Structures Monitoring Program (B2.1.32)	III.A6-12	3.5.1.44	A
Caulking/ Sealant	FLB, SPB	Elastomer	Plant Indoor Air (Structural) (Ext)	Loss of sealing	Structures Monitoring Program (B2.1.32)	III.A6-12	3.5.1.44	A
Compressible Joints/Seals	ES, SH	Elastomer	Atmosphere/ Weather (Structural) (Ext)	Loss of sealing	Structures Monitoring Program (B2.1.32)	III.A6-12	3.5.1.44	A
Compressible Joints/Seals	ES	Elastomer	Plant Indoor Air (Structural) (Ext)	Loss of sealing	Structures Monitoring Program (B2.1.32)	III.A6-12	3.5.1.44	A
Concrete Block (Masonry Walls)	FB, NSRS	Concrete Block (Masonry Walls)	Plant Indoor Air (Structural) (Ext)	Cracking	Fire Protection (B2.1.12) and Masonry Wall Program (B2.1.31)	III.A1-11	3.5.1.43	E, 1
Concrete Elements	FB, MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking due to expansion	Structures Monitoring Program (B2.1.32)	III.A1-2	3.5.1.27	A
Concrete Elements	FB, MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracks and distortion	Structures Monitoring Program (B2.1.32)	III.A1-3	3.5.1.28	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 Vol. 2 Item	Table 1 Item	Notes
Concrete Elements	FB, MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Loss of material (spalling, scaling) and cracking	Structures Monitoring Program (B2.1.32)	III.A1-6	3.5.1.26	A
Concrete Elements	FB, MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring Program (B2.1.32)	III.A1-9	3.5.1.23	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 Program (B2.1.32)	III.A1-10	3.5.1.24	A
Concrete Elements	FB, MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Concrete cracking and spalling	Fire Protection (B2.1.12) and Structures Monitoring Program (B2.1.32)	VII.G-30	3.3.1.66	B
Concrete Elements	FB, MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Fire Protection (B2.1.12) and Structures Monitoring Program (B2.1.32)	VII.G-31	3.3.1.67	B
Concrete Elements	FLB, SH, SS	Concrete	Buried (Structural) (Ext)	Cracking due to expansion	Structures Monitoring Program (B2.1.32)	III.A1-2	3.5.1.27	A
Concrete Elements	FLB, SH, SS	Concrete	Buried (Structural) (Ext)	Cracks and distortion	Structures Monitoring Program (B2.1.32)	III.A1-3	3.5.1.28	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 Vol. 2 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 Program (B2.1.32)	III.A1-4	3.5.1.31	A
Concrete Elements	FLB, SH, SS	Concrete	Buried (Structural) (Ext)	Increase in porosity and permeability, cracking, loss of material (spalling, scaling	Structures Monitoring Program (B2.1.32)	III.A1-5	3.5.1.31	A
Concrete Elements	FLB, SH, SS	Concrete	Buried (Structural) (Ext)	Loss of material (spalling, scaling) and cracking	Structures Monitoring Program (B2.1.32)	III.A1-6	3.5.1.26	A
Concrete Elements	FLB, SH, SS	Concrete	Buried (Structural) (Ext)	Increase in porosity and permeability, loss of strength	Structures Monitoring Program (B2.1.32)	III.A1-7	3.5.1.32	A
Concrete Elements	FB, SPB, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking due to expansion	Structures Monitoring Program (B2.1.32)	III.A1-2	3.5.1.27	A
Concrete Elements	FB, SPB, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Cracks and distortion	Structures Monitoring Program (B2.1.32)	III.A1-3	3.5.1.28	A
Concrete Elements	FB, SPB, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring Program (B2.1.32)	III.A1-9	3.5.1.23	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 Vol. 2 Item	Table 1 Item	Notes
Concrete Elements	FB, SPB, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Increase in porosity and permeability, cracking, loss of material (spalling, scaling	Structures Monitoring Program (B2.1.32)	III.A1-10	3.5.1.24	A
Concrete Elements	FB, SPB, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Concrete cracking and spalling	Fire Protection (B2.1.12) and Structures Monitoring Program (B2.1.32)	VII.G-28	3.3.1.65	B
Concrete Elements	FB, SPB, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Loss of material	Fire Protection (B2.1.12) and Structures Monitoring Program (B2.1.32)	VII.G-29	3.3.1.67	B
Doors	SH, SPB	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A1-12	3.5.1.25	C
Doors	SPB	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A1-12	3.5.1.25	C
Fire Barrier Coatings/ Wraps	FB	Fire Barrier (Cementitiou s Coating)	Plant Indoor Air (Structural) (Ext)	Loss of material, cracking	Fire Protection (B2.1.12	None	None	J, 2
Fire Barrier Doors	FB, MB, SPB	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Fire Protection (B2.1.12)	VII.G-3	3.3.1.63	B

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 Vol. 2 Item	Table 1 Item	Notes
Fire Barrier Doors	FB	Carbon Steel (Galvanized or Coated)	Plant Indoor Air (Structural) (Ext)	Loss of material	Fire Protection (B2.1.12)	VII.G-3	3.3.1.63	B
Fire Barrier Seals	FB	Elastomer	Plant Indoor Air (Structural) (Ext)	Increased hardness, shrinkage and loss of strength	Fire Protection (B2.1.12)	VII.G-1	3.3.1.61	B
Instrument Panels & Racks	SH, SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A1-12	3.5.1.25	A
Penetration Boot Seals	FLB	Elastomer	Buried (Structural) (Ext)	Loss of sealing	Structures Monitoring Program (B2.1.32)	III.A6-12	3.5.1.44	A
Penetrations Electrical	SS	Carbon Steel	Encased in Concrete (Ext)	None	None	VII.J-21	3.3.1.96	C
Penetrations Electrical	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A1-12	3.5.1.25	A
Penetrations Mechanical	SS	Carbon Steel	Encased in Concrete (Ext)	None	None	VII.J-21	3.3.1.96	C
Penetrations Mechanical	SPB, SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A1-12	3.5.1.25	A
Roofing Membrane	SH	Roofing Membrane	Atmosphere/ Weather (Structural) (Ext)	Loss of sealing	Structures Monitoring Program (B2.1.32)	III.A6-12	3.5.1.44	C
Stairs/ Platforms/ Grates	SS	Carbon Steel (Galvanized or Coated)	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A1-12	3.5.1.25	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 Vol. 2 Item	Table 1 Item	Notes
Structural Steel	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A1-12	3.5.1.25	A

Notes for Table 3.5.2-2:

Standard Note Text

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.

J Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant Specific Note

1 NUREG-1801 does not provide a line in which concrete masonry is inspected per the Fire Protection program (B2.1.12).

2 NUREG-1801 does not provide a line in which Fire Barriers (Ceramic Fiber or Cementitious Coating) are inspected per the Fire Protection program (B2.1.12).

Table 3.5.2-3 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 Vol. 2 Item	Table 1 Item	Notes
Caulking/ Sealant	SH	Elastomer	Plant Indoor Air (Structural) (Ext)	Loss of sealing	Structures Monitoring Program (B2.1.32)	III.A6-12	3.5.1.44	A
Compressible Joints/Seals	ES, SH	Elastomer	Atmosphere /Weather (Structural) (Ext)	Loss of sealing	Structures Monitoring Program (B2.1.32)	III.A6-12	3.5.1.44	A
Concrete Elements	FB, FLB, MB, SS	Concrete	Atmosphere /Weather (Structural) (Ext)	Cracking due to expansion	Structures Monitoring Program (B2.1.32)	III.A3-2	3.5.1.27	A
Concrete Elements	FB, FLB, MB, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracks and distortion	Structures Monitoring Program (B2.1.32)	III.A3-3	3.5.1.28	A
Concrete Elements	FB, FLB, MB, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Loss of material (spalling, scaling) and cracking	Structures Monitoring Program (B2.1.32)	III.A3-6	3.5.1.26	A
Concrete Elements	FB, FLB, MB, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring Program (B2.1.32)	III.A3-9	3.5.1.23	A

Table 3.5.2-3 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 Vol. 2 Item	Table 1 Item	Notes
Concrete Elements	FB, FLB, MB, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Increase in porosity and permeability, cracking, loss of material (spalling, scaling	Structures Monitoring Program (B2.1.32)	III.A3-10	3.5.1.24	A
Concrete Elements	FB, FLB, MB, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Concrete cracking and spalling	Fire Protection (B2.1.12) and Structures Monitoring Program (B2.1.32)	VII.G-30	3.3.1.66	B
Concrete Elements	FB, FLB, MB, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Fire Protection (B2.1.12) and Structures Monitoring Program (B2.1.32)	VII.G-31	3.3.1.67	B
Concrete Elements	FLB, SH, SS	Concrete	Buried (Structural) (Ext)	Cracking due to expansion	Structures Monitoring Program (B2.1.32)	III.A3-2	3.5.1.27	A
Concrete Elements	FLB, SH, SS	Concrete	Buried (Structural) (Ext)	Cracks and distortion	Structures Monitoring Program (B2.1.32)	III.A3-3	3.5.1.28	A
Concrete Elements	FLB, SH, SS	Concrete	Buried (Structural) (Ext)	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring Program (B2.1.32)	III.A3-4	3.5.1.31	A

Table 3.5.2-3 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 Vol. 2 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 Program (B2.1.32)	III.A3-5	3.5.1.31	A
Concrete Elements	FLB, SH, SS	Concrete	Buried (Structural) (Ext)	Loss of material (spalling, scaling) and cracking	Structures Monitoring Program (B2.1.32)	III.A3-6	3.5.1.26	A
Concrete Elements	FLB, SH, SS	Concrete	Buried (Structural) (Ext)	Increase in porosity and permeability, loss of strength	Structures Monitoring Program (B2.1.32)	III.A3-7	3.5.1.32	A
Concrete Elements	FB, FLB, MB, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking due to expansion	Structures Monitoring Program (B2.1.32)	III.A3-2	3.5.1.27	A
Concrete Elements	FB, FLB, MB, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Cracks and distortion	Structures Monitoring Program (B2.1.32)	III.A3-3	3.5.1.28	A
Concrete Elements	FB, FLB, MB, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring Program (B2.1.32)	III.A3-9	3.5.1.23	A
Concrete Elements	FB, FLB, MB, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Increase in porosity and permeability, cracking, loss of material (spalling, scaling	Structures Monitoring Program (B2.1.32)	III.A3-10	3.5.1.24	A

Table 3.5.2-3 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 Vol. 2 Item	Table 1 Item	Notes
Concrete Elements	FB, FLB, MB, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Concrete cracking and spalling	Fire Protection (B2.1.12) and Structures Monitoring Program (B2.1.32)	VII.G-28	3.3.1.65	B
Concrete Elements	FB, FLB, MB, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Loss of material	Fire Protection (B2.1.12) and Structures Monitoring Program (B2.1.32)	VII.G-29	3.3.1.67	B
Doors	MB, SH	Carbon Steel (Galvanized or Coated)	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A3-12	3.5.1.25	C
Doors	MB	Carbon Steel (Galvanized or Coated)	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A3-12	3.5.1.25	C
Fire Barrier Coatings/ Wraps	FB	Fire Barrier (Ceramic Fiber)	Plant Indoor Air (Structural) (Ext)	Loss of material, cracking	Fire Protection (B2.1.12)	None	None	J, 1
Fire Barrier Seals	FB	Elastomer	Plant Indoor Air (Structural) (Ext)	Increased hardness, shrinkage and loss of strength	Fire Protection (B2.1.12)	VII.G-1	3.3.1.61	B
Hatches/Plugs	SH	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking due to expansion	Structures Monitoring Program (B2.1.32)	III.A3-2	3.5.1.27	A

Table 3.5.2-3 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 Vol. 2 Item	Table 1 Item	Notes
Hatches/Plugs	SH	Concrete	Atmosphere/ Weather (Structural) (Ext)	Loss of material (spalling, scaling) and cracking	Structures Monitoring Program (B2.1.32)	III.A3-6	3.5.1.26	A
Hatches/Plugs	SH	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring Program (B2.1.32)	III.A3-9	3.5.1.23	A
Hatches/Plugs	SH	Concrete	Atmosphere/ Weather (Structural) (Ext)	Increase in porosity and permeability, cracking, loss of material (spalling, scaling	Structures Monitoring Program (B2.1.32)	III.A3-10	3.5.1.24	A
Hatches/Plugs	SH	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking due to expansion	Structures Monitoring Program (B2.1.32)	III.A3-2	3.5.1.27	A
Hatches/Plugs	SH	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring Program (B2.1.32)	III.A3-9	3.5.1.23	A
Instrument Panels & Racks	NSRS, SH, SS	Carbon Steel (Galvanized or Coated)	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A3-12	3.5.1.25	A
Penetrations Electrical	FLB, SS	Carbon Steel	Encased in Concrete (Ext)	None	None	VII.J-21	3.3.1.96	C

Table 3.5.2-3 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 Vol. 2 Item	Table 1 Item	Notes
Penetrations Electrical	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A3-12	3.5.1.25	A
Penetrations Mechanical	FLB, SS	Carbon Steel	Encased in Concrete (Ext)	None	None	VII.J-21	3.3.1.96	C
Penetrations Mechanical	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A3-12	3.5.1.25	A
Roofing Membrane	SH	Roofing Membrane	Atmosphere/ Weather (Structural) (Ext)	Loss of sealing	Structures Monitoring Program (B2.1.32)	III.A6-12	3.5.1.44	C
Stairs/ Platforms/ Grates	NSRS, SS	Carbon Steel (Galvanized or Coated)	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A3-12	3.5.1.25	A
Structural Steel	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A3-12	3.5.1.25	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.

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 (B2.1.12).

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 Vol. 2 Item	Table 1 Item	Notes
Compressible Joints/Seals	ES, SH	Elastomer	Atmosphere/ Weather (Structural) (Ext)	Loss of sealing	Structures Monitoring Program (B2.1.32)	III.A6-12	3.5.1.44	A
Compressible Joints/Seals	ES	Elastomer	Plant Indoor Air (Structural) (Ext)	Loss of sealing	Structures Monitoring Program (B2.1.32)	III.A6-12	3.5.1.44	A
Concrete Block (Masonry Walls)	FB, SH	Concrete Block (Masonry Walls)	Atmosphere/ Weather (Structural) (Ext)	Cracking	Fire Protection (B2.1.12) and Masonry Wall Program (B2.1.31)	III.A3-11	3.5.1.43	E, 1
Concrete Block (Masonry Walls)	FB, SH	Concrete Block (Masonry Walls)	Plant Indoor Air (Structural) (Ext)	Cracking	Fire Protection (B2.1.12) and Masonry Wall Program (B2.1.31)	III.A3-11	3.5.1.43	E, 1
Concrete Elements	NSRS, SH	Concrete	Buried (Structural) (Ext)	Cracking due to expansion	Structures Monitoring Program (B2.1.32)	III.A3-2	3.5.1.27	A
Concrete Elements	NSRS, SH	Concrete	Buried (Structural) (Ext)	Cracks and distortion	Structures Monitoring Program (B2.1.32)	III.A3-3	3.5.1.28	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 Vol. 2 Item	Table 1 Item	Notes
Concrete Elements	NSRS, SH	Concrete	Buried (Structural) (Ext)	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring Program (B2.1.32)	III.A3-4	3.5.1.31	A
Concrete Elements	NSRS, SH	Concrete	Buried (Structural) (Ext)	Increase in porosity and permeability, cracking, loss of material (spalling, scaling	Structures Monitoring Program (B2.1.32)	III.A3-5	3.5.1.31	A
Concrete Elements	NSRS, SH	Concrete	Buried (Structural) (Ext)	Loss of material (spalling, scaling) and cracking	Structures Monitoring Program (B2.1.32)	III.A3-6	3.5.1.26	A
Concrete Elements	NSRS, SH	Concrete	Buried (Structural) (Ext)	Increase in porosity and permeability, loss of strength	Structures Monitoring Program (B2.1.32)	III.A3-7	3.5.1.32	A
Concrete Elements	FB, FLB, NSRS, SH	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking due to expansion	Structures Monitoring Program (B2.1.32)	III.A3-2	3.5.1.27	A
Concrete Elements	FB, FLB, NSRS, SH	Concrete	Plant Indoor Air (Structural) (Ext)	Cracks and distortion	Structures Monitoring Program (B2.1.32)	III.A3-3	3.5.1.28	A
Concrete Elements	FB, FLB, NSRS, SH	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring Program (B2.1.32)	III.A3-9	3.5.1.23	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 Vol. 2 Item	Table 1 Item	Notes
Concrete Elements	FB, FLB, NSRS, SH	Concrete	Plant Indoor Air (Structural) (Ext)	Increase in porosity and permeability, cracking, loss of material (spalling, scaling	Structures Monitoring Program (B2.1.32)	III.A3-10	3.5.1.24	A
Concrete Elements	FB, FLB, NSRS, SH	Concrete	Plant Indoor Air (Structural) (Ext)	Concrete cracking and spalling	Fire Protection (B2.1.12) and Structures Monitoring Program (B2.1.32)	VII.G-28	3.3.1.65	B
Concrete Elements	FB, FLB, NSRS, SH	Concrete	Plant Indoor Air (Structural) (Ext)	Loss of material	Fire Protection (B2.1.12) and Structures Monitoring Program (B2.1.32)	VII.G-29	3.3.1.67	B
Fire Barrier Coatings/ Wraps	FB	Fire Barrier (Cementitious Coating)	Plant Indoor Air (Structural) (Ext)	Loss of material, cracking	Fire Protection (B2.1.12)	None	None	J, 2
Fire Barrier Doors	FB, MB	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Fire Protection (B2.1.12)	VII.G-3	3.3.1.63	B
Fire Barrier Seals	FB	Elastomer	Plant Indoor Air (Structural) (Ext)	Increased hardness, shrinkage and loss of strength	Fire Protection (B2.1.12)	VII.G-1	3.3.1.61	B
Instrument Panels & Racks	NSRS, SH	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A3-12	3.5.1.25	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 Vol. 2 Item	Table 1 Item	Notes
Metal Siding	SH	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A3-12	3.5.1.25	A
Penetration	SH	Carbon Steel	Encased in Concrete (Ext)	None	None	VII.J-21	3.3.1.96	C
Roofing Membrane	SH	Elastomer	Atmosphere/ Weather (Structural) (Ext)	Loss of sealing	Structures Monitoring Program (B2.1.32)	III.A6-12	3.5.1.44	C
Structural Steel	NSRS	Carbon Steel	Encased in Concrete (Ext)	None	None	VII.J-21	3.3.1.96	C
Structural Steel	NSRS, SH	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A3-12	3.5.1.25	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.

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.

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 (B2.1.12).

2 NUREG-1801 does not provide a line in which Fire Barriers (Ceramic Fiber or Cementitious Coating) are inspected per the Fire Protection program (B2.1.12).

Table 3.5.2-5 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 Vol. 2 Item	Table 1 Item	Notes
Caulking/ Sealant	SH	Elastomer	Atmosphere/ Weather (Structural) (Ext)	Cracking	Structures Monitoring Program (B2.1.32)	III.A6-12	3.5.1.44	A
Caulking/ Sealant	FLB, SH	Elastomer	Buried (Structural) (Ext)	Loss of sealing	Structures Monitoring Program (B2.1.32)	III.A6-12	3.5.1.44	A
Caulking/ Sealant	FLB, SH	Elastomer	Plant Indoor Air (Structural) (Ext)	Loss of sealing	Structures Monitoring Program (B2.1.32)	III.A6-12	3.5.1.44	A
Compressible Joints/Seals	ES, SH	Elastomer	Atmosphere/ Weather (Structural) (Ext)	Loss of sealing	Structures Monitoring Program (B2.1.32)	III.A6-12	3.5.1.44	A
Compressible Joints/Seals	ES, SH	Elastomer	Plant Indoor Air (Structural) (Ext)	Loss of sealing	Structures Monitoring Program (B2.1.32)	III.A6-12	3.5.1.44	A
Concrete Block (Masonry Walls)	FB, NSRS, SH	Concrete Block (Masonry Walls)	Plant Indoor Air (Structural) (Ext)	Cracking	Fire Protection (B2.1.12) and Masonry Wall Program (B2.1.31)	III.A3-11	3.5.1.43	E, 1
Concrete Elements	FB, MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking due to expansion	Structures Monitoring Program (B2.1.32)	III.A3-2	3.5.1.27	A
Concrete Elements	FB, MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracks and distortion	Structures Monitoring Program (B2.1.32)	III.A3-3	3.5.1.28	A

Table 3.5.2-5 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 Vol. 2 Item	Table 1 Item	Notes
Concrete Elements	FB, MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Loss of material (spalling, scaling) and cracking	Structures Monitoring Program (B2.1.32)	III.A3-6	3.5.1.26	A
Concrete Elements	FB, MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring Program (B2.1.32)	III.A3-9	3.5.1.23	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 Program (B2.1.32)	III.A3-10	3.5.1.24	A
Concrete Elements	FB, MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Concrete cracking and spalling	Fire Protection (B2.1.12) and Structures Monitoring Program (B2.1.32)	VII.G-30	3.3.1.66	B
Concrete Elements	FB, MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Fire Protection (B2.1.12) and Structures Monitoring Program (B2.1.32)	VII.G-31	3.3.1.67	B
Concrete Elements	FLB, SH, SS	Concrete	Buried (Structural) (Ext)	Cracking due to expansion	Structures Monitoring Program (B2.1.32)	III.A3-2	3.5.1.27	A
Concrete Elements	FLB, SH, SS	Concrete	Buried (Structural) (Ext)	Cracks and distortion	Structures Monitoring Program (B2.1.32)	III.A3-3	3.5.1.28	A

Table 3.5.2-5 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 Vol. 2 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 Program (B2.1.32)	III.A3-4	3.5.1.31	A
Concrete Elements	FLB, SH, SS	Concrete	Buried (Structural) (Ext)	Increase in porosity and permeability, cracking, loss of material (spalling, scaling	Structures Monitoring Program (B2.1.32)	III.A3-5	3.5.1.31	A
Concrete Elements	FLB, SH, SS	Concrete	Buried (Structural) (Ext)	Loss of material (spalling, scaling) and cracking	Structures Monitoring Program (B2.1.32)	III.A3-6	3.5.1.26	A
Concrete Elements	FLB, SH, SS	Concrete	Buried (Structural) (Ext)	Increase in porosity and permeability, loss of strength	Structures Monitoring Program (B2.1.32)	III.A3-7	3.5.1.32	A
Concrete Elements	FB, FLB, SH, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking due to expansion	Structures Monitoring Program (B2.1.32)	III.A3-2	3.5.1.27	A
Concrete Elements	FB, FLB, SH, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Cracks and distortion	Structures Monitoring Program (B2.1.32)	III.A3-3	3.5.1.28	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 Program (B2.1.32)	III.A3-9	3.5.1.23	A

Table 3.5.2-5 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 Vol. 2 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 Program (B2.1.32)	III.A3-10	3.5.1.24	A
Concrete Elements	FB, FLB, SH, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Concrete cracking and spalling	Fire Protection (B2.1.12) and Structures Monitoring Program (B2.1.32)	VII.G-28	3.3.1.65	B
Concrete Elements	FB, FLB, SH, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Loss of material	Fire Protection (B2.1.12) and Structures Monitoring Program (B2.1.32)	VII.G-29	3.3.1.67	B
Doors	MB, SH	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A3-12	3.5.1.25	C
Doors	FLB, MB, SH	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A3-12	3.5.1.25	C
Fire Barrier Coatings/ Wraps	FB	Fire Barrier (Cementitious Coating)	Plant Indoor Air (Structural) (Ext)	Loss of material, cracking	Fire Protection (B2.1.12)	None	None	J, 2
Fire Barrier Coatings/ Wraps	FB	Fire Barrier (Ceramic Fiber)	Plant Indoor Air (Structural) (Ext)	Loss of material, cracking	Fire Protection (B2.1.12)	None	None	J, 2

Table 3.5.2-5 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 Vol. 2 Item	Table 1 Item	Notes
Fire Barrier Doors	FB, FLB, MB, SH, SPB	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Fire Protection (B2.1.12)	VII.G-3	3.3.1.63	B
Fire Barrier Seals	FB	Elastomer	Atmosphere/ Weather (Structural) (Ext)	Increased hardness, shrinkage and loss of strength	Fire Protection (B2.1.12)	VII.G-2	3.3.1.61	B
Fire Barrier Seals	FB	Elastomer	Plant Indoor Air (Structural) (Ext)	Increased hardness, shrinkage and loss of strength	Fire Protection (B2.1.12)	VII.G-1	3.3.1.61	B
Hatches/ Plugs	SH	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A3-12	3.5.1.25	C
Hatches/ Plugs	SH, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking due to expansion	Structures Monitoring Program (B2.1.32)	III.A3-2	3.5.1.27	A
Hatches/ Plugs	SH, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring Program (B2.1.32)	III.A3-9	3.5.1.23	A
Penetration	FLB, SLD, SPB, SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A3-12	3.5.1.25	C
Penetration Boot Seals	FLB	Elastomer	Buried (Structural) (Ext)	Loss of sealing	Structures Monitoring Program (B2.1.32)	III.A6-12	3.5.1.44	A
Penetrations Electrical	SS	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A3-12	3.5.1.25	C

Table 3.5.2-5 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 Vol. 2 Item	Table 1 Item	Notes
Penetrations Electrical	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A3-12	3.5.1.25	C
Penetrations Mechanical	FLB, SLD, SPB, SS	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A3-12	3.5.1.25	C
Penetrations Mechanical	FLB, SLD, SPB, SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A3-12	3.5.1.25	C
Roofing Membrane	SH	Roofing Membrane	Atmosphere/ Weather (Structural) (Ext)	Loss of sealing	Structures Monitoring Program (B2.1.32)	III.A6-12	3.5.1.44	C
Stairs/ Platforms/ Grates	NSRS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A3-12	3.5.1.25	A
Structural Steel	SH, SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A3-12	3.5.1.25	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.

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.

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 (B2.1.12).

2 NUREG-1801 does not provide a line in which Fire Barriers (Ceramic Fiber or Cementitious Coating) are inspected per the Fire Protection program (B2.1.12).

Table 3.5.2-6 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 Vol. 2 Item	Table 1 Item	Notes
Caulking/ Sealant	SH	Elastomer	Atmosphere/ Weather (Structural) (Ext)	Loss of sealing	Structures Monitoring Program (B2.1.32)	III.A6-12	3.5.1.44	A
Caulking/ Sealant	SH	Elastomer	Buried (Structural) (Ext)	Loss of sealing	Structures Monitoring Program (B2.1.32)	III.A6-12	3.5.1.44	A
Caulking/ Sealant	SH	Elastomer	Plant Indoor Air (Structural) (Ext)	Loss of sealing	Structures Monitoring Program (B2.1.32)	III.A6-12	3.5.1.44	A
Concrete Block (Masonry Walls)	NSRS, SH	Concrete Block (Masonry Walls)	Atmosphere/ Weather (Structural) (Ext)	Cracking	Masonry Wall Program (B2.1.31)	III.A3-11	3.5.1.43	A
Concrete Block (Masonry Walls)	NSRS, SH	Concrete Block (Masonry Walls)	Plant Indoor Air (Structural) (Ext)	Cracking	Masonry Wall Program (B2.1.31)	III.A3-11	3.5.1.43	A
Concrete Elements	NSRS, SH	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking due to expansion	Structures Monitoring Program (B2.1.32)	III.A3-2	3.5.1.27	A
Concrete Elements	NSRS, SH	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracks and distortion	Structures Monitoring Program (B2.1.32)	III.A3-3	3.5.1.28	A

Table 3.5.2-6 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 Vol. 2 Item	Table 1 Item	Notes
Concrete Elements	NSRS, SH	Concrete	Atmosphere/ Weather (Structural) (Ext)	Loss of material (spalling, scaling) and cracking	Structures Monitoring Program (B2.1.32)	III.A3-6	3.5.1.26	A
Concrete Elements	NSRS, SH	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring Program (B2.1.32)	III.A3-9	3.5.1.23	A
Concrete Elements	NSRS, SH	Concrete	Atmosphere/ Weather (Structural) (Ext)	Increase in porosity and permeability, cracking, loss of material (spalling, scaling	Structures Monitoring Program (B2.1.32)	III.A3-10	3.5.1.24	A
Concrete Elements	NSRS, SH	Concrete	Buried (Structural) (Ext)	Cracking due to expansion	Structures Monitoring Program (B2.1.32)	III.A3-2	3.5.1.27	A
Concrete Elements	NSRS, SH	Concrete	Buried (Structural) (Ext)	Cracks and distortion	Structures Monitoring Program (B2.1.32)	III.A3-3	3.5.1.28	A
Concrete Elements	NSRS, SH	Concrete	Buried (Structural) (Ext)	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring Program (B2.1.32)	III.A3-4	3.5.1.31	A

Table 3.5.2-6 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 Vol. 2 Item	Table 1 Item	Notes
Concrete Elements	NSRS, SH	Concrete	Buried (Structural) (Ext)	Increase in porosity and permeability, cracking, loss of material (spalling, scaling	Structures Monitoring Program (B2.1.32)	III.A3-5	3.5.1.31	A
Concrete Elements	NSRS, SH	Concrete	Buried (Structural) (Ext)	Loss of material (spalling, scaling) and cracking	Structures Monitoring Program (B2.1.32)	III.A3-6	3.5.1.26	A
Concrete Elements	NSRS, SH	Concrete	Buried (Structural) (Ext)	Increase in porosity and permeability, loss of strength	Structures Monitoring Program (B2.1.32)	III.A3-7	3.5.1.32	A
Concrete Elements	NSRS, SH	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking due to expansion	Structures Monitoring Program (B2.1.32)	III.A3-2	3.5.1.27	A
Concrete Elements	NSRS, SH	Concrete	Plant Indoor Air (Structural) (Ext)	Cracks and distortion	Structures Monitoring Program (B2.1.32)	III.A3-3	3.5.1.28	A
Concrete Elements	NSRS, SH	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring Program (B2.1.32)	III.A3-9	3.5.1.23	A

Table 3.5.2-6 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 Vol. 2 Item	Table 1 Item	Notes
Concrete Elements	NSRS, SH	Concrete	Plant Indoor Air (Structural) (Ext)	Increase in porosity and permeability, cracking, loss of material (spalling, scaling	Structures Monitoring Program (B2.1.32)	III.A3-10	3.5.1.24	A
Doors	SH	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A3-12	3.5.1.25	C
Metal Siding	SH	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A3-12	3.5.1.25	C
Metal Siding	SH	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A3-12	3.5.1.25	C
Penetration	SH	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A3-12	3.5.1.25	C
Penetration	SH	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A3-12	3.5.1.25	C
Roofing Membrane	SH	Roofing Membrane	Atmosphere/ Weather (Structural) (Ext)	Loss of sealing	Structures Monitoring Program (B2.1.32)	III.A6-12	3.5.1.44	C
Structural Steel	NSRS, SH	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A3-12	3.5.1.25	A
Tunnel	SH	Concrete	Buried (Structural) (Ext)	Cracking due to expansion	Structures Monitoring Program (B2.1.32)	III.A3-2	3.5.1.27	A

Table 3.5.2-6 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 Vol. 2 Item	Table 1 Item	Notes
Tunnel	SH	Concrete	Buried (Structural) (Ext)	Cracks and distortion	Structures Monitoring Program (B2.1.32)	III.A3-3	3.5.1.28	A
Tunnel	SH	Concrete	Buried (Structural) (Ext)	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring Program (B2.1.32)	III.A3-4	3.5.1.31	A
Tunnel	SH	Concrete	Buried (Structural) (Ext)	Increase in porosity and permeability, cracking, loss of material (spalling, scaling	Structures Monitoring Program (B2.1.32)	III.A3-5	3.5.1.31	A
Tunnel	SH	Concrete	Buried (Structural) (Ext)	Loss of material (spalling, scaling) and cracking	Structures Monitoring Program (B2.1.32)	III.A3-6	3.5.1.26	A
Tunnel	SH	Concrete	Buried (Structural) (Ext)	Increase in porosity and permeability, loss of strength	Structures Monitoring Program (B2.1.32)	III.A3-7	3.5.1.32	A
Tunnel	SH	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking due to expansion	Structures Monitoring Program (B2.1.32)	III.A3-2	3.5.1.27	A
Tunnel	SH	Concrete	Plant Indoor Air (Structural) (Ext)	Cracks and distortion	Structures Monitoring Program (B2.1.32)	III.A3-3	3.5.1.28	A

Table 3.5.2-6 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 Vol. 2 Item	Table 1 Item	Notes
Tunnel	SH	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring Program (B2.1.32)	III.A3-9	3.5.1.23	A
Tunnel	SH	Concrete	Plant Indoor Air (Structural) (Ext)	Increase in porosity and permeability, cracking, loss of material (spalling, scaling	Structures Monitoring Program (B2.1.32)	III.A3-10	3.5.1.24	A

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.

Plant Specific Notes:

None

Table 3.5.2-7 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation - Emergency Fuel Oil Tank Vaults

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Compressible Joints/Seals	FLB	Elastomer	Plant Indoor Air (Structural) (Ext)	Loss of sealing	Structures Monitoring Program (B2.1.32)	III.A6-12	3.5.1.44	A
Concrete Elements	FLB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking due to expansion	Structures Monitoring Program (B2.1.32)	III.A3-2	3.5.1.27	A
Concrete Elements	FLB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracks and distortion	Structures Monitoring Program (B2.1.32)	III.A3-3	3.5.1.28	A
Concrete Elements	FLB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Loss of material (spalling, scaling) and cracking	Structures Monitoring Program (B2.1.32)	III.A3-6	3.5.1.26	A
Concrete Elements	FLB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring Program (B2.1.32)	III.A3-9	3.5.1.23	A
Concrete Elements	FLB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Increase in porosity and permeability, cracking, loss of material (spalling, scaling	Structures Monitoring Program (B2.1.32)	III.A3-10	3.5.1.24	A
Concrete Elements	FLB, SH, SS	Concrete	Buried (Structural) (Ext)	Cracking due to expansion	Structures Monitoring Program (B2.1.32)	III.A3-2	3.5.1.27	A

Table 3.5.2-7 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation - Emergency Fuel Oil Tank Vaults (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Concrete Elements	FLB, SH, SS	Concrete	Buried (Structural) (Ext)	Cracks and distortion	Structures Monitoring Program (B2.1.32)	III.A3-3	3.5.1.28	A
Concrete Elements	FLB, SH, SS	Concrete	Buried (Structural) (Ext)	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring Program (B2.1.32)	III.A3-4	3.5.1.31	A
Concrete Elements	FLB, SH, SS	Concrete	Buried (Structural) (Ext)	Increase in porosity and permeability, cracking, loss of material (spalling, scaling	Structures Monitoring Program (B2.1.32)	III.A3-5	3.5.1.31	A
Concrete Elements	FLB, SH, SS	Concrete	Buried (Structural) (Ext)	Loss of material (spalling, scaling) and cracking	Structures Monitoring Program (B2.1.32)	III.A3-6	3.5.1.26	A
Concrete Elements	FLB, SH, SS	Concrete	Buried (Structural) (Ext)	Increase in porosity and permeability, loss of strength	Structures Monitoring Program (B2.1.32)	III.A3-7	3.5.1.32	A
Concrete Elements	FLB, SH, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking due to expansion	Structures Monitoring Program (B2.1.32)	III.A3-2	3.5.1.27	A
Concrete Elements	FLB, SH, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Cracks and distortion	Structures Monitoring Program (B2.1.32)	III.A3-3	3.5.1.28	A

Table 3.5.2-7 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation - Emergency Fuel Oil Tank Vaults (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 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 Program (B2.1.32)	III.A3-9	3.5.1.23	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 Program (B2.1.32)	III.A3-10	3.5.1.24	A
Duct Banks and Manholes	FLB, SH	Concrete	Buried (Structural) (Ext)	Cracking due to expansion	Structures Monitoring Program (B2.1.32)	III.A3-2	3.5.1.27	A
Duct Banks and Manholes	FLB, SH	Concrete	Buried (Structural) (Ext)	Cracks and distortion	Structures Monitoring Program (B2.1.32)	III.A3-3	3.5.1.28	A
Duct Banks and Manholes	FLB, SH	Concrete	Buried (Structural) (Ext)	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring Program (B2.1.32)	III.A3-4	3.5.1.31	A
Duct Banks and Manholes	FLB, SH	Concrete	Buried (Structural) (Ext)	Increase in porosity and permeability, cracking, loss of material (spalling, scaling	Structures Monitoring Program (B2.1.32)	III.A3-5	3.5.1.31	A

Table 3.5.2-7 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation - Emergency Fuel Oil Tank Vaults (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Duct Banks and Manholes	FLB, SH	Concrete	Buried (Structural) (Ext)	Increase in porosity and permeability, loss of strength	Structures Monitoring Program (B2.1.32)	III.A3-7	3.5.1.32	A
Hatches/ Plugs	FLB, SH	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A3-12	3.5.1.25	A
Hatches/ Plugs	FLB, SH	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A3-12	3.5.1.25	A
Penetration Boot Seals	FLB	Elastomer	Buried (Structural) (Ext)	Loss of sealing	Structures Monitoring Program (B2.1.32)	III.A6-12	3.5.1.44	A
Penetration Boot Seals	FLB	Elastomer	Plant Indoor Air (Structural) (Ext)	Loss of sealing	Structures Monitoring Program (B2.1.32)	III.A6-12	3.5.1.44	A

Notes for Table 3.5.2-7:

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 3.5.2-8 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation - Essential Service Water System Electrical Duct Banks and Manways

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Caulking/ Sealant	SH	Elastomer	Buried (Structural) (Ext)	Loss of sealing	Structures Monitoring Program (B2.1.32)	III.A6-12	3.5.1.44	A
Caulking/ Sealant	SH	Elastomer	Plant Indoor Air (Structural) (Ext)	Loss of sealing	Structures Monitoring Program (B2.1.32)	III.A6-12	3.5.1.44	A
Compressible Joints/Seals	SH	Elastomer	Atmosphere/ Weather (Structural) (Ext)	Loss of sealing	Structures Monitoring Program (B2.1.32)	III.A6-12	3.5.1.44	A
Concrete Elements	MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking due to expansion	Structures Monitoring Program (B2.1.32)	III.A3-2	3.5.1.27	A
Concrete Elements	MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracks and distortion	Structures Monitoring Program (B2.1.32)	III.A3-3	3.5.1.28	A
Concrete Elements	MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Loss of material (spalling, scaling) and cracking	Structures Monitoring Program (B2.1.32)	III.A3-6	3.5.1.26	A

Table 3.5.2-8 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation - Essential Service Water System Electrical Duct Banks and Manways (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Concrete Elements	MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring Program (B2.1.32)	III.A3-9	3.5.1.23	A
Concrete Elements	MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Increase in porosity and permeability, cracking, loss of material (spalling, scaling	Structures Monitoring Program (B2.1.32)	III.A3-10	3.5.1.24	A
Concrete Elements	SH, SS	Concrete	Buried (Structural) (Ext)	Cracking due to expansion	Structures Monitoring Program (B2.1.32)	III.A3-2	3.5.1.27	A
Concrete Elements	SH, SS	Concrete	Buried (Structural) (Ext)	Cracks and distortion	Structures Monitoring Program (B2.1.32)	III.A3-3	3.5.1.28	A
Concrete Elements	SH, SS	Concrete	Buried (Structural) (Ext)	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring Program (B2.1.32)	III.A3-4	3.5.1.31	A
Concrete Elements	SH, SS	Concrete	Buried (Structural) (Ext)	Increase in porosity and permeability, cracking, loss of material (spalling, scaling	Structures Monitoring Program (B2.1.32)	III.A3-5	3.5.1.31	A

Table 3.5.2-8 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation - Essential Service Water System Electrical Duct Banks and Manways (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Concrete Elements	SH, SS	Concrete	Buried (Structural) (Ext)	Loss of material (spalling, scaling) and cracking	Structures Monitoring Program (B2.1.32)	III.A3-6	3.5.1.26	A
Concrete Elements	SH, SS	Concrete	Buried (Structural) (Ext)	Increase in porosity and permeability, loss of strength	Structures Monitoring Program (B2.1.32)	III.A3-7	3.5.1.32	A
Duct Banks and Manholes	SH	Concrete	Buried (Structural) (Ext)	Cracking due to expansion	Structures Monitoring Program (B2.1.32)	III.A3-2	3.5.1.27	A
Duct Banks and Manholes	SH	Concrete	Buried (Structural) (Ext)	Cracks and distortion	Structures Monitoring Program (B2.1.32)	III.A3-3	3.5.1.28	A
Duct Banks and Manholes	SH	Concrete	Buried (Structural) (Ext)	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring Program (B2.1.32)	III.A3-4	3.5.1.31	A
Duct Banks and Manholes	SH	Concrete	Buried (Structural) (Ext)	Increase in porosity and permeability, cracking, loss of material (spalling, scaling	Structures Monitoring Program (B2.1.32)	III.A3-5	3.5.1.31	A
Duct Banks and Manholes	SH	Concrete	Buried (Structural) (Ext)	Increase in porosity and permeability, loss of strength	Structures Monitoring Program (B2.1.32)	III.A3-7	3.5.1.32	A

Table 3.5.2-8 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation - Essential Service Water System Electrical Duct Banks and Manways (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Hatches/ Plugs	MB, SH	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking due to expansion	Structures Monitoring Program (B2.1.32)	III.A3-2	3.5.1.27	A
Hatches/ Plugs	MB, SH	Concrete	Atmosphere/ Weather (Structural) (Ext)	Loss of material (spalling, scaling) and cracking	Structures Monitoring Program (B2.1.32)	III.A3-6	3.5.1.26	A
Hatches/ Plugs	MB, SH	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring Program (B2.1.32)	III.A3-9	3.5.1.23	A
Hatches/ Plugs	MB, SH	Concrete	Atmosphere /Weather (Structural) (Ext)	Increase in porosity and permeability, cracking, loss of material (spalling, scaling	Structures Monitoring Program (B2.1.32)	III.A3-10	3.5.1.24	A
Structural Steel	SS	Carbon Steel	Atmosphere /Weather (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A3-12	3.5.1.25	A

Notes for Table 3.5.2-8:

Standard Note Text

A Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

Plant Specific Note

None

Table 3.5.2-9 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation - Communications Corridor

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Concrete Block (Masonry Walls)	FB	Concrete Block (Masonry Walls)	Plant Indoor Air (Structural) (Ext)	Cracking	Fire Protection (B2.1.12) and Masonry Wall Program (B2.1.31)	III.A3-11	3.5.1.43	E, 1
Concrete Elements	NSRS	Concrete	Buried (Structural) (Ext)	Cracking due to expansion	Structures Monitoring Program (B2.1.32)	III.A3-2	3.5.1.27	A
Concrete Elements	NSRS	Concrete	Buried (Structural) (Ext)	Cracks and distortion	Structures Monitoring Program (B2.1.32)	III.A3-3	3.5.1.28	A
Concrete Elements	NSRS	Concrete	Buried (Structural) (Ext)	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring Program (B2.1.32)	III.A3-4	3.5.1.31	A
Concrete Elements	NSRS	Concrete	Buried (Structural) (Ext)	Increase in porosity and permeability, cracking, loss of material (spalling, scaling	Structures Monitoring Program (B2.1.32)	III.A3-5	3.5.1.31	A
Concrete Elements	NSRS	Concrete	Buried (Structural) (Ext)	Loss of material (spalling, scaling) and cracking	Structures Monitoring Program (B2.1.32)	III.A3-6	3.5.1.26	A

Table 3.5.2-9 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation - Communications Corridor (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Concrete Elements	NSRS	Concrete	Buried (Structural) (Ext)	Increase in porosity and permeability, loss of strength	Structures Monitoring Program (B2.1.32)	III.A3-7	3.5.1.32	A
Concrete Elements	DF, FB, NSRS	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking due to expansion	Structures Monitoring Program (B2.1.32)	III.A3-2	3.5.1.27	A
Concrete Elements	DF, FB, NSRS	Concrete	Plant Indoor Air (Structural) (Ext)	Cracks and distortion	Structures Monitoring Program (B2.1.32)	III.A3-3	3.5.1.28	A
Concrete Elements	DF, FB, NSRS	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring Program (B2.1.32)	III.A3-9	3.5.1.23	A
Concrete Elements	DF, FB, NSRS	Concrete	Plant Indoor Air (Structural) (Ext)	Increase in porosity and permeability, cracking, loss of material (spalling, scaling	Structures Monitoring Program (B2.1.32)	III.A3-10	3.5.1.24	A
Concrete Elements	DF, FB, NSRS	Concrete	Plant Indoor Air (Structural) (Ext)	Concrete cracking and spalling	Fire Protection (B2.1.12) and Structures Monitoring Program (B2.1.32)	VII.G-28	3.3.1.65	B

Table 3.5.2-9 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation - Communications Corridor (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Concrete Elements	DF, FB, NSRS	Concrete	Plant Indoor Air (Structural) (Ext)	Loss of material	Fire Protection (B2.1.12) and Structures Monitoring Program (B2.1.32)	VII.G-29	3.3.1.67	B
Fire Barrier Coatings/ Wraps	FB	Fire Barrier (Cementitious Coating)	Plant Indoor Air (Structural) (Ext)	Loss of material, cracking	Fire Protection (B2.1.12)	None	None	J, 2
Fire Barrier Doors	FB	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Fire Protection (B2.1.12)	VII.G-3	3.3.1.63	B
Fire Barrier Seals	FB	Elastomer	Plant Indoor Air (Structural) (Ext)	Increased hardness, shrinkage and loss of strength	Fire Protection (B2.1.12)	VII.G-1	3.3.1.61	B
Penetrations Electrical	SH	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A3-12	3.5.1.25	A
Penetrations Mechanical	SH	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A3-12	3.5.1.25	A
Structural Steel	NSRS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A3-12	3.5.1.25	A

Notes for Table 3.5.2-9:

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.

J Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant Specific Note

1 NUREG-1801 does not provide a line in which concrete masonry is inspected per the Fire Protection program (B2.1.12).

2 NUREG-1801 does not provide a line in which Fire Barriers (Ceramic Fiber or Cementitious Coating) are inspected per the Fire Protection program (B2.1.12).

Table 3.5.2-10 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation - Transmission Towers

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Concrete Elements	NSRS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking due to expansion	Structures Monitoring Program (B2.1.32)	III.A3-2	3.5.1.27	A
Concrete Elements	NSRS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracks and distortion	Structures Monitoring Program (B2.1.32)	III.A3-3	3.5.1.28	A
Concrete Elements	NSRS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Loss of material (spalling, scaling) and cracking	Structures Monitoring Program (B2.1.32)	III.A3-6	3.5.1.26	A
Concrete Elements	NSRS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring Program (B2.1.32)	III.A3-9	3.5.1.23	A
Concrete Elements	NSRS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Increase in porosity and permeability, cracking, loss of material (spalling, scaling	Structures Monitoring Program (B2.1.32)	III.A3-10	3.5.1.24	A
Concrete Elements	NSRS	Concrete	Buried (Structural) (Ext)	Cracking due to expansion	Structures Monitoring Program (B2.1.32)	III.A3-2	3.5.1.27	A

Table 3.5.2-10 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation - Transmission Towers (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Concrete Elements	NSRS	Concrete	Buried (Structural) (Ext)	Cracks and distortion	Structures Monitoring Program (B2.1.32)	III.A3-3	3.5.1.28	A
Concrete Elements	NSRS	Concrete	Buried (Structural) (Ext)	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring Program (B2.1.32)	III.A3-4	3.5.1.31	A
Concrete Elements	NSRS	Concrete	Buried (Structural) (Ext)	Increase in porosity and permeability, cracking, loss of material (spalling, scaling	Structures Monitoring Program (B2.1.32)	III.A3-5	3.5.1.31	A
Concrete Elements	NSRS	Concrete	Buried (Structural) (Ext)	Loss of material (spalling, scaling) and cracking	Structures Monitoring Program (B2.1.32)	III.A3-6	3.5.1.26	A
Concrete Elements	NSRS	Concrete	Buried (Structural) (Ext)	Increase in porosity and permeability, loss of strength	Structures Monitoring Program (B2.1.32)	III.A3-7	3.5.1.32	A
Transmission Tower	NSRS	Carbon Steel (Galvanized or Coated)	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A3-12	3.5.1.25	A
Transmission Tower	NSRS	Treated Wood	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	None	None	F, 1

Table 3.5.2-10 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation - Transmission Towers (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Transmission Tower	NSRS	Treated Wood	Buried (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	None	None	F, 1

Notes for Table 3.5.2-10:

Standard Notes:

A Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

F Material not in NUREG-1801 for this component.

Plant Specific Notes:

1 NUREG 1801 does not provide a line in which treated wood is evaluated.

Table 3.5.2-11 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation - Essential Service Water System Access Vaults

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Caulking/ Sealant	SH	Elastomer	Atmosphere/ Weather (Structural) (Ext)	Loss of sealing	Structures Monitoring Program (B2.1.32)	III.A6-12	3.5.1.44	A
Compressible Joints/Seals	SH	Elastomer	Atmosphere/ Weather (Structural) (Ext)	Loss of sealing	Structures Monitoring Program (B2.1.32)	III.A6-12	3.5.1.44	A
Concrete Elements	MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking due to expansion	Structures Monitoring Program (B2.1.32)	III.A3-2	3.5.1.27	A
Concrete Elements	MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracks and distortion	Structures Monitoring Program (B2.1.32)	III.A3-3	3.5.1.28	A
Concrete Elements	MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Loss of material (spalling, scaling) and cracking	Structures Monitoring Program (B2.1.32)	III.A3-6	3.5.1.26	A
Concrete Elements	MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring Program (B2.1.32)	III.A3-9	3.5.1.23	A

Table 3.5.2-11 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation - Essential Service Water System Access Vaults (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Concrete Elements	MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Increase in porosity and permeability, cracking, loss of material (spalling, scaling	Structures Monitoring Program (B2.1.32)	III.A3-10	3.5.1.24	A
Concrete Elements	FLB, SH, SS	Concrete	Buried (Structural) (Ext)	Cracking due to expansion	Structures Monitoring Program (B2.1.32)	III.A3-2	3.5.1.27	A
Concrete Elements	FLB, SH, SS	Concrete	Buried (Structural) (Ext)	Cracks and distortion	Structures Monitoring Program (B2.1.32)	III.A3-3	3.5.1.28	A
Concrete Elements	FLB, SH, SS	Concrete	Buried (Structural) (Ext)	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring Program (B2.1.32)	III.A3-4	3.5.1.31	A
Concrete Elements	FLB, SH, SS	Concrete	Buried (Structural) (Ext)	Increase in porosity and permeability, cracking, loss of material (spalling, scaling	Structures Monitoring Program (B2.1.32)	III.A3-5	3.5.1.31	A
Concrete Elements	FLB, SH, SS	Concrete	Buried (Structural) (Ext)	Loss of material (spalling, scaling) and cracking	Structures Monitoring Program (B2.1.32)	III.A3-6	3.5.1.26	A

Table 3.5.2-11 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation - Essential Service Water System Access Vaults (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Concrete Elements	FLB, SH, SS	Concrete	Buried (Structural) (Ext)	Increase in porosity and permeability, loss of strength	Structures Monitoring Program (B2.1.32)	III.A3-7	3.5.1.32	A
Concrete Elements	FLB, MB, SH, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking due to expansion	Structures Monitoring Program (B2.1.32)	III.A3-2	3.5.1.27	A
Concrete Elements	FLB, MB, SH, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Cracks and distortion	Structures Monitoring Program (B2.1.32)	III.A3-3	3.5.1.28	A
Concrete Elements	FLB, MB, SH, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring Program (B2.1.32)	III.A3-9	3.5.1.23	A
Concrete Elements	FLB, MB, SH, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Increase in porosity and permeability, cracking, loss of material (spalling, scaling	Structures Monitoring Program (B2.1.32)	III.A3-10	3.5.1.24	A
Hatches/ Plugs	MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking due to expansion	Structures Monitoring Program (B2.1.32)	III.A3-2	3.5.1.27	A
Hatches/ Plugs	MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Loss of material (spalling, scaling) and cracking	Structures Monitoring Program (B2.1.32)	III.A3-6	3.5.1.26	A

Table 3.5.2-11 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation - Essential Service Water System Access Vaults (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Hatches/Plugs	MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring Program (B2.1.32)	III.A3-9	3.5.1.23	A
Hatches/Plugs	MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Increase in porosity and permeability, cracking, loss of material (spalling, scaling	Structures Monitoring Program (B2.1.32)	III.A3-10	3.5.1.24	A
Structural Steel	SS	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A3-12	3.5.1.25	A
Structural Steel	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A3-12	3.5.1.25	A

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.

Plant Specific Notes:

None

Table 3.5.2-12 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 Vol. 2 Item	Table 1 Item	Notes
Caulking/Sealant	SH	Elastomer	Plant Indoor Air (Structural) (Ext)	Loss of sealing	Structures Monitoring Program (B2.1.32)	III.A6-12	3.5.1.44	A
Compressible Joints/Seals	SH	Elastomer	Atmosphere/ Weather (Structural) (Ext)	Loss of sealing	Structures Monitoring Program (B2.1.32)	III.A6-12	3.5.1.44	A
Compressible Joints/Seals	ES, SH	Elastomer	Buried (Structural) (Ext)	Loss of sealing	Structures Monitoring Program (B2.1.32)	III.A6-12	3.5.1.44	A
Concrete Elements	FB, MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking due to expansion	Structures Monitoring Program (B2.1.32)	III.A5-2	3.5.1.27	A
Concrete Elements	FB, MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracks and distortion	Structures Monitoring Program (B2.1.32)	III.A5-3	3.5.1.28	A
Concrete Elements	FB, MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Loss of material (spalling, scaling) and cracking	Structures Monitoring Program (B2.1.32)	III.A5-6	3.5.1.26	A
Concrete Elements	FB, MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring Program (B2.1.32)	III.A5-9	3.5.1.23	A

Table 3.5.2-12 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 Vol. 2 Item	Table 1 Item	Notes
Concrete Elements	FB, MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Increase in porosity and permeability, cracking, loss of material (spalling, scaling	Structures Monitoring Program (B2.1.32)	III.A5-10	3.5.1.24	A
Concrete Elements	FB, MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Concrete cracking and spalling	Fire Protection (B2.1.12) and Structures Monitoring Program (B2.1.32)	VII.G-30	3.3.1.66	B
Concrete Elements	FB, MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Fire Protection (B2.1.12) and Structures Monitoring Program (B2.1.32)	VII.G-31	3.3.1.67	B
Concrete Elements	SH, SS	Concrete	Buried (Structural) (Ext)	Cracking due to expansion	Structures Monitoring Program (B2.1.32)	III.A5-2	3.5.1.27	A
Concrete Elements	SH, SS	Concrete	Buried (Structural) (Ext)	Cracks and distortion	Structures Monitoring Program (B2.1.32)	III.A5-3	3.5.1.28	A
Concrete Elements	SH, SS	Concrete	Buried (Structural) (Ext)	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring Program (B2.1.32)	III.A5-4	3.5.1.31	A

Table 3.5.2-12 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 Vol. 2 Item	Table 1 Item	Notes
Concrete Elements	SH, SS	Concrete	Buried (Structural) (Ext)	Increase in porosity and permeability, cracking, loss of material (spalling, scaling	Structures Monitoring Program (B2.1.32)	III.A5-5	3.5.1.31	A
Concrete Elements	SH, SS	Concrete	Buried (Structural) (Ext)	Loss of material (spalling, scaling) and cracking	Structures Monitoring Program (B2.1.32)	III.A5-6	3.5.1.26	A
Concrete Elements	SH, SS	Concrete	Buried (Structural) (Ext)	Increase in porosity and permeability, loss of strength	Structures Monitoring Program (B2.1.32)	III.A5-7	3.5.1.32	A
Concrete Elements	FB, SLD, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking due to expansion	Structures Monitoring Program (B2.1.32)	III.A5-2	3.5.1.27	A
Concrete Elements	FB, SLD, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Cracks and distortion	Structures Monitoring Program (B2.1.32)	III.A5-3	3.5.1.28	A
Concrete Elements	FB, SLD, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring Program (B2.1.32)	III.A5-9	3.5.1.23	A

Table 3.5.2-12 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 Vol. 2 Item	Table 1 Item	Notes
Concrete Elements	FB, SLD, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Increase in porosity and permeability, cracking, loss of material (spalling, scaling	Structures Monitoring Program (B2.1.32)	III.A5-10	3.5.1.24	A
Concrete Elements	FB, SLD, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Concrete cracking and spalling	Fire Protection (B2.1.12) and Structures Monitoring Program (B2.1.32)	VII.G-28	3.3.1.65	B
Concrete Elements	FB, SLD, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Loss of material	Fire Protection (B2.1.12) and Structures Monitoring Program (B2.1.32)	VII.G-29	3.3.1.67	B
Doors	SH	Carbon Steel (Galvanized or Coated)	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A5-12	3.5.1.25	A
Doors	SH, SLD	Carbon Steel (Galvanized or Coated)	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A5-12	3.5.1.25	A
Fire Barrier Coatings/ Wraps	FB, SH	Fire Barrier (Ceramic Fiber)	Plant Indoor Air (Structural) (Ext)	Loss of material, cracking	Fire Protection (B2.1.12)	None	None	J, 2
Fire Barrier Doors	FB, SH	Carbon Steel (Galvanized or Coated)	Plant Indoor Air (Structural) (Ext)	Loss of material	Fire Protection (B2.1.12)	VII.G-3	3.3.1.63	B

Table 3.5.2-12 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 Vol. 2 Item	Table 1 Item	Notes
Fire Barrier Seals	FB	Elastomer	Atmosphere/ Weather (Structural) (Ext)	Increased hardness, shrinkage and loss of strength	Fire Protection (B2.1.12)	VII.G-2	3.3.1.61	B
Fire Barrier Seals	FB	Elastomer	Plant Indoor Air (Structural) (Ext)	Increased hardness, shrinkage and loss of strength	Fire Protection (B2.1.12)	VII.G-1	3.3.1.61	B
Fire Barrier Seals	FB	Fire Barrier (Ceramic Fiber)	Atmosphere/ Weather (Structural) (Ext)	Loss of material, cracking	Fire Protection (B2.1.12)	None	None	J, 2
Instrument Panels & Racks	NSRS, SH, SS	Carbon Steel (Galvanized or Coated)	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A5-12	3.5.1.25	A
Liner Spent Fuel Pool	SPB, SS	Stainless Steel	Plant Indoor Air (Structural) (Ext)	None	None	VII.J-15	3.3.1.94	C
Liner Spent Fuel Pool	SPB, SS	Stainless Steel	Submerged (Structural) (Ext)	Cracking	Water Chemistry (B2.1.2) and Monitoring of the Spent Fuel Pool Water Level (LCO 3.7.15)	III.A5-13	3.5.1.46	B, 3
Liner Spent Fuel Pool	SPB, SS	Stainless Steel	Submerged (Structural) (Ext)	Cumulative fatigue damage	Time Limited Aging Analysis evaluated for the period of extended operation.	None	None	H, 1

Table 3.5.2-12 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 Vol. 2 Item	Table 1 Item	Notes
Penetrations Electrical	SS	Carbon Steel	Encased in Concrete (Ext)	None	None	VII.J-21	3.3.1.96	C
Penetrations Electrical	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A5-12	3.5.1.25	A
Penetrations Mechanical	SS	Carbon Steel	Encased in Concrete (Ext)	None	None	VII.J-21	3.3.1.96	C
Penetrations Mechanical	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A5-12	3.5.1.25	A
Roofing Membrane	SH	Roofing Membrane	Atmosphere/ Weather (Structural) (Ext)	Loss of sealing	Structures Monitoring Program (B2.1.32)	III.A6-12	3.5.1.44	C
Stairs/ Platforms/ Grates	SS	Carbon Steel (Galvanized or Coated)	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A5-12	3.5.1.25	A
Structural Steel	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A5-12	3.5.1.25	A
Structural Steel	SS	Carbon Steel (Galvanized or Coated)	Encased in Concrete (Ext)	None	None	VII.J-21	3.3.1.96	C
Structural Steel	SS	Carbon Steel (Galvanized or Coated)	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A5-12	3.5.1.25	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.

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 Fatigue design of the spent fuel pool liner 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 this TLAA for the fatigue design of the spent fuel racks.

2 NUREG-1801 does not provide a line in which Fire Barriers (Ceramic Fiber or Cementitious Coating) are inspected per the Fire Protection program (B2.1.12).

3 Fuel storage pool leak chase standpipes utilize base-mounted pressure transmitters to monitor standpipe water levels. (Reference USAR Section 9.3.3.2.3)

Table 3.5.2-13 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation - Essential Service Water System Pumphouse Building

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Caulking/ Sealant	SH	Elastomer	Atmosphere/ Weather (Structural) (Ext)	Loss of sealing	Structures Monitoring Program (B2.1.32)	III.A6-12	3.5.1.44	A
Caulking/ Sealant	SH	Elastomer	Plant Indoor Air (Structural) (Ext)	Loss of sealing	Structures Monitoring Program (B2.1.32)	III.A6-12	3.5.1.44	A
Compressible Joints/Seals	SH	Elastomer	Atmosphere/ Weather (Structural) (Ext)	Loss of sealing	Structures Monitoring Program (B2.1.32)	III.A6-12	3.5.1.44	A
Concrete Elements	FB, MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking, loss of bond, and loss of material (spalling, scaling)	Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.33)	III.A6-1	3.5.1.34	A
Concrete Elements	FB, MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking due to expansion	Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.33)	III.A6-2	3.5.1.36	A

Table 3.5.2-13 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation - Essential Service Water System Pumphouse Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Concrete Elements	FB, MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracks and distortion	Structures Monitoring Program (B2.1.32)	III.A6-4	3.5.1.28	A
Concrete Elements	FB, MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Loss of material (spalling, scaling) and cracking	Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.33)	III.A6-5	3.5.1.35	A
Concrete Elements	FB, MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Concrete cracking and spalling	Fire Protection (B2.1.12) and Structures Monitoring Program (B2.1.32)	VII.G-30	3.3.1.66	B
Concrete Elements	FB, MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Fire Protection (B2.1.12) and Structures Monitoring Program (B2.1.32)	VII.G-31	3.3.1.67	B
Concrete Elements	SS	Concrete	Buried (Structural) (Ext)	Cracking due to expansion	Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.33)	III.A6-2	3.5.1.36	A

Table 3.5.2-13 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation - Essential Service Water System Pumphouse Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Concrete Elements	SS	Concrete	Buried (Structural) (Ext)	Increase in porosity and permeability, cracking, loss of material (spalling, scaling	Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.33)	III.A6-3	3.5.1.34	A
Concrete Elements	SS	Concrete	Buried (Structural) (Ext)	Cracks and distortion	Structures Monitoring Program (B2.1.32)	III.A6-4	3.5.1.28	A
Concrete Elements	SS	Concrete	Buried (Structural) (Ext)	Loss of material (spalling, scaling) and cracking	Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.33)	III.A6-5	3.5.1.35	A
Concrete Elements	SS	Concrete	Buried (Structural) (Ext)	Increase in porosity and permeability, loss of strength	Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.33)	III.A6-6	3.5.1.37	A
Concrete Elements	SS	Concrete	Buried (Structural) (Ext)	Loss of material	Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.33)	III.A6-7	3.5.1.45	A

Table 3.5.2-13 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation - Essential Service Water System Pumphouse Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Concrete Elements	FB, MB, SH, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking, loss of bond, and loss of material (spalling, scaling)	Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.33)	III.A6-1	3.5.1.34	A
Concrete Elements	FB, MB, SH, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking due to expansion	Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.33)	III.A6-2	3.5.1.36	A
Concrete Elements	FB, MB, SH, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Cracks and distortion	Structures Monitoring Program (B2.1.32)	III.A6-4	3.5.1.28	A
Concrete Elements	FB, MB, SH, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Concrete cracking and spalling	Fire Protection (B2.1.12) and Structures Monitoring Program (B2.1.32)	VII.G-28	3.3.1.65	B
Concrete Elements	FB, MB, SH, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Loss of material	Fire Protection (B2.1.12) and Structures Monitoring Program (B2.1.32)	VII.G-29	3.3.1.67	B
Concrete Elements	DF, SS	Concrete	Submerged (Structural) (Ext)	Cracking due to expansion	Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.33)	III.A6-2	3.5.1.36	A

Table 3.5.2-13 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation - Essential Service Water System Pumphouse Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Concrete Elements	DF, SS	Concrete	Submerged (Structural) (Ext)	Loss of material	Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.33)	III.A6-7	3.5.1.45	A
Doors	SH	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A6-11	3.5.1.47	E, 1
Doors	SH	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A6-11	3.5.1.47	E, 1
Hatches/Plugs	SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking, loss of bond, and loss of material (spalling, scaling)	Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.33)	III.A6-1	3.5.1.34	A
Hatches/Plugs	SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking due to expansion	Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.33)	III.A6-2	3.5.1.36	A
Hatches/Plugs	SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Loss of material (spalling, scaling) and cracking	Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.33)	III.A6-5	3.5.1.35	A

Table 3.5.2-13 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation - Essential Service Water System Pumphouse Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Hatches/Plugs	SH, SS	Concrete	Plant Indoor Air (Ext)	Cracking, loss of bond, and loss of material (spalling, scaling)	Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.33)	III.A6-1	3.5.1.34	A
Hatches/Plugs	SH, SS	Concrete	Plant Indoor Air (Ext)	Cracking due to expansion	Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.33)	III.A6-2	3.5.1.36	A
Penetration Boot Seals	FLB	Elastomer	Buried (Structural) (Ext)	Loss of sealing	Structures Monitoring Program (B2.1.32)	III.A6-12	3.5.1.44	A
Penetrations Electrical	SS	Carbon Steel	Encased in Concrete (Ext)	None	None	VII.J-21	3.3.1.96	C
Penetrations Electrical	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A6-11	3.5.1.47	E, 1
Penetrations Mechanical	SS	Carbon Steel	Encased in Concrete (Ext)	None	None	VII.J-21	3.3.1.96	C
Penetrations Mechanical	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A6-11	3.5.1.47	E, 1
Stairs/ Platforms/ Grates	NSRS	Carbon Steel (Galvanized or Coated)	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A6-11	3.5.1.47	E, 1
Structural Steel	NSRS, SH, SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A6-11	3.5.1.47	E, 1

Table 3.5.2-13 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation - Essential Service Water System Pumphouse Building (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Structural Steel	NSRS, SS	Carbon Steel (Galvanized or Coated)	Submerged (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A6-11	3.5.1.47	E, 1
Structural Steel	SS	Stainless Steel	Submerged (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A6-11	3.5.1.47	E, 1

Notes for Table 3.5.2-13:

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.

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 line III.A6-11 specifies Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.33) as the aging management program for metal components in water-control structures. Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.33) does not address metal components, so the Structures Monitoring Program (B2.1.32) is used.

Table 3.5.2-14 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation - Circulating Water Screen House

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Compressible Joints/Seals	SH	Elastomer	Plant Indoor Air (Structural) (Ext)	Loss of sealing	Structures Monitoring Program (B2.1.32)	III.A6-12	3.5.1.44	A
Concrete Block (Masonry Walls)	FB	Concrete Block (Masonry Walls)	Plant Indoor Air (Structural) (Ext)	Cracking	Fire Protection (B2.1.12) and Masonry Wall Program (B2.1.31)	III.A3-11	3.5.1.43	E, 1
Concrete Elements	NSRS, SH	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking due to expansion	Structures Monitoring Program (B2.1.32)	III.A3-2	3.5.1.27	A
Concrete Elements	NSRS, SH	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracks and distortion	Structures Monitoring Program (B2.1.32)	III.A3-3	3.5.1.28	A
Concrete Elements	NSRS, SH	Concrete	Atmosphere/ Weather (Structural) (Ext)	Loss of material (spalling, scaling) and cracking	Structures Monitoring Program (B2.1.32)	III.A3-6	3.5.1.26	A
Concrete Elements	NSRS, SH	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring Program (B2.1.32)	III.A3-9	3.5.1.23	A
Concrete Elements	NSRS, SH	Concrete	Atmosphere/ Weather (Structural) (Ext)	Increase in porosity and permeability, cracking, loss of material (spalling, scaling	Structures Monitoring Program (B2.1.32)	III.A3-10	3.5.1.24	A

Table 3.5.2-14 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation - Circulating Water Screen House (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Concrete Elements	NSRS	Concrete	Buried (Structural) (Ext)	Cracking due to expansion	Structures Monitoring Program (B2.1.32)	III.A3-2	3.5.1.27	A
Concrete Elements	NSRS	Concrete	Buried (Structural) (Ext)	Cracks and distortion	Structures Monitoring Program (B2.1.32)	III.A3-3	3.5.1.28	A
Concrete Elements	NSRS	Concrete	Buried (Structural) (Ext)	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring Program (B2.1.32)	III.A3-4	3.5.1.31	A
Concrete Elements	NSRS	Concrete	Buried (Structural) (Ext)	Increase in porosity and permeability, cracking, loss of material (spalling, scaling	Structures Monitoring Program (B2.1.32)	III.A3-5	3.5.1.31	A
Concrete Elements	NSRS	Concrete	Buried (Structural) (Ext)	Loss of material (spalling, scaling) and cracking	Structures Monitoring Program (B2.1.32)	III.A3-6	3.5.1.26	A
Concrete Elements	NSRS	Concrete	Buried (Structural) (Ext)	Increase in porosity and permeability, loss of strength	Structures Monitoring Program (B2.1.32)	III.A3-7	3.5.1.32	A
Concrete Elements	DF, FB, NSRS, SH	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking due to expansion	Structures Monitoring Program (B2.1.32)	III.A3-2	3.5.1.27	A
Concrete Elements	DF, FB, NSRS, SH	Concrete	Plant Indoor Air (Structural) (Ext)	Cracks and distortion	Structures Monitoring Program (B2.1.32)	III.A3-3	3.5.1.28	A

Table 3.5.2-14 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation - Circulating Water Screen House (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Concrete Elements	DF, FB, NSRS, SH	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring Program (B2.1.32)	III.A3-9	3.5.1.23	A
Concrete Elements	DF, FB, NSRS, SH	Concrete	Plant Indoor Air (Structural) (Ext)	Increase in porosity and permeability, cracking, loss of material (spalling, scaling	Structures Monitoring Program (B2.1.32)	III.A3-10	3.5.1.24	A
Concrete Elements	DF, FB, NSRS, SH	Concrete	Plant Indoor Air (Structural) (Ext)	Concrete cracking and spalling	Fire Protection (B2.1.12) and Structures Monitoring Program (B2.1.32)	VII.G-28	3.3.1.65	B
Concrete Elements	DF, FB, NSRS, SH	Concrete	Plant Indoor Air (Structural) (Ext)	Loss of material	Fire Protection (B2.1.12) and Structures Monitoring Program (B2.1.32)	VII.G-29	3.3.1.67	B
Concrete Elements	NSRS	Concrete	Submerged (Structural) (Ext)	Cracking due to expansion	Structures Monitoring Program (B2.1.32)	III.A3-2	3.5.1.27	A
Concrete Elements	NSRS	Concrete	Submerged (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A6-7	3.5.1.45	E, 3
Doors	SH	Carbon Steel (Galvanized or Coated)	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A3-12	3.5.1.25	C

Table 3.5.2-14 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation - Circulating Water Screen House (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Doors	SH	Carbon Steel (Galvanized or Coated)	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A3-12	3.5.1.25	C
Duct Banks and Manholes	SH	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking due to expansion	Structures Monitoring Program (B2.1.32)	III.A3-2	3.5.1.27	A
Duct Banks and Manholes	SH	Concrete	Atmosphere/ Weather (Structural) (Ext)	Loss of material (spalling, scaling) and cracking	Structures Monitoring Program (B2.1.32)	III.A3-6	3.5.1.26	A
Duct Banks and Manholes	SH	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring Program (B2.1.32)	III.A3-9	3.5.1.23	A
Duct Banks and Manholes	SH	Concrete	Atmosphere/ Weather (Structural) (Ext)	Increase in porosity and permeability, cracking, loss of material (spalling, scaling	Structures Monitoring Program (B2.1.32)	III.A3-10	3.5.1.24	A
Duct Banks and Manholes	SH	Concrete	Buried (Structural) (Ext)	Cracking due to expansion	Structures Monitoring Program (B2.1.32)	III.A3-2	3.5.1.27	A
Duct Banks and Manholes	SH	Concrete	Buried (Structural) (Ext)	Cracks and distortion	Structures Monitoring Program (B2.1.32)	III.A3-3	3.5.1.28	A

Table 3.5.2-14 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation - Circulating Water Screen House (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Duct Banks and Manholes	SH	Concrete	Buried (Structural) (Ext)	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring Program (B2.1.32)	III.A3-4	3.5.1.31	A
Duct Banks and Manholes	SH	Concrete	Buried (Structural) (Ext)	Increase in porosity and permeability, cracking, loss of material (spalling, scaling	Structures Monitoring Program (B2.1.32)	III.A3-5	3.5.1.31	A
Duct Banks and Manholes	SH	Concrete	Buried (Structural) (Ext)	Loss of material (spalling, scaling) and cracking	Structures Monitoring Program (B2.1.32)	III.A3-6	3.5.1.26	A
Duct Banks and Manholes	SH	Concrete	Buried (Structural) (Ext)	Increase in porosity and permeability, loss of strength	Structures Monitoring Program (B2.1.32)	III.A3-7	3.5.1.32	A
Fire Barrier Coatings/ Wraps	FB	Fire Barrier (Cementitious Coating)	Plant Indoor Air (Structural) (Ext)	Loss of material, cracking	Fire Protection (B2.1.12)	None	None	J, 2
Fire Barrier Doors	FB	Carbon Steel (Galvanized or Coated)	Plant Indoor Air (Structural) (Ext)	Loss of material	Fire Protection (B2.1.12)	VII.G-3	3.3.1.63	B

Table 3.5.2-14 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation - Circulating Water Screen House (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Fire Barrier Seals	FB	Elastomer	Plant Indoor Air (Structural) (Ext)	Increased hardness, shrinkage and loss of strength	Fire Protection (B2.1.12)	VII.G-1	3.3.1.61	B
Fire Barrier Seals	FB	Fire Barrier (Ceramic Fiber)	Plant Indoor Air (Structural) (Ext)	Loss of material, cracking	Fire Protection (B2.1.12)	None	None	J, 2
Metal Siding	SH	Carbon Steel (Galvanized or Coated)	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A3-12	3.5.1.25	C
Metal Siding	SH	Carbon Steel (Galvanized or Coated)	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A3-12	3.5.1.25	C
Penetrations Electrical	NSRS	Carbon Steel	Encased in Concrete (Ext)	None	None	VII.J-21	3.3.1.96	C
Penetrations Mechanical	NSRS	Carbon Steel	Encased in Concrete (Ext)	None	None	VII.J-21	3.3.1.96	C
Penetrations Mechanical	NSRS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A3-12	3.5.1.25	C
Roofing Membrane	SH	Roofing Membrane	Atmosphere/ Weather (Structural) (Ext)	Loss of sealing	Structures Monitoring Program (B2.1.32)	III.A6-12	3.5.1.44	C
Structural Steel	NSRS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A3-12	3.5.1.25	A

Notes for Table 3.5.2-14:

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.
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 (B2.1.12).
2	NUREG-1801 does not provide a line in which Fire Barriers (Ceramic Fiber or Cementitious Coating) are inspected per the Fire Protection program (B2.1.12).
3	WCGS inspects the submerged portions of the Circulating Water Screen House as part of the Structures Monitoring Program (B2.1.32).

Table 3.5.2-15 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation - Ultimate Heat Sink

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Dams/Dikes	HS	Earthfill (rip-rap, stone, soil)	Submerged (Structural) (Ext)	Loss of material, loss of form	Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.33)	III.A6-9	3.5.1.48	A

Notes for Table 3.5.2-15:

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 3.5.2-16 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation - Essential Service Water System Discharge Structure

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Concrete Elements	SH, SS	Concrete	Buried (Structural) (Ext)	Cracking due to expansion	Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.33)	III.A6-2	3.5.1.36	A
Concrete Elements	SH, SS	Concrete	Buried (Structural) (Ext)	Increase in porosity and permeability, cracking, loss of material (spalling, scaling	Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.33)	III.A6-3	3.5.1.34	A
Concrete Elements	SH, SS	Concrete	Buried (Structural) (Ext)	Cracks and distortion	Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.33)	III.A6-4	3.5.1.28	E, 1
Concrete Elements	SH, SS	Concrete	Buried (Structural) (Ext)	Loss of material (spalling, scaling) and cracking	Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.33)	III.A6-5	3.5.1.35	A

Table 3.5.2-16 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation - Essential Service Water System Discharge Structure (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Concrete Elements	SH, SS	Concrete	Buried (Structural) (Ext)	Increase in porosity and permeability, loss of strength	Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.33)	III.A6-6	3.5.1.37	A
Concrete Elements	SH, SS	Concrete	Buried (Structural) (Ext)	Loss of material	Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.33)	III.A6-7	3.5.1.45	A
Concrete Elements	DF, SH, SS	Concrete	Submerged (Structural) (Ext)	Increase in porosity and permeability, loss of strength	Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.33)	III.A6-6	3.5.1.37	A
Concrete Elements	DF, SH, SS	Concrete	Submerged (Structural) (Ext)	Loss of material	Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.33)	III.A6-7	3.5.1.45	A
Penetrations Mechanical	SH, SS	Carbon Steel (Galvanized or Coated)	Encased in Concrete (Ext)	None	None	VII.J-21	3.3.1.96	C

Table 3.5.2-16 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation - Essential Service Water System Discharge Structure (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Penetrations Mechanical	SH, SS	Carbon Steel (Galvanized or Coated)	Submerged (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A6-11	3.5.1.47	E, 2

Notes for Table 3.5.2-16:

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 Essential Service Water System Discharge Structure is inspected per plant specification.

2 NUREG 1801 line III.A6-11 specifies Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.33) as the aging management program for metal components in water-control structures. Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.33) does not address metal components, so the Structures Monitoring Program (B2.1.32) is used.

Table 3.5.2-17 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation - Main Dam and Auxiliary Spillway

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Dams/Dikes	FLB	Earthfill (rip-rap, stone, soil)	Atmosphere/ Weather (Structural) (Ext)	Loss of material, loss of form	Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.33)	III.A6-9	3.5.1.48	A

Notes for Table 3.5.2-17:

Standard Note Text

A Consistent with NUREG-1801 item for component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

Plant Specific Note

None

Table 3.5.2-18 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation - Essential Service Water System Valve House

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Caulking/ Sealant	SH	Elastomer	Plant Indoor Air (Structural) (Ext)	Loss of sealing	Structures Monitoring Program (B2.1.32)	III.A6-12	3.5.1.44	A
Compressible Joints/Seals	SH	Elastomer	Atmosphere/ Weather (Structural) (Ext)	Loss of sealing	Structures Monitoring Program (B2.1.32)	III.A6-12	3.5.1.44	A
Concrete Elements	MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking due to expansion	Structures Monitoring Program (B2.1.32)	III.A3-2	3.5.1.27	A
Concrete Elements	MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracks and distortion	Structures Monitoring Program (B2.1.32)	III.A3-3	3.5.1.28	A
Concrete Elements	MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Loss of material (spalling, scaling) and cracking	Structures Monitoring Program (B2.1.32)	III.A3-6	3.5.1.26	A
Concrete Elements	MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring Program (B2.1.32)	III.A3-9	3.5.1.23	A

Table 3.5.2-18 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation - Essential Service Water System Valve House (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Concrete Elements	MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Increase in porosity and permeability, cracking, loss of material (spalling, scaling	Structures Monitoring Program (B2.1.32)	III.A3-10	3.5.1.24	A
Concrete Elements	FLB, SH, SS	Concrete	Buried (Structural) (Ext)	Cracking due to expansion	Structures Monitoring Program (B2.1.32)	III.A3-2	3.5.1.27	A
Concrete Elements	FLB, SH, SS	Concrete	Buried (Structural) (Ext)	Cracks and distortion	Structures Monitoring Program (B2.1.32)	III.A3-3	3.5.1.28	A
Concrete Elements	FLB, SH, SS	Concrete	Buried (Structural) (Ext)	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring Program (B2.1.32)	III.A3-4	3.5.1.31	A
Concrete Elements	FLB, SH, SS	Concrete	Buried (Structural) (Ext)	Increase in porosity and permeability, cracking, loss of material (spalling, scaling	Structures Monitoring Program (B2.1.32)	III.A3-5	3.5.1.31	A
Concrete Elements	FLB, SH, SS	Concrete	Buried (Structural) (Ext)	Loss of material (spalling, scaling) and cracking	Structures Monitoring Program (B2.1.32)	III.A3-6	3.5.1.26	A

Table 3.5.2-18 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation - Essential Service Water System Valve House (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Concrete Elements	FLB, SH, SS	Concrete	Buried (Structural) (Ext)	Increase in porosity and permeability, loss of strength	Structures Monitoring Program (B2.1.32)	III.A3-7	3.5.1.32	A
Concrete Elements	SH, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking due to expansion	Structures Monitoring Program (B2.1.32)	III.A3-2	3.5.1.27	A
Concrete Elements	SH, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Cracks and distortion	Structures Monitoring Program (B2.1.32)	III.A3-3	3.5.1.28	A
Concrete Elements	SH, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring Program (B2.1.32)	III.A3-9	3.5.1.23	A
Concrete Elements	SH, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Increase in porosity and permeability, cracking, loss of material (spalling, scaling	Structures Monitoring Program (B2.1.32)	III.A3-10	3.5.1.24	A
Hatches/Plugs	MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking due to expansion	Structures Monitoring Program (B2.1.32)	III.A3-2	3.5.1.27	A
Hatches/Plugs	MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Loss of material (spalling, scaling) and cracking	Structures Monitoring Program (B2.1.32)	III.A3-6	3.5.1.26	A

Table 3.5.2-18 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation - Essential Service Water System Valve House (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Hatches/Plugs	MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring Program (B2.1.32)	III.A3-9	3.5.1.23	A
Hatches/Plugs	MB, SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Increase in porosity and permeability, cracking, loss of material (spalling, scaling	Structures Monitoring Program (B2.1.32)	III.A3-10	3.5.1.24	A
Penetration Boot Seals	FLB	Elastomer	Buried (Structural) (Ext)	Loss of sealing	Structures Monitoring Program (B2.1.32)	III.A6-12	3.5.1.44	A
Penetrations Mechanical	SS	Carbon Steel	Encased in Concrete (Ext)	None	None	VII.J-21	3.3.1.96	C
Penetrations Mechanical	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A3-12	3.5.1.25	A
Structural Steel	SS	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A3-12	3.5.1.25	A
Structural Steel	NSRS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A3-12	3.5.1.25	A

Notes for Table 3.5.2-18:

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 3.5.2-19 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation - Refueling Water Storage Tank Foundation and Valve House

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Caulking/ Sealant	FLB, SH	Elastomer	Buried (Structural) (Ext)	Loss of sealing	Structures Monitoring Program (B2.1.32)	III.A6-12	3.5.1.44	A
Caulking/ Sealant	FLB, SH	Elastomer	Plant Indoor Air (Structural) (Ext)	Loss of sealing	Structures Monitoring Program (B2.1.32)	III.A6-12	3.5.1.44	A
Concrete Elements	SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking due to expansion	Structures Monitoring Program (B2.1.32)	III.A3-2	3.5.1.27	A
Concrete Elements	SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracks and distortion	Structures Monitoring Program (B2.1.32)	III.A3-3	3.5.1.28	A
Concrete Elements	SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Loss of material (spalling, scaling) and cracking	Structures Monitoring Program (B2.1.32)	III.A3-6	3.5.1.26	A
Concrete Elements	SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring Program (B2.1.32)	III.A3-9	3.5.1.23	A
Concrete Elements	SH, SS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Increase in porosity and permeability, cracking, loss of material (spalling, scaling	Structures Monitoring Program (B2.1.32)	III.A3-10	3.5.1.24	A

Table 3.5.2-19 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation - Refueling Water Storage Tank Foundation and Valve House (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Concrete Elements	FLB, SH, SS	Concrete	Buried (Structural) (Ext)	Cracking due to expansion	Structures Monitoring Program (B2.1.32)	III.A3-2	3.5.1.27	A
Concrete Elements	FLB, SH, SS	Concrete	Buried (Structural) (Ext)	Cracks and distortion	Structures Monitoring Program (B2.1.32)	III.A3-3	3.5.1.28	A
Concrete Elements	FLB, SH, SS	Concrete	Buried (Structural) (Ext)	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring Program (B2.1.32)	III.A3-4	3.5.1.31	A
Concrete Elements	FLB, SH, SS	Concrete	Buried (Structural) (Ext)	Increase in porosity and permeability, cracking, loss of material (spalling, scaling	Structures Monitoring Program (B2.1.32)	III.A3-5	3.5.1.31	A
Concrete Elements	FLB, SH, SS	Concrete	Buried (Structural) (Ext)	Loss of material (spalling, scaling) and cracking	Structures Monitoring Program (B2.1.32)	III.A3-6	3.5.1.26	A
Concrete Elements	FLB, SH, SS	Concrete	Buried (Structural) (Ext)	Increase in porosity and permeability, loss of strength	Structures Monitoring Program (B2.1.32)	III.A3-7	3.5.1.32	A
Concrete Elements	FLB, SH, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking due to expansion	Structures Monitoring Program (B2.1.32)	III.A3-2	3.5.1.27	A
Concrete Elements	FLB, SH, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Cracks and distortion	Structures Monitoring Program (B2.1.32)	III.A3-3	3.5.1.28	A

Table 3.5.2-19 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation - Refueling Water Storage Tank Foundation and Valve House (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 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 Program (B2.1.32)	III.A3-9	3.5.1.23	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 Program (B2.1.32)	III.A3-10	3.5.1.24	A
Doors	SH	Carbon Steel (Galvanized or Coated)	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A3-12	3.5.1.25	C
Doors	SH	Carbon Steel (Galvanized or Coated)	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A3-12	3.5.1.25	C
Duct Banks and Manholes	SH	Concrete	Buried (Structural) (Ext)	Cracking due to expansion	Structures Monitoring Program (B2.1.32)	III.A3-2	3.5.1.27	A
Duct Banks and Manholes	SH	Concrete	Buried (Structural) (Ext)	Cracks and distortion	Structures Monitoring Program (B2.1.32)	III.A3-3	3.5.1.28	A
Duct Banks and Manholes	SH	Concrete	Buried (Structural) (Ext)	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring Program (B2.1.32)	III.A3-4	3.5.1.31	A

Table 3.5.2-19 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation - Refueling Water Storage Tank Foundation and Valve House (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Duct Banks and Manholes	SH	Concrete	Buried (Structural) (Ext)	Increase in porosity and permeability, cracking, loss of material (spalling, scaling	Structures Monitoring Program (B2.1.32)	III.A3-5	3.5.1.31	A
Duct Banks and Manholes	SH	Concrete	Buried (Structural) (Ext)	Loss of material (spalling, scaling) and cracking	Structures Monitoring Program (B2.1.32)	III.A3-6	3.5.1.26	A
Duct Banks and Manholes	SH	Concrete	Buried (Structural) (Ext)	Increase in porosity and permeability, loss of strength	Structures Monitoring Program (B2.1.32)	III.A3-7	3.5.1.32	A
Duct Banks and Manholes	SH	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking due to expansion	Structures Monitoring Program (B2.1.32)	III.A3-2	3.5.1.27	A
Duct Banks and Manholes	SH	Concrete	Plant Indoor Air (Structural) (Ext)	Cracks and distortion	Structures Monitoring Program (B2.1.32)	III.A3-3	3.5.1.28	A
Duct Banks and Manholes	SH	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring Program (B2.1.32)	III.A3-9	3.5.1.23	A

Table 3.5.2-19 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation - Refueling Water Storage Tank Foundation and Valve House (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Duct Banks and Manholes	SH	Concrete	Plant Indoor Air (Structural) (Ext)	Increase in porosity and permeability, cracking, loss of material (spalling, scaling	Structures Monitoring Program (B2.1.32)	III.A3-10	3.5.1.24	A
Hatches/Plugs	SH	Carbon Steel (Galvanized or Coated)	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A3-12	3.5.1.25	A
Hatches/Plugs	SH	Carbon Steel (Galvanized or Coated)	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A3-12	3.5.1.25	A
Penetration Boot Seals	FLB	Elastomer	Buried (Structural) (Ext)	Loss of sealing	Structures Monitoring Program (B2.1.32)	III.A6-12	3.5.1.44	A
Penetrations Electrical	SH, SS	Carbon Steel	Encased in Concrete (Ext)	None	None	VII.J-21	3.3.1.96	C
Penetrations Electrical	SH, SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A3-12	3.5.1.25	A
Penetrations Mechanical	SH, SS	Carbon Steel	Encased in Concrete (Ext)	None	None	VII.J-21	3.3.1.96	C
Penetrations Mechanical	SH, SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A3-12	3.5.1.25	A
Roofing Membrane	SH	Roofing Membrane	Atmosphere/ Weather (Structural) (Ext)	Loss of sealing	Structures Monitoring Program (B2.1.32)	III.A6-12	3.5.1.44	C

Table 3.5.2-19 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation - Refueling Water Storage Tank Foundation and Valve House (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Structural Steel	SS	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A3-12	3.5.1.25	A
Structural Steel	SS	Carbon Steel	Encased in Concrete (Ext)	None	None	VII.J-21	3.3.1.96	C
Structural Steel	SH, SS	Carbon Steel (Galvanized or Coated)	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A3-12	3.5.1.25	A

Notes for Table 3.5.2-19:

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 3.5.2-20 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation - Condensate Water Storage Tank Foundation and Valve House

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Compressible Joints/Seals	SH	Elastomer	Buried (Structural) (Ext)	Loss of sealing	Structures Monitoring Program (B2.1.32)	III.A6-12	3.5.1.44	A
Concrete Block (Masonry Walls)	NSRS, SH	Concrete Block (Masonry Walls)	Atmosphere/ Weather (Structural) (Ext)	Cracking	Masonry Wall Program (B2.1.31)	III.A3-11	3.5.1.43	A
Concrete Block (Masonry Walls)	NSRS, SH	Concrete Block (Masonry Walls)	Plant Indoor Air (Structural) (Ext)	Cracking	Masonry Wall Program (B2.1.31)	III.A3-11	3.5.1.43	A
Concrete Elements	NSRS, SH	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking due to expansion	Structures Monitoring Program (B2.1.32)	III.A3-2	3.5.1.27	A
Concrete Elements	NSRS, SH	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracks and distortion	Structures Monitoring Program (B2.1.32)	III.A3-3	3.5.1.28	A
Concrete Elements	NSRS, SH	Concrete	Atmosphere/ Weather (Structural) (Ext)	Loss of material (spalling, scaling) and cracking	Structures Monitoring Program (B2.1.32)	III.A3-6	3.5.1.26	A

Table 3.5.2-20 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation - Condensate Water Storage Tank Foundation and Valve House (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Concrete Elements	NSRS, SH	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring Program (B2.1.32)	III.A3-9	3.5.1.23	A
Concrete Elements	NSRS, SH	Concrete	Atmosphere/ Weather (Structural) (Ext)	Increase in porosity and permeability, cracking, loss of material (spalling, scaling	Structures Monitoring Program (B2.1.32)	III.A3-10	3.5.1.24	A
Concrete Elements	NSRS, SH	Concrete	Buried (Structural) (Ext)	Cracking due to expansion	Structures Monitoring Program (B2.1.32)	III.A3-2	3.5.1.27	A
Concrete Elements	NSRS, SH	Concrete	Buried (Structural) (Ext)	Cracks and distortion	Structures Monitoring Program (B2.1.32)	III.A3-3	3.5.1.28	A
Concrete Elements	NSRS, SH	Concrete	Buried (Structural) (Ext)	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring Program (B2.1.32)	III.A3-4	3.5.1.31	A
Concrete Elements	NSRS, SH	Concrete	Buried (Structural) (Ext)	Increase in porosity and permeability, cracking, loss of material (spalling, scaling	Structures Monitoring Program (B2.1.32)	III.A3-5	3.5.1.31	A

Table 3.5.2-20 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation - Condensate Water Storage Tank Foundation and Valve House (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Concrete Elements	NSRS, SH	Concrete	Buried (Structural) (Ext)	Loss of material (spalling, scaling) and cracking	Structures Monitoring Program (B2.1.32)	III.A3-6	3.5.1.26	A
Concrete Elements	NSRS, SH	Concrete	Buried (Structural) (Ext)	Increase in porosity and permeability, loss of strength	Structures Monitoring Program (B2.1.32)	III.A3-7	3.5.1.32	A
Concrete Elements	NSRS, SH	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking due to expansion	Structures Monitoring Program (B2.1.32)	III.A3-2	3.5.1.27	A
Concrete Elements	NSRS, SH	Concrete	Plant Indoor Air (Structural) (Ext)	Cracks and distortion	Structures Monitoring Program (B2.1.32)	III.A3-3	3.5.1.28	A
Concrete Elements	NSRS, SH	Concrete	Plant Indoor Air (Structural) (Ext)	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring Program (B2.1.32)	III.A3-9	3.5.1.23	A
Concrete Elements	NSRS, SH	Concrete	Plant Indoor Air (Structural) (Ext)	Increase in porosity and permeability, cracking, loss of material (spalling, scaling	Structures Monitoring Program (B2.1.32)	III.A3-10	3.5.1.24	A
Doors	SH	Carbon Steel (Galvanized or Coated)	Atmosphere/ Weather (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A3-12	3.5.1.25	C

Table 3.5.2-20 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation - Condensate Water Storage Tank Foundation and Valve House (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Doors	SH	Carbon Steel (Galvanized or Coated)	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A3-12	3.5.1.25	C
Hatches/Plugs	SH	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A3-12	3.5.1.25	C
Hatches/Plugs	SH	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A3-12	3.5.1.25	C
Penetrations Mechanical	NSRS, SH	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A3-12	3.5.1.25	A
Roofing Membrane	SH	Roofing Membrane	Atmosphere/ Weather (Structural) (Ext)	Loss of sealing	Structures Monitoring Program (B2.1.32)	III.A6-12	3.5.1.44	C
Structural Steel	NSRS	Carbon Steel	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A3-12	3.5.1.25	A
Structural Steel	NSRS, SH	Carbon Steel (Galvanized or Coated)	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A3-12	3.5.1.25	A
Structural Steel	NSRS, SH	Carbon Steel (Galvanized or Coated)	Encased in Concrete (Ext)	None	None	VII.J-21	3.3.1.96	C
Structural Steel	NSRS, SH	Carbon Steel (Galvanized or Coated)	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A3-12	3.5.1.25	A

Notes for Table 3.5.2-20:

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 3.5.2-21 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation - Concrete Pads for Station Transformers

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Caulking/ Sealant	SH	Elastomer	Atmosphere/ Weather (Structural) (Ext)	Loss of sealing	Structures Monitoring Program (B2.1.32)	III.A6-12	3.5.1.44	C
Concrete Elements	NSRS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking due to expansion	Structures Monitoring Program (B2.1.32)	III.A3-2	3.5.1.27	A
Concrete Elements	NSRS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracks and distortion	Structures Monitoring Program (B2.1.32)	III.A3-3	3.5.1.28	A
Concrete Elements	NSRS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Loss of material (spalling, scaling) and cracking	Structures Monitoring Program (B2.1.32)	III.A3-6	3.5.1.26	A
Concrete Elements	NSRS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring Program (B2.1.32)	III.A3-9	3.5.1.23	A
Concrete Elements	NSRS	Concrete	Atmosphere/ Weather (Structural) (Ext)	Increase in porosity and permeability, cracking, loss of material (spalling, scaling	Structures Monitoring Program (B2.1.32)	III.A3-10	3.5.1.24	A

Table 3.5.2-21 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation - Concrete Pads for Station Transformers (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Concrete Elements	NSRS	Concrete	Buried (Structural) (Ext)	Cracking due to expansion	Structures Monitoring Program (B2.1.32)	III.A3-2	3.5.1.27	A
Concrete Elements	NSRS	Concrete	Buried (Structural) (Ext)	Cracks and distortion	Structures Monitoring Program (B2.1.32)	III.A3-3	3.5.1.28	A
Concrete Elements	NSRS	Concrete	Buried (Structural) (Ext)	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring Program (B2.1.32)	III.A3-4	3.5.1.31	A
Concrete Elements	NSRS	Concrete	Buried (Structural) (Ext)	Increase in porosity and permeability, cracking, loss of material (spalling, scaling	Structures Monitoring Program (B2.1.32)	III.A3-5	3.5.1.31	A
Concrete Elements	NSRS	Concrete	Buried (Structural) (Ext)	Loss of material (spalling, scaling) and cracking	Structures Monitoring Program (B2.1.32)	III.A3-6	3.5.1.26	A
Concrete Elements	NSRS	Concrete	Buried (Structural) (Ext)	Increase in porosity and permeability, loss of strength	Structures Monitoring Program (B2.1.32)	III.A3-7	3.5.1.32	A
Duct Banks and Manholes	SH	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking due to expansion	Structures Monitoring Program (B2.1.32)	III.A3-2	3.5.1.27	A

Table 3.5.2-21 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation - Concrete Pads for Station Transformers (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Duct Banks and Manholes	SH	Concrete	Atmosphere/ Weather (Structural) (Ext)	Loss of material (spalling, scaling) and cracking	Structures Monitoring Program (B2.1.32)	III.A3-6	3.5.1.26	A
Duct Banks and Manholes	SH	Concrete	Atmosphere/ Weather (Structural) (Ext)	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring Program (B2.1.32)	III.A3-9	3.5.1.23	A
Duct Banks and Manholes	SH	Concrete	Atmosphere/ Weather (Structural) (Ext)	Increase in porosity and permeability, cracking, loss of material (spalling, scaling	Structures Monitoring Program (B2.1.32)	III.A3-10	3.5.1.24	A
Duct Banks and Manholes	SH	Concrete	Buried (Structural) (Ext)	Cracking due to expansion	Structures Monitoring Program (B2.1.32)	III.A3-2	3.5.1.27	A
Duct Banks and Manholes	SH	Concrete	Buried (Structural) (Ext)	Cracks and distortion	Structures Monitoring Program (B2.1.32)	III.A3-3	3.5.1.28	A
Duct Banks and Manholes	SH	Concrete	Buried (Structural) (Ext)	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring Program (B2.1.32)	III.A3-4	3.5.1.31	A

Table 3.5.2-21 Containments, Structures, and Component Supports – Summary of Aging Management Evaluation - Concrete Pads for Station Transformers (Continued)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Duct Banks and Manholes	SH	Concrete	Buried (Structural) (Ext)	Increase in porosity and permeability, cracking, loss of material (spalling, scaling	Structures Monitoring Program (B2.1.32)	III.A3-5	3.5.1.31	A
Duct Banks and Manholes	SH	Concrete	Buried (Structural) (Ext)	Loss of material (spalling, scaling) and cracking	Structures Monitoring Program (B2.1.32)	III.A3-6	3.5.1.26	A
Duct Banks and Manholes	SH	Concrete	Buried (Structural) (Ext)	Increase in porosity and permeability, loss of strength	Structures Monitoring Program (B2.1.32)	III.A3-7	3.5.1.32	A
Penetrations Electrical	SH	Carbon Steel (Galvanized or Coated)	Encased in Concrete (Ext)	None	None	VII.J-21	3.3.1.96	C
Structural Steel	NSRS	Carbon Steel (Galvanized or Coated)	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.A3-12	3.5.1.25	A
Structural Steel	NSRS	Carbon Steel (Galvanized or Coated)	Encased in Concrete (Ext)	None	None	VII.J-21	3.3.1.96	C

Notes for Table 3.5.2-21:

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 3.5.2-22 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 Vol. 2 Item	Table 1 Item	Notes
Cable Trays & Supports	NSRS	Carbon Steel (Galvanized or Coated)	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.B2-7	3.5.1.50	A
Cable Trays & Supports	NSRS, SS	Carbon Steel (Galvanized or Coated)	Plant Indoor Air (Structural) (Ext)	None	None	III.B2-5	3.5.1.58	A
Cable Trays & Supports	NSRS, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Reduction in concrete anchor capacity	Structures Monitoring Program (B2.1.32)	III.B2-1	3.5.1.40	A
Conduit And Supports	NSRS, SH	Aluminum	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.B2-7	3.5.1.50	A
Conduit And Supports	NSRS, SH, SS	Aluminum	Plant Indoor Air (Structural) (Ext)	None	None	III.B2-4	3.5.1.58	A
Conduit And Supports	NSRS, SH	Carbon Steel (Galvanized or Coated)	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.B2-7	3.5.1.50	A
Conduit And Supports	NSRS, SH, SS	Carbon Steel (Galvanized or Coated)	Plant Indoor Air (Structural) (Ext)	None	None	III.B2-5	3.5.1.58	A
Conduit And Supports	NSRS, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Reduction in concrete anchor capacity	Structures Monitoring Program (B2.1.32)	III.B2-1	3.5.1.40	A

Table 3.5.2-22 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 Vol. 2 Item	Table 1 Item	Notes
Electrical Panels & Enclosures	NSRS, SH	Carbon Steel (Galvanized or Coated)	Atmosphere/ Weather (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.B3-7	3.5.1.39	A
Electrical Panels & Enclosures	NSRS, SH, SS	Carbon Steel (Galvanized or Coated)	Plant Indoor Air (Structural) (Ext)	None	None	III.B3-3	3.5.1.58	A
Electrical Panels & Enclosures	NSRS, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Reduction in concrete anchor capacity	Structures Monitoring Program (B2.1.32)	III.B3-1	3.5.1.40	A
High Strength Bolting	SS	High Strength Low Alloy Steel (Bolting)	Plant Indoor Air (Structural) (Ext)	Cracking	Bolting Integrity (B2.1.7)	III.B1.1-3	3.5.1.51	B, 2
Spring Hangers	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of mechanical function	ASME Section XI, Subsection IWF (B2.1.29)	III.B1.1-2	3.5.1.54	B
Spring Hangers	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of mechanical function	ASME Section XI, Subsection IWF (B2.1.29)	III.B1.2-2	3.5.1.54	B
Support Fittings IE Cable Tray	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Cumulative fatigue damage	Time Limited Aging Analysis evaluated for the period of extended operation.	None	None	H, 3
Supports ASME 1	SS	Carbon Steel	Borated Water Leakage (Ext)	Loss of material	Boric Acid Corrosion (B2.1.4)	III.B1.1-14	3.5.1.55	A

Table 3.5.2-22 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 Vol. 2 Item	Table 1 Item	Notes
Supports ASME 1	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Cumulative fatigue damage	Time Limited Aging Analysis evaluated for the period of extended operation.	III.B1.1-12	3.5.1.42	A, 5
Supports ASME 1	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	ASME Section XI, Subsection IWF (B2.1.29)	III.B1.1-13	3.5.1.53	B
Supports ASME 1	SS	Concrete	Plant Indoor Air (Structural) (Ext)	Reduction in concrete anchor capacity	Structures Monitoring Program (B2.1.32)	III.B1.1-1	3.5.1.40	A
Supports ASME 1	SS	Graphitic Tool Steel	Borated Water Leakage (Ext)	Loss of material	Boric Acid Corrosion (B2.1.4)	III.B1.1-14	3.5.1.55	A
Supports ASME 1	SS	Stainless Steel	Borated Water Leakage (Ext)	None	None	III.B1.1-10	3.5.1.59	A
Supports ASME 2 & 3	SS	Carbon Steel	Borated Water Leakage (Ext)	Loss of material	Boric Acid Corrosion (B2.1.4)	III.B1.2-11	3.5.1.55	A
Supports ASME 2 & 3	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of mechanical function	ASME Section XI, Subsection IWF (B2.1.29)	III.B1.2-2	3.5.1.54	B
Supports ASME 2 & 3	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Cumulative fatigue damage	Time Limited Aging Analysis evaluated for the period of extended operation.	III.B1.2-9	3.5.1.42	I, 4
Supports ASME 2 & 3	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	ASME Section XI, Subsection IWF (B2.1.29)	III.B1.2-10	3.5.1.53	B

Table 3.5.2-22 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 Vol. 2 Item	Table 1 Item	Notes
Supports ASME 2 & 3	NSRS, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Reduction in concrete anchor capacity	Structures Monitoring Program (B2.1.32)	III.B1.2-1	3.5.1.40	A
Supports ASME 2 & 3	SS	Stainless Steel	Borated Water Leakage (Ext)	None	None	III.B1.2-8	3.5.1.59	A
Supports ASME 2 & 3	SS	Stainless Steel	Plant Indoor Air (Structural) (Ext)	None	None	III.B1.2-7	3.5.1.59	A
Supports HVAC Duct	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.B2-10	3.5.1.39	A
Supports HVAC Duct	SS	Concrete	Plant Indoor Air (Structural) (Ext)	Reduction in concrete anchor capacity	Structures Monitoring Program (B2.1.32)	III.B2-1	3.5.1.40	A
Supports Instrument	NSRS, SS	Carbon Steel	Borated Water Leakage (Ext)	Loss of material	Boric Acid Corrosion (B2.1.4)	III.B2-11	3.5.1.55	A
Supports Instrument	NSRS, SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.B2-10	3.5.1.39	A
Supports Instrument	NSRS, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Reduction in concrete anchor capacity	Structures Monitoring Program (B2.1.32)	III.B2-1	3.5.1.40	A
Supports Mech Equip Class 1	SS	Carbon Steel	Borated Water Leakage (Ext)	Loss of material	Boric Acid Corrosion (B2.1.4)	III.B1.1-14	3.5.1.55	A
Supports Mech Equip Class 1	SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	ASME Section XI, Subsection IWF (B2.1.29)	III.B1.1-13	3.5.1.53	B

Table 3.5.2-22 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 Vol. 2 Item	Table 1 Item	Notes
Supports Mech Equip Class 1	SS	Concrete	Plant Indoor Air (Structural) (Ext)	Reduction in concrete anchor capacity	Structures Monitoring Program (B2.1.32)	III.B1.1-1	3.5.1.40	A
Supports Mech Equip Class 2 & 3	SS	Carbon Steel	Borated Water Leakage (Ext)	Loss of material	Boric Acid Corrosion (B2.1.4)	III.B1.2-11	3.5.1.55	A
Supports Mech Equip Class 2 & 3	NSRS, SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of mechanical function	ASME Section XI, Subsection IWF (B2.1.29)	III.B1.2-2	3.5.1.54	B
Supports Mech Equip Class 2 & 3	NSRS, SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	ASME Section XI, Subsection IWF (B2.1.29)	III.B1.2-10	3.5.1.53	B
Supports Mech Equip Class 2 & 3	SS	Carbon Steel	Raw Water (Ext)	Loss of material	ASME Section XI, Subsection IWF (B2.1.29)	None	None	H, 1
Supports Mech Equip Class 2 & 3	NSRS, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Reduction in concrete anchor capacity	Structures Monitoring Program (B2.1.32)	III.B1.2-1	3.5.1.40	A
Supports Mech Equip Non ASME	NSRS	Carbon Steel	Borated Water Leakage (Ext)	Loss of material	Boric Acid Corrosion (B2.1.4)	III.B4-11	3.5.1.55	A
Supports Mech Equip Non ASME	NSRS, SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.B4-10	3.5.1.39	A

Table 3.5.2-22 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 Vol. 2 Item	Table 1 Item	Notes
Supports Mech Equip Non ASME	NSRS, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Reduction in concrete anchor capacity	Structures Monitoring Program (B2.1.32)	III.B4-1	3.5.1.40	A
Supports Mech Equip Non ASME	NSRS	Stainless Steel	Plant Indoor Air (Structural) (Ext)	None	None	III.B4-8	3.5.1.59	A
Supports Non ASME	NSRS, SS	Carbon Steel	Borated Water Leakage (Ext)	Loss of material	Boric Acid Corrosion (B2.1.4)	III.B2-11	3.5.1.55	A
Supports Non ASME	NSRS, SS	Carbon Steel	Plant Indoor Air (Structural) (Ext)	Loss of material	Structures Monitoring Program (B2.1.32)	III.B2-10	3.5.1.39	A
Supports Non ASME	NSRS, SS	Concrete	Plant Indoor Air (Structural) (Ext)	Reduction in concrete anchor capacity	Structures Monitoring Program (B2.1.32)	III.B2-1	3.5.1.40	A
Supports Non ASME	ES, SS	Lubrite®	Plant Indoor Air (Structural) (Ext)	Loss of mechanical function	Structures Monitoring Program (B2.1.32)	III.B2-2	3.5.1.52	A
Supports Non ASME	NSRS	Stainless Steel	Borated Water Leakage (Ext)	None	None	III.B2-9	3.5.1.59	A
Supports Non ASME	NSRS	Stainless Steel	Plant Indoor Air (Structural) (Ext)	None	None	III.B2-8	3.5.1.59	A

Notes for Table 3.5.2-22:

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.

H Aging effect not in NUREG-1801 for this component, material and environment combination.

<u>Plant Specific Notes:</u>

1 This non-NUREG-1801 line was created because NUREG-1801 does not address carbon steel supports in raw water. The aging effects listed are the same as those listed in the Open-Cycle Cooling Water Section of NUREG-1801. Therefore the aging management program was chosen separately as this particular component is consistently under water and other aging management programs would not apply.

2 High strength bolting with an actual yield strength of greater than 150 ksi may be susceptible to stress corrosion cracking (SCC) if subjected to excessive bolt preload and contaminants, such as molybdenum sulfide in the thread lubricants. At WCGS, the maximum ultimate tensile strength for bolts was limited to 170 ksi. Of the bolting materials specified, only SA-540 Grade 21 has a specified minimum yield of equal to or greater than 150 ksi. Bolt preload was managed by procedural controls, and lubricants containing detrimental contaminants were not used. A review of plant operating experience has not found any instances of SCC. Therefore, cracking due to SCC is not an aging effect requiring management for high strength bolting at WCGS.

3 Fatigue design of Class 1E electrical raceway supports is a TLAA as defined in 10 CFR 54.3. TLAAs are evaluated in accordance with 10 CFR 54.21(c)(1). Section 4.3.7 describes the evaluation of this TLAA for the fatigue of Class 1E electrical raceway supports.

4 ASME Class 2 and 3 rules used for WCGS Class 2 and 3 piping and components require no fatigue or cycle design analysis for their supports, and no other similar analyses exist for supports for these components at WCGS.

5 For fluid system and component supports at WCGS, only a time-dependent analysis of reactor vessel supports for heatup operational events is a TLAA. Section 4.3.2.9 describes the evaluation of this TLAA.

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 for those component types identified in Section 2.5, Scoping and Screening Results – Electrical and Instrument and Control Systems, subject to aging management review. The electrical component types subject to aging management review are discussed in the following sections:

- Cable Connections (Metallic Parts) (Section 2.5.1.1)
- Connectors (Section 2.5.1.2)
- High Voltage Insulators (Section 2.5.1.3)
- Insulated Cables and Connections (Section 2.5.1.4)
- Penetrations Electrical (Section 2.5.1.5)
- Switchyard Bus and Connections (Section 2.5.1.6)
- Terminal Blocks (Section 2.5.1.7)
- Transmission Conductors and Connections (Section 2.5.1.8)
- Electrical Equipment Subject to 10 CFR 50.49 Environmental Qualification (EQ) Requirements (Section 2.5.1.9)

Table 3.6.1, Summary of Aging Management Evaluations 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.

3.6.2 Results

The following table summarizes the results of the aging management review for the component types in the Electrical and Instrumentation and Controls area.

- Table 3.6.2-1 Electrical and Instrument and Controls – Summary of Aging Management Evaluation – Electrical Components

This table uses the format of Table 2 discussed in Section 3.0.

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 subsections.

3.6.2.1.1 Cable Connections (Metallic Parts)

Materials

The materials of construction for the cable connections (metallic parts) are:

- Various Metals Used For Electrical Contacts

Environment

The cable connections (metallic parts) are exposed to the following environment:

- Plant Indoor Air

Aging Effects Requiring Management

The following cable connections (metallic parts) aging effect requires management:

- Loosening of bolted connections

Aging Management Programs

The following aging management program manages the aging effects for the cable connections (metallic parts):

- Electrical Connections Not Subject to 10 CFR 50.49 EQ Requirements (B2.1.36)

3.6.2.1.2 Connectors

Materials

The materials of construction for the connector contacts are:

- Various Metals Used For Electrical Contacts

Environment

The connector contacts are exposed to the following environment:

- Borated Water Leakage

Aging Effects Requiring Management

The following connector contacts aging effect requires management:

- Corrosion Of Connector Contact Surfaces

Aging Management Programs

The following aging management program manages the aging effects for the connector contacts:

- 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:

- Porcelain
- Carbon Steel (Galvanized or Coated)
- Cement (Electrical Insulators)

Environment

The high voltage insulators are exposed to the following environment:

- Atmosphere/Weather

Aging Effects Requiring Management

The following high voltage insulators aging effect require management:

- None

Technical justification for no aging effects requiring management

The WCGS 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 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 WCGS 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.

Aging Management Programs

Since there are no aging effects that require management for high voltage insulators, no aging management program is required.

3.6.2.1.4 Insulated Cables and Connections

3.6.2.1.4.1 Electrical cables and connections not subject to 10 CFR 50.49 EQ requirements

Materials

The materials of construction for the electrical cable and connections not subject to 10 CFR 50.49 EQ requirements are:

- Various Organic Polymers

Environment

The electrical cable and connections not subject to 10 CFR 50.49 EQ 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 EQ requirements aging effects require management:

- Embrittlement, cracking, melting, discoloration, swelling, or loss of dielectric strength leading to reduced insulation resistance (IR); electrical failure

Aging Management Programs

The following aging management program manages the aging effects for the cable and connections not subject to 10 CFR 50.49 EQ requirements:

- Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements (B2.1.24)

3.6.2.1.4.2 Electrical cables and connections used in instrumentation circuits not subject to 10 CFR 50.49 EQ requirements that are sensitive to reduction in conductor insulation resistance

Materials

The materials of construction for the electrical cables and connections used in sensitive instrumentation circuits not subject to 10 CFR 50.49 EQ requirements are:

- Various Insulation Material (Electrical) - various organic polymers

Environment

The electrical cables and connections used in sensitive instrumentation circuits not subject to 10 CFR 50.49 EQ requirements are exposed to the following environment:

- Adverse Localized Environment

Aging Effects Requiring Management

The following electrical cables and connections used in sensitive instrumentation circuits not subject to 10 CFR 50.49 EQ requirements aging effects require management:

- Embrittlement, cracking, melting, discoloration, swelling, or loss of dielectric strength leading to reduced insulation resistance (IR); electrical failure

Aging Management Programs

The following aging management program manages the aging effects for the cable and connections used in sensitive instrumentation circuits 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 (B2.1.25)

3.6.2.1.4.3 Inaccessible Medium Voltage Electrical Cables not subject to 10 CFR 50.49 EQ requirements

Materials

The materials of construction for the inaccessible medium voltage electrical cables not subject to 10 CFR 50.49 EQ requirements are:

- Various Organic Polymers

Environment

The inaccessible medium voltage electrical cables not subject to 10 CFR 50.49 EQ requirements are exposed to the following environment:

- Adverse Localized Environment

Aging Effects Requiring Management

The following inaccessible medium voltage electrical cables not subject to 10 CFR 50.49 EQ requirements aging effects require management:

- Localized damage and breakdown of insulation leading to electrical failure

Aging Management Programs

The following aging management program manages the inaccessible medium voltage electrical cables not subject to 10 CFR 50.49 EQ requirements:

- Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 EQ Requirements (B2.1.26)

3.6.2.1.5 Penetrations Electrical (Non-EQ Electrical Portion)

Materials

The materials of construction for the penetrations electrical (Non-EQ electrical portion) are:

- Various Organic Polymers

Environment

The penetrations electrical (Non-EQ electrical portion) are exposed to the following environment:

- Adverse Localized Environment

Aging Effects Requiring Management

The following penetrations electrical (Non-EQ electrical portion) aging effects require management:

- Embrittlement, cracking, melting, discoloration, swelling, or loss of dielectric strength leading to reduced insulation resistance (IR); electrical failure

Aging Management Programs

The following aging management program manages the penetrations electrical (Non-EQ electrical portion):

- Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements (B2.1.24)

3.6.2.1.6 Switchyard Bus and Connections

Materials

The materials of construction for the switchyard bus and connections are:

- Aluminum
- 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 require management:

- None

Technical justification for no aging effects requiring management

The WCGS outdoor environment is not subject to industry air pollution or saline environment. Aluminum bus material and stainless steel connection material does not experience any appreciable aging effects in this environment.

Aging Management Programs

Since there are no aging effects that require management for switchyard bus and connections, no aging management program is required.

3.6.2.1.7 Terminal Blocks

Materials

The materials of construction for the terminal blocks not subject to 10 CFR 50.49 EQ requirements are:

- Various Insulation Material (Electrical)

Environment

The terminal blocks not subject to 10 CFR 50.49 EQ requirements are exposed to the following environment:

- Adverse Localized Environment

Aging Effects Requiring Management

The following terminal blocks not subject to 10 CFR 50.49 EQ requirements aging effects require management:

- Embrittlement, cracking, melting, discoloration, swelling, or loss of dielectric strength leading to reduced insulation resistance (IR); electrical failure

Aging Management Programs

The following aging management program manages the aging effects for the terminal blocks not subject to 10 CFR 50.49 EQ requirements:

- Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements (B2.1.24)

3.6.2.1.8 Transmission Conductors and Connections

Materials

The materials of construction for the transmission conductors and connections are:

- Aluminum Conductor Steel Reinforced

Environment

The transmission conductors and connections are exposed to the following environment:

- Atmosphere/Weather

Aging Effects Requiring Management

The following transmission conductors and connections aging effect require management:

- None

Technical justification for no aging effects requiring management

The most prevalent mechanism contributing to loss of conductor strength of an Aluminum Conductor Steel Reinforced (ACSR) transmission conductor is corrosion, which includes corrosion of the steel core and aluminum strand pitting. ACSR conductor degradation begins as a loss of zinc from the galvanized steel core wires. Corrosion rates depend largely on air quality, which involves suspended particles in the air, SO2 concentration, rain, fog chemistry, and other weather conditions. The WCGS outdoor environment is not subject to industry air pollution or saline environment that would cause significant corrosion of the transmission conductors.

The National Electrical Safety Code (NESC) requires that tension on installed conductors be a maximum of 60% of the ultimate conductor 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 WCGS, the ACSR transmission conductors with a core of 7 steel strands have ultimate conductor strength of 42,200 lbs. The WCGS ACSR transmission conductors within the scope of License Renewal are installed so that conductor tension does not exceed 9,900 lbs at the NESC heavy loading condition (23% of the ultimate conductor strength).

Tests performed by Ontario Hydroelectric on ACSR transmission conductors with a core of 7 steel strands averaging 70 to 80 years old showed a 30% loss of ultimate conductor strength due to corrosion. Assuming a 30% loss of ultimate conductor strength (12,660 lbs) due to corrosion over 60 years the WCGS 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% of the ultimate conductor strength ((42,200- 12660)(0.60) = 17,724 lbs). The Ontario Hydroelectric test envelopes the conductors at WCGS, and based on the conservatism in strength margin, demonstrates that the material loss on the WCGS ACSR 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.

Aging Management Programs

Since there are no aging effects that require management for transmission conductors and connections, no aging management program is required.

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 subsections.

3.6.2.2.1 Electrical Equipment Subject to Environmental Qualification

Environmental Qualification (EQ) is a TLAA as defined in 10 CFR 54.3. Equipment qualification for degradation due to various aging mechanisms to which electrical equipment is subject must therefore be evaluated in accordance with 10 CFR 54.21(c)(1). The WCGS EQ program meets requirements of 10 CFR 50.49.

Section 4.4 describes the 10 CFR 54.21(c)(1) TLAA evaluation of electrical equipment subject to 10 CFR 50.49 environmental qualification.

3.6.2.2.2 Degradation of Insulator Quality due to Presence of Any Salt Deposits and Surface Contamination, and Loss of Material due to Mechanical Wear

The WCGS 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 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 WCGS 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.

3.6.2.2.3 Loss of Material due to Wind Induced Abrasion and Fatigue, 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 of an Aluminum Conductor Steel Reinforced (ACSR) transmission conductor is corrosion, which includes corrosion of the steel core and aluminum strand pitting. ACSR conductor degradation begins as a loss of zinc from the galvanized steel core wires. Corrosion rates depend largely on air quality, which involves suspended particles in the air, SO2 concentration, rain, fog chemistry, and other weather conditions. The WCGS outdoor environment is not subject to industry air pollution or saline environment that would cause significant corrosion of the transmission conductors.

The National Electrical Safety Code (NESC) requires that tension on installed conductors be a maximum of 60% of the ultimate conductor 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 WCGS the ACSR transmission conductors with a core of 7 steel strands have ultimate conductor strength of 42,200 lbs. The WCGS ACSR transmission conductors within the scope of License Renewal are installed so that conductor tension does not exceed 9,900 lbs at the NESC heavy loading condition (23% of the ultimate conductor strength).

Tests performed by Ontario Hydroelectric on ACSR transmission conductors with a core of 7 steel strands averaging 70 to 80 years old showed a 30% loss of ultimate conductor strength due to corrosion. Assuming a 30% loss of ultimate conductor strength (12,660 lbs) due to corrosion over 60 years the WCGS 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% of the ultimate conductor strength ((42,200- 12660)(0.60) = 17,724 lbs). The Ontario Hydroelectric test envelopes the conductors at WCGS, and based on the conservatism in strength margin, demonstrates that the material loss on the WCGS ACSR 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.

Transmission conductor connections at the time of installation are treated with corrosion inhibitors to avoid connection oxidation and torqued to avoid loss of pre-load. Based on temperature data in the USAR Chapter 2.3, the transmission connections do not experience thermal cycling. The transmission connections are subject to average monthly temperatures ranging from 80 ºF in July and August to 29 ºF in January with minimal ohmic heating. Therefore, increased resistance of connections due to oxidation or loss of pre-load is not an aging effect requiring management for the period of extended operation.

The WCGS outdoor environment is not subject to industry air pollution or saline environment. Aluminum bus material, galvanized steel support hardware and stainless steel connection material do not experience any appreciable aging effects in this environment. The design incorporates the use of stainless steel “Belleville” washers on the switchyard bus bolted electrical connections of dissimilar metals to compensate for temperature changes, to maintain the proper torque and prevent loss of pre-load.

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.

3.6.2.3 Time-Limited Aging Analysis

The time-limited aging analyses identified below are associated with the electrical and instrument 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 Electrical Equipment)

3.6.3 Conclusions

The Electrical and Instrument and Controls component types that are subject to aging management review have been evaluated. The aging management programs selected to manage the aging effects for the Electrical and Instrument 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, 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, the effects of aging associated with the Electrical and Instrument 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 Evaluations in Chapter VI of NUREG-1801 for Electrical Components

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.6.1.01	Electrical equipment subject to 10 CFR 50.49 environmental qualification (EQ) requirements	Degradation due to various aging mechanisms	Environmental Qualification Of Electric Components (B3.2)	Yes, TLAA	Environmental qualification of electric components is a TLAA. See further evaluation in subsection 3.6.2.2.1.
3.6.1.02	Electrical cables, connections and fuse holders (insulation) not subject to 10 CFR 50.49 EQ requirements	Reduced insulation resistance and electrical failure due to various physical, thermal, radiolytic, photolytic, and chemical mechanisms	Electrical Cables and Connections Not Subject To 10 CFR 50.49 EQ Requirements (B2.1.24)	No	Consistent with NUREG-1801.

Table 3.6.1 Summary of Aging Management Evaluations in Chapter VI of NUREG-1801 for Electrical Components (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.6.1.03	Conductor insulation for electrical cables and connections used in instrumentation circuits not subject to 10 CFR 50.49 EQ requirements that are sensitive to reduction in conductor insulation resistance (IR)	Reduced insulation resistance and electrical failure due to various physical, thermal, radiolytic, photolytic, and chemical mechanisms	Electrical Cables And Connections Used In Instrumentation Circuits Not Subject To 10 CFR 50.49 EQ Requirements (B2.1.25)	No	Consistent with NUREG-1801.
3.6.1.04	Conductor insulation for inaccessible medium voltage (2 kV to 35 kV) cables (e.g., installed in conduit or direct buried) not subject to 10 CFR 50.49 EQ requirements	Localized damage and breakdown of insulation leading to electrical failure due to moisture intrusion, water trees	Inaccessible Medium Voltage Cables Not Subject To 10 CFR 50.49 EQ Requirements (B2.1.26)	No	Consistent with NUREG-1801.
3.6.1.05	Connector contacts for electrical connectors exposed to borated water leakage	Corrosion of connector contact surfaces due to intrusion of borated water	Boric Acid Corrosion (B2.1.4)	No	Consistent with NUREG-1801.

Table 3.6.1 Summary of Aging Management Evaluations in Chapter VI of NUREG-1801 for Electrical Components (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.6.1.06	Fuse Holders (Not Part of a Larger Assembly): Fuse holders – metallic clamp	Fatigue due to ohmic heating, thermal cycling, electrical transients, frequent manipulation, vibration, chemical contamination, corrosion, and oxidation	Fuse Holders	No	Not applicable. All fuse holders including the fuses installed for electrical penetration protection are part of larger assemblies, so the applicable NUREG-1801 lines were not used.
3.6.1.07	Metal enclosed bus - Bus/connections	Loosening of bolted connections due to thermal cycling and ohmic heating	Metal Enclosed Bus	No	Not applicable. WCGS has no in scope metal enclosed bus, so the applicable NUREG-1801 lines were not used.
3.6.1.08	Metal enclosed bus – Insulation/insulators	Reduced insulation resistance and electrical failure due to various physical, thermal, radiolytic, photolytic, and chemical mechanisms	Metal Enclosed Bus	No	Not applicable. WCGS has no in scope metal enclosed bus, so the applicable NUREG-1801 lines were not used.
3.6.1.09	Metal enclosed bus – Enclosure assemblies	Loss of material due to general corrosion	Structures Monitoring Program (B2.1.32)	No	Not applicable. WCGS has no in scope metal enclosed bus, so the applicable NUREG-1801 lines were not used.
3.6.1.10	Metal enclosed bus – Enclosure assemblies	Hardening and loss of strength due to elastomers degradation	Structures Monitoring Program (B2.1.32)	No	Not applicable. WCGS has no in scope metal enclosed bus, so the applicable NUREG-1801 lines were not used.

Table 3.6.1 Summary of Aging Management Evaluations in Chapter VI of NUREG-1801 for Electrical Components (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.6.1.11	High voltage insulators	Degradation of insulation quality due to presence of any salt deposits and surface contamination, Loss of material caused by mechanical wear due to wind blowing on transmission conductors	A plant-specific aging management program is to be evaluated.	Yes	Exception to NUREG-1801. Aging effect in NUREG-1801 for this material and environment combination is not applicable. See further evaluation in subsection 3.6.2.2.2.
3.6.1.12	Transmission conductors and connections, Switchyard bus and connections	Loss of material due to wind induced abrasion and fatigue, Loss of conductor strength due to corrosion, Increased resistance of connection due to oxidation or loss of preload	A plant-specific aging management program is to be evaluated.	Yes	Exception to NUREG-1801. Aging effect in NUREG-1801 for this material and environment combination is not applicable. See further evaluation in subsection 3.6.2.2.3.
3.6.1.13	Cable Connections – Metallic parts	Loosening of bolted connections 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 (B2.1.36)	No	Consistent with NUREG-1801.

Table 3.6.1 Summary of Aging Management Evaluations in Chapter VI of NUREG-1801 for Electrical Components (Continued)

Item Number	Component Type	Aging Effect / Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.6.1.14	Fuse Holders (Not Part of a Larger Assembly) Insulation material	None	None	No	Not applicable. All fuse holders including the fuses installed for electrical penetration protection are part of larger assemblies, so the applicable NUREG-1801 lines were not used.

Table 3.6.2-1 – Electrical and Instrument and Controls – Summary of Aging Management Evaluation – Electrical Components

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
10 CFR 50.49 Electrical Equipment	EC, IN	Various Organic Polymers and Metallic Materials	Adverse Localized Environment (Ext)	Various degradation	Time Limited Aging Analysis evaluated for the period of extended operation.	VI.B-1	3.6.1.01	A
Cable Connections (Metallic Parts)	EC	Various Metals Used for Electrical Contacts	Plant Indoor Air (Ext)	Loosening of bolted connections	Electrical Connections Not Subject to 10 CFR 50.49 EQ Requirements (B2.1.36)	VI.A-1	3.6.1.13	A
Connector	EC	Various Metals Used for Electrical Contacts	Borated Water Leakage (Ext)	Corrosion of connector contact surfaces	Boric Acid Corrosion (B2.1.4)	VI.A-5	3.6.1.05	A
High Voltage Insulator	NSRS	Carbon Steel (Galvanized or Coated)	Atmosphere/ Weather (Ext)	None	None	VI.A-9	3.6.1.11	I, 1
High Voltage Insulator	NSRS	Carbon Steel (Galvanized or Coated)	Atmosphere/ Weather (Ext)	None	None	VI.A-10	3.6.1.11	I, 1
High Voltage Insulator	IN	Cement (Electrical Insulators)	Atmosphere/ Weather (Ext)	None	None	VI.A-9	3.6.1.11	I, 1
High Voltage Insulator	IN	Cement (Electrical Insulators)	Atmosphere/ Weather (Ext)	None	None	VI.A-10	3.6.1.11	I, 1
High Voltage Insulator	IN	Porcelain	Atmosphere/ Weather (Ext)	None	None	VI.A-9	3.6.1.11	I, 1

Table 3.6.2-1 – Electrical and Instrument 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 Vol. 2 Item	Table 1 Item	Notes
High Voltage Insulator	IN	Porcelain	Atmosphere/ Weather (Ext)	None	None	VI.A-10	3.6.1.11	I, 1
Insulated Cable & Connections	EC, IN	Various Organic Polymers	Adverse Localized Environment (Ext)	Embrittlement, cracking, melting, discoloration, swelling, or loss of dielectric strength leading to reduced insulation resistance (IR); electrical failure	Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements (B2.1.24)	VI.A-2	3.6.1.02	A
Insulated Cable & Connections	EC, IN	Various Organic Polymers	Adverse Localized Environment (Ext)	Embrittlement, cracking, melting, discoloration, swelling, or loss of dielectric strength leading to reduced insulation resistance (IR); electrical failure	Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements Used in Instrumentation Circuits (B2.1.25)	VI.A-3	3.6.1.03	A
Insulated Cable & Connections	EC, IN	Various Organic Polymers	Adverse Localized Environment (Ext)	Localized damage and breakdown of insulation leading to electrical failure	Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 EQ Requirements (B2.1.26)	VI.A-4	3.6.1.04	A

Table 3.6.2-1 – Electrical and Instrument 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 Vol. 2 Item	Table 1 Item	Notes
Penetrations Electrical	EC, IN	Various Organic Polymers	Adverse Localized Environment (Ext)	Embrittlement, cracking, melting, discoloration, swelling, or loss of dielectric strength leading to reduced insulation resistance (IR); electrical failure	Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements (B2.1.24)	VI.A-2	3.6.1.02	C
Switchyard Bus and Connections	EC	Aluminum	Atmosphere/ Weather (Ext)	None	None	VI.A-15	3.6.1.12	I, 2
Switchyard Bus and Connections	EC	Stainless Steel	Atmosphere/ Weather (Ext)	None	None	VI.A-15	3.6.1.12	I, 2
Terminal Block	IN	Various Insulation Material (Electrical)	Adverse Localized Environment (Ext)	Embrittlement, cracking, melting, discoloration, swelling, or loss of dielectric strength leading to reduced insulation resistance (IR); electrical failure	Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements (B2.1.24)	VI.A-6	3.6.1.02	C
Transmission Conductors and Connections	EC	Aluminum Conductor Steel Reinforced	Atmosphere/ Weather (Ext)	None	None	VI.A-16	3.6.1.12	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.

C Component is different, but consistent with NUREG-1801 item for 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 3.6.2.2.2

2 See further evaluation 3.6.2.2.3

CHAPTER 4

TIME-LIMITED AGING ANALYSES

4.0 TIME-LIMITED AGING ANALYSES

4.1 INTRODUCTION

Chapter 4 describes the Time-Limited Aging Analyses (TLAAs) for the WCGS in accordance with 10 CFR 54.3(a) and 54.21(c). Subsequent sections describe TLAAs within these common general categories:

The information on each specific TLAA within these general categories is organized under three subheads:

Summary Description

A brief description of the TLAA topic and of the affected components.

Analysis

A description of the current licensing basis analysis, that is, of the TLAA itself, including implications of the extended licensed operating period.

Disposition

The disposition of the TLAA for the extended licensed operating period, in accordance with 10 CFR 54.21(c)(1):

- Validation - 10 CFR 54.21(c)(1)(i) - The analysis remains valid for the period of extended operation, or
- Revision - 10 CFR 54.21(c)(1)(ii) - The analysis has been projected to the end of the period of extended operation, or
- Aging Management - 10 CFR 54.21(c)(1)(iii) - The effects of aging on the intended function(s) will be adequately managed for the period of extended operation.

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 (the Rule) only if it meets all six of the 10 CFR 54.3(a) criteria:

> Time-limited aging analyses are those licensee calculations and analyses that:
>
> (1) Involve systems, structures, and components within the scope of license renewal;
>
> (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; and
>
> (6) Are contained or incorporated by reference in the CLB [current licensing basis].

The Rule requires that:

> (1) 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.
>
> (2) A list must be provided 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 §54.3. The applicant shall provide an evaluation that justifies the continuation of these exemptions for the period of extended operation.

A list of potential TLAAs was assembled from regulatory guidance and industry experience, including:

- The NUREG-1800, “Standard Review Plan for License Renewal”
- The NEI 95-10 “Industry Guideline for Implementing the Requirements of 10 CFR 54, the License Renewal Rule”
- The 10 CFR 54 Final Rule “Statement of Considerations”
- Westinghouse Engineering Owner’s Group Topical Reports
- Prior license renewal applications
- Plant-specific document reviews and interviews with plant personnel.

Keyword searches examined the current licensing basis (CLB) to determine whether the design or analysis feature of each potential TLAA exists in the WCGS licensing basis, and to identify additional potential unit-specific TLAAs. The CLB search included:

- The Updated Safety Analysis Report (USAR)
- Technical Specifications
- The NRC Safety Evaluation Report (SER) for the original operating license
- All subsequent NRC Safety Evaluations (SEs)
- WCNOC and NRC docketed licensing correspondence.

Licensing basis program documents, such as the in-service inspection and equipment qualification programs (ISI and EQ programs), were reviewed separately.

Only those potential TLAAs meeting all six criteria of 10CFR54.3(a) are actual TLAAs requiring disposition in accordance with 54.21(c). The list of potential TLAAs was reviewed (screened) against the six 10 CFR 54.3(a) criteria from information in the CLB source documents, such as:

- Design calculations
- Code stress reports or code design reports
- Environmental Qualification Work Packages
- ISI reports (ASME Section XI Summaries of Reportable Indications)
- Design Basis Documents
- Drawings

- Specifications

These TLAA source documents confirmed the screening and provided the information and the basis for the dispositions in this chapter.

4.1.2 Aging Management Review

NUREG-1801 identifies numerous aging effects that require evaluation as possible TLAAs in accordance with 10 CFR 54.21(c). Each of these was reviewed in the appropriate aging management review, or in this chapter, and dispositioned as a TLAA if identified as such under the 10 CFR 54.3(a) criteria. Tables 3.1.1, 3.2.1, 3.3.1, 3.4.1, 3.5.1 and 3.6.1, as discussed in Section 3.0, Aging Management Reviews, list the TLAA line items of the NUREG-1801 Volume 1 Summary Tables, and identify the specific sections relating to the required further evaluations.

4.1.3 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 §54.3. The applicant shall provide an evaluation that justifies the continuation of these exemptions for the period of extended operation.

A search of docketed correspondence, the operating license, and the Updated Safety Analysis Report (USAR) identified and listed exemptions in effect. Each exemption in effect was then evaluated to determine whether it involved a TLAA as defined in 10 CFR 54.3.

The search found 12 exemptions that have been granted pursuant to 10CFR50.12.

One of the 10 CFR 50.12 exemptions from the original SER and Operating License is supported in part by a TLAA. This is an exemption from the then-current requirement of 10 CFR 50 Appendix A, General Design Criterion 4 to assume a break "…equivalent … to the double-ended rupture of the largest pipe in the reactor coolant system." This exemption was granted with the Safety Evaluation Report for the original license. The supporting leak-before-break analysis is based in part upon an evaluation of fatigue effects for the original 40-year licensed operating period. This TLAA is described in Section 4.3.2.11.

One exemption granted in 1999 permitted use of ASME Code Case N-514 for determining the low-temperature overpressure protection (cold over pressurization mitigation system, COMS) pressure setpoint. Although this permitted change in method did not depend on a TLAA - and the exemption therefore also did not depend on a TLAA - the calculation of the COMS setpoint itself is a TLAA, and is so described in Section 4.2.4.

4.1.4 Summary of Results

Sections 4.2 through 4.7 list and describe six general categories of TLAAs. They are listed in Table 4.1-1. They are presented in the order in which they appear in Sections 4.2 and following of the NUREG-1800, “Standard Review Plan for the Review of License Renewal Applications for Nuclear Power Plants.”

NUREG-1800, 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 summarizes the results of the WCGS review of the analyses identified in NUREG-1800 Tables 4.1-2 and 4.1-3.

Table 4.1-1: List of TLAAs

TLAA Category	Description	Disposition Category[(1)]	Report Section
1.	Reactor Vessel Neutron Embrittlement		4.2
	Neutron Fluence, Upper Shelf Energy and Adjusted Reference Temperature (Fluence, USE, and ART)	ii, iii	4.2.1
	Pressurized Thermal Shock (PTS)	ii	4.2.2
	Pressure-Temperature (P-T) Limits	ii	4.2.3
	Low Temperature Overpressure Protection (LTOP)	ii	4.2.4
2.	Metal Fatigue		4.3
	Fatigue Aging Management Program		4.3.1
	ASME Section III Class 1 Fatigue Analysis of Vessels, Piping, and Components		4.3.2
	Reactor Pressure Vessel, Nozzles, Head, and Studs	i, iii	4.3.2.1
	Control Rod Drive Mechanism (CRDM) Pressure Housings, Adapter Plugs, and Canopy Seals	i	4.3.2.2
	Reactor Coolant Pump Pressure Boundary Components	i, iii	4.3.2.3
	Pressurizer and Nozzles	iii	4.3.2.4
	Steam Generator ASME Section III Class 1, Class 2 Secondary Side, and Feedwater Nozzle Fatigue Analyses	iii	4.3.2.5
	ASME Section III Class 1 Valves	i, iii	4.3.2.6

Table 4.1-1: List of TLAAs (Continued)

TLAA Category	Description	Disposition Category[1]	Report Section
	ASME Section III Class 1 Piping and Piping Nozzles	i, iii	4.3.2.7
	Bulletin 88-11 Revised Fatigue Analysis of the Pressurizer Surge Line for Thermal Cycling and Stratification	iii	4.3.2.8
	Primary Coolant System Heatup Expansion Noise Events	i	4.3.2.9
	High Energy Line Break Postulation Based on Fatigue Cumulative Usage Factor	i, iii	4.3.2.10
	Fatigue Crack Growth Assessment in Support of a Fracture Mechanics Analysis for the Leak-Before-Break (LBB) Elimination of Dynamic Effects of Primary Loop Piping Failures	i, iii	4.3.2.11
	ASME Section III Subsection NG Fatigue Analysis of Reactor Pressure Vessel Internals	ii, iii	4.3.3
	Effects of the Reactor Coolant System Environment on Fatigue Life of Piping and Components (Generic Safety Issue 190)	i, iii	4.3.4
	Assumed Thermal Cycle Count for Allowable Secondary Stress Range Reduction Factor in B31.1 and ASME Section III Class 2 and 3 Piping	i, ii	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 IE Electrical Raceway Support Angle Fittings for Seismic Events	i	4.3.7
3.	Environmental Qualification of Electrical Equipment	iii	4.4
4.	Concrete Containment Tendon Prestress	i, iii	4.5
5.	Containment Liner Plate, Polar Crane Bracket, and Penetration Load Cycles		4.6
	Absence of a TLAA for Containment Liner Plate, Polar Crane Bracket, and Containment Penetration Design (Except Main Steam Penetrations)	—	4.6.1
	Design Cycles for the Main Steam Line Penetrations	i	4.6.2
6.	Plant-Specific Time-Limited Aging Analyses		4.7

Table 4.1-1: List of TLAAs (Continued)

	Containment Polar Crane, Fuel Building Cask Handling Crane, Spent Fuel Pool Bridge Crane, and Fuel Handling Machine CMAA-70 Load Cycle Limits	i	4.7.1
	Absence of a TLAA for Reactor Vessel Underclad Cracking Analyses	—	4.7.2
	Absence of a TLAA in a Reactor Coolant Pump Flywheel Fatigue Crack Growth Analysis	—	4.7.3

1 i 10 CFR 54.21(c)(1)(i) – Validation: Demonstration that “The analyses remain valid for the period of extended operation,”

ii 10 CFR 54.21(c)(1)(ii) – Revision: Demonstration that “The analyses have been projected to the end of the period of extended operation,” or

iii 10 CFR 54.21(c)(1)(iii) – Aging Management: Demonstration that “The effects of aging on the intended function(s) will be adequately managed for the period of extended operation.”

Table 4.1-2 Review of Analyses Listed in NUREG-1800 Tables 4.1-2 and 4.1-3

NUREG-1800 Examples	Applicability to WCGS	Section
NUREG-1800, Table 4.1-2– Potential TLAAs		
Reactor vessel neutron Embrittlement	Yes	4.2
Concrete containment tendon prestress	Yes	4.5
Metal fatigue	Yes	4.3
Environmental qualification of electrical equipment	Yes	4.4
Metal corrosion allowance	No No explicit 40-year basis applies.	N/A
Inservice flaw growth analyses that demonstrate structure stability for 40 years	No No explicit 40-year basis applies.	N/A
Inservice local metal containment corrosion analyses	No No explicit 40-year basis applies.	N/A
High-energy line-break postulation based on fatigue cumulative usage factor	Yes	4.3.2.10
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.	4.7.2
Low-temperature overpressure (LTOP) analyses	Yes	4.2.4
Fatigue analysis for the main steam supply lines to the turbine-driven auxiliary feedwater pumps	Yes 7000-cycle stress range reduction factor only.	4.3.5
Fatigue analysis for the reactor coolant pump flywheel	No No explicit 40-year basis applies.	4.7.3

Table 4.1-2 Review of Analyses Listed in NUREG-1800 Tables 4.1-2 and 4.1-3

NUREG-1800 Examples	Applicability to WCGS	Section
Fatigue analysis of polar crane	Yes Design to CMAA-70.	4.7.1
Flow-induced vibration endurance limit, transient cycle count assumptions, and ductility reduction of fracture toughness for the reactor vessel internals	Yes WCGS is designed to ASME Section III Subsection NG, 1974 edition. No WCGS is designed with no explicit 40-year embrittlement analysis for internals.	4.3.3
Leak before break	Yes	4.3.2.11
Fatigue analysis for the containment liner plate	No No fatigue evaluations were performed.	4.6.1
Containment penetration pressurization cycles	Yes Design cycles for main steam line penetrations.	4.6.2
Reactor vessel circumferential weld inspection relief (BWR)	No WCGS is a PWR.	N/A

4.2 REACTOR VESSSEL NEUTRON EMBRITTLEMENT ANALYSIS

Reactor vessel materials are subject to embrittlement, primarily due to exposure to neutron radiation. Absorbed energy increases with temperature up to a maximum (the Charpy impact test “upper-shelf energy,” USE). Neutron embrittlement decreases USE. RT_{NDT}, nil-ductility transition reference temperature, is determined for vessel materials before irradiation and indicates temperatures above which impact tests will demonstrate an acceptable USE. Neutron embrittlement raises this transition temperature. This increase (ΔRT_{NDT}) means that higher temperatures are required for the material to continue to act in a ductile fashion. The P-T curves are determined by the limiting adjusted reference temperatures (ART; or if at end-of-life, EOL ART). Low-temperature overpressure protection (LTOP) is provided by a cold overpressurization mitigation system (COMS), one of whose setpoints is determined by the calculation of the P-T limit curves.

Concerns for the possibility of thermal shock to the vessel while at high pressure have required evaluation of a ductile-brittle transition temperature screening parameter for PWR vessel material susceptibility to pressurized thermal shock, RT_{PTS}, similar to evaluations of EOL ART.

These limits and effects depend on lifetime neutron fluence, are part of the licensing basis, and support safety determinations and Technical Specification operating limits. Their calculations are therefore TLAAs. The supporting calculation of expected end-of-life vessel neutron fluence is similarly a TLAA.

At WCGS, limiting-material coupons have been tested at exposures comparable to those expected at the end of the period of extended operation. The tests demonstrate EOL USE values with considerable margins above the 50 ft-lbf acceptance criterion, and special methods were therefore unnecessary (See Section 4.2.1). The same tests demonstrate low values of EOL ART, and therefore permit generous operating margins to pressure-temperature (P-T) curve limits to the end of the period of extended operation, Section 4.2.3. See Section 4.2.4 for the related LTOP-COMS setpoint. The same coupon tests similarly demonstrate considerable margins between the reference temperatures for pressurized thermal shock for the vessel materials at the EOL fluence (RT_{PTS}), and their acceptance criteria, Section 4.2.2.

4.2.1 Neutron Fluence, Upper Shelf Energy and Adjusted Reference Temperature (Fluence, USE, and ART)

Summary Description

See Section 4.2.

Analysis

Surveillance Coupons and Fluence Monitoring

The WCGS surveillance program is consistent with 10 CFR 50 Appendix H. The coupons are actual samples from the materials used in the vessel [USAR 5.3.1.6]. However the weld material test specimens were not taken from excess material from the beltline region, for which an exemption was granted with the NUREG-0881, Safety Evaluation Report for the original license, Section 5.3.3 [Ref. 4.9.1]. WCGS coupon capsules are lettered U, V, W, X, Y, and Z. The U, Y, V, and X coupons have been withdrawn and examined (in that order), and the last W and Z capsules have been placed in storage. The W and Z capsules were removed to the spent fuel pool during the spring 2005 refueling outage at about 16.5 EFPY. These capsules had a lead factor of 4.11, and therefore reached a fluence equivalent to about 54 EFPY at the vessel surface at 13.83 EFPY, and would have reached two times this fluence at 26.8 EFPY. This withdrawal therefore meets the ASTM E185-82 criterion that states that capsules may be removed when the capsule neutron fluence is between one and two times the limiting fluence calculated for the reactor vessel at the end of expected life. This removal and the change to the withdrawal schedule have been reviewed and approved as required by Appendix H.

Vessel neutron fluence is now confirmed by ex-vessel dosimetry.

Fluence

The critical parameter for determining radiation embrittlement effects is lifetime fluence of neutrons with energies greater than 1 MeV. The original design basis estimate for the maximum expected fluence at the vessel clad-base metal interface at 40 years (32 effective full-power years, EFPY) has been revised to account for several effects. The unit rating has been increased, but the adoption of low-leakage core loadings has considerably reduced the flux in recent and planned future cycles. Increased plant capacity factors prompted the increase in the lifetime capacity factor assumed for fluence estimates from 80 to 90 percent, and hence increased the assumed EFPY from 32 to 35 for a 40-year life, or 54 EFPY for a 60-year life.

Table 4.2-1 summarizes the net effect of these changes.

Table 4.2-1: WCGS Reactor Vessel Peak Beltline Neutron Fluences

Case	EFPY	**Fluence** >1 MeV, x 10^{19} neutrons/cm^2
Original 40-year design basis estimate at the clad-base metal interface	32	3.14
Current 40-year licensing basis calculated projection at the clad-base metal interface, for the PTLR[1]	35	2.18
X-Capsule dosimeter 40-year calculated projection at the clad-base metal interface	35	2.23
X-Capsule dosimeter, actual exposure	<54	3.49
X-Capsule dosimeter 60-year calculated projection at the clad-base metal interface	54	3.51
X-Capsule dosimeter 60-year calculated projection at ¼ t through the vessel wall (Reg Guide 1.99 Revision 2 Section 1.1 Equation 3 attenuation)	54	2.09
X-Capsule dosimeter 60-year calculated projection at ¾ t through the vessel wall (Reg Guide 1.99 Revision 2 Section 1.1 Equation 3 attenuation)	54	0.742

The WCAP-16028 X-Capsule examination report [Ref. 4.9.10] projected neutron fluences to 54 EFPY, including effects of power rerate from 3411 to 3565 MWt, using methods consistent with Regulatory Guide 1.190, Revision 0, "Calculational and Dosimetry Methods for Determining Pressure Vessel Neutron Fluence." WCAP-16028 validated these projections by comparison of the measured Capsule X dosimetry reaction rates with expected rates from the calculated exposures; and evaluated the uncertainties in these projections as recommended by Regulatory Guide 1.190. WCAP-16028 Section 6.0 and Appendix A also projected the dpa alternative measure of neutron embrittlement (energy-dependent displacements per iron atom) to 54 EFPY, using methods consistent with ASTM E853 and E693, in support of Regulatory Guide 1.99, Revision 2, "Radiation Embrittlement of Reactor Vessel Materials," embrittlement assessment methods using dpa.

The measured exposure of these coupons is 3.49 x 10^{19} neutrons/cm^2, nearly equal to the 3.51 x 10^{19} now predicted for 54 EFPY (i.e., for a 60 year life, including rerate). This 54-EFPY, 60-year projection of 3.51 x 10^{19} neutrons/cm^2 is only 12 percent more than the original design basis 32 EFPY estimate of 3.14 x 10^{19} neutrons/cm^2.

USE and ART

WCNOC evaluated the X coupon set in 2003.

[1] This current *Pressure and Temperature Limits Report* is valid only up to about 20 EFPY and will be revised. See Section 0 below.

Table 4.2-2: Results of Examination of Capsule X Coupons

Parameter	Value
Measured mean 30 ft-lb transition temperatures of the limiting— • Weld Metal • HAZ (heat-affected zone of plate next to a weld) • Longitudinal Plate Coupons (parallel to rolling direction) • Transverse Plate Coupons	(ºF) 10.66 -74.34 36.11 55.97
Calculated mean 30 ft-lb transition temperature shifts of the limiting— • Weld Metal • HAZ (heat-affected zone of plate next to a weld) • Longitudinal Plate Coupons (parallel to rolling direction) • Transverse Plate Coupons	(ºF) 68.36 69.66 61.06 53.97
Measured mean 50 ft-lb transition temperatures of the limiting— • Weld Metal • HAZ (heat-affected zone of plate next to a weld) • Longitudinal Plate Coupons (parallel to rolling direction) • Transverse Plate Coupons	(ºF) 54.73 -52.92 67.75 97.04
Measured mean Charpy V-notch upper shelf energies (USE) of the limiting— • Weld Metal • HAZ (heat-affected zone of plate next to a weld) • Longitudinal Plate Coupons (parallel to rolling direction) • Transverse Plate Coupons (The acceptance criterion is 50 ft-lbf.)	(ft-lbf) 93 135 142 95

The WCAP-16028 analysis of the X vessel material coupons and the associated NRC staff evaluation [Ref. 4.9.12], indicate more-than-adequate EOL USE, and indicate that ART for the limiting material will remain modest and will permit adequate operating margins to P-T limits until the end of a 60-year period of extended operation.

Disposition: Revision, 10 CFR 54.21(c)(1)(ii); and Aging Management, 10 CFR 54.21(c)(1)(iii)

An updated Pressure and Temperature Limits Report (PTLR) based on the X-capsule coupon tests and analysis will be submitted later. See Section 4.2.3. The evaluation of the acceptability of these parameters will thereby have been projected to the end of the period of extended operation, with considerable margin, in accordance with 10 CFR 54.21(c)(1)(ii).

Aging management for fluence, USE, and ART therefore now consists of ex-vessel dosimetry and available reserve coupons, stored in the spent fuel pool, with exposures in excess of those expected for the vessel at the end of the period of extended operation, in case additional coupon tests are required. Additional vessel material is available if new coupons are needed. The validity of these parameters for the analyses that depend upon them will therefore be maintained and confirmed to the end of the period of extended operation in accordance with 10 CFR 54.21(c)(1)(iii).

The WCGS Reactor Vessel Surveillance program is described in Appendix B2.1.15.

4.2.2 Pressurized Thermal Shock (PTS)

Summary Description

The license renewal rule, at 10 CFR 54.4(a)(3), requires that the licensee evaluate all 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.

If the reference temperature for pressurized thermal shock (RT_{PTS}) for each heat of material of the reactor pressure vessel does not exceed 270 ºF for plates, forgings, and axial welds; or 300 ºF for circumferential welds (the PTS screening criteria), only the reactor pressure vessel is "relied on to demonstrate compliance" with 10 CFR 50.61. The reactor pressure vessel meets the PTS screening criteria and will continue to do so for the period of extended operation, and is therefore the only component relied upon to demonstrate compliance with 10 CFR 50.61.

10 CFR 50.61(b)(1) requires a re-evaluation of 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. License renewal therefore requires the re-evaluation of RT_{PTS}, even if the expected change is not significant.

Analysis

The original 1986 WCGS PTS submittal predicted a limiting beltline RT_{PTS} (in lower shell plate heat R2508-3) of only 152 ºF, even at 7×10^{19} high-energy neutrons/cm^2, more than twice the maximum 3.14×10^{19} fluence then expected for a 40-year life. At that then-expected EOL fluence, RT_{PTS} of this limiting plate was only 140 ºF. The net effect of power rerate and low-leakage cores has reduced flux and predicted fluences, and other changes (mostly refinements of chemistry data) have since affected the calculation basis, but the RT_{PTS} vs. fluence curves of Section IV of this original submittal indicate that it is still impossible for RT_{PTS} of the limiting plate material to reach the 270 ºF screening criterion in a 60-year life. Weld materials are even less limiting.

The plate material coupons were cut from plate heat R2508-3, the heat whose chemistry indicated the greatest susceptibility to embrittlement.

The predicted RT_{PTS} values for heat R2508-3 are higher than those for heat R2508-1, whose chemistry indicated that it should be less limiting. However, since there are no R2508-1 coupons, embrittlement parameters for this heat are predicted from unirradiated specimen data, chemistry, and fluence, with larger margins for uncertainties than those measured by test of irradiated coupons. The predicted end-of-life values for R2508-1 are therefore more limiting than the measured end-of-life values from irradiated R2508-3 coupons. However, when RT_{PTS} is predicted for both heats on a common basis, R2508-3 remains limiting. See Table 4.2-3.

Table 4.2-3 RT_{PTS} for Limiting WCGS Reactor Vessel Materials

Case (Fluences at stated EFPY are calculated rather than best-estimate.)	**EOL Years and EFPY**	**Fluence** >1 MeV, x 10^{19} n/cm^2	**Plate Heat R2508-1** (predicted)	**Plate Heat R2508-3** (predicted)	**Plate Heat R2508-3** (from test)
Original 1986 Licensing Basis Prediction	40, 32	3.14	121 ºF	140 ºF	—
Original 1986 Licensing Basis Prediction, high-fluence limiting case	>80, Undef.	7.0	138 ºF	152 ºF	—
Current 1998 V-Coupon Test and Prediction and 1999 PTLR Licensing Basis	40, 35	2.18	104 ºF	143 ºF	100 ºF
Latest 2003 X-Coupon Test and Prediction	40, 35	2.23	105 ºF	136 ºF	105 ºF
Latest 2003 X-Coupon Test and Prediction	60, 54	3.51	111 ºF	142 ºF	109 ºF
PTS Screening Criterion			**≤ 270 ºF**	**≤ 270 ºF**	**≤ 270 ºF**

The 2003 WCAP-16028 analysis of the "X" vessel material coupons, the WCAP-16030 X-coupon PTS report, and the NRC evaluation of this analysis, indicate that RT_{PTS} for the limiting material will remain well below its screening criterion until the end of a 60-year period of extended operation [Refs 4.9.10, 4.9.11, and 4.9.12].

The weld materials have even larger margins than these two plate heats, and one of these two plate heats will therefore remain limiting for PTS for the period of extended operation.

All materials in the reactor pressure vessel will therefore meet the PTS screening criteria with considerable margin at the end of the 60-year period of extended operation. Therefore no safety analysis by Regulatory Guide 1.154 alternative methods is required.

Disposition: Revision, 10 CFR 54.21(c)(1)(ii)

WCNOC will revise the Pressure and Temperature Limits Report for the period of extended operation as described in Section 4.2.3 and will at that time incorporate the projections of RT_{PTS} to the end of the 60-year licensed operating period reported in WCAP-16030 and summarized above, in accordance with 10 CFR 50.61(b)(1).

The evaluation of the PTS screening parameter will have been thereby projected to the end of the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii).

4.2.3 Pressure-Temperature (P-T) Limits

Summary Description

P-T limit curves are operating limits, conditions of the operating license, and are included in the Pressure and Temperature Limits Report (PTLR), as required by Technical Specifications. They are valid up to a stated vessel fluence limit, and must be revised prior to operating beyond that limit.

Analysis

The currently-applicable PTLR is valid only up to 20 EFPY, and is not based on the evaluation of the most-recently-withdrawn X-Coupon set.

As described in Section 4.2.1, the analysis of the X vessel coupons indicates that the adjusted reference temperature (ART) for the limiting material will remain modest and will permit adequate operating margins to P-T limits until the end of a 60 year period of extended operation.

Disposition: Revision, 10 CFR 54.21(c)(1)(ii)

WCNOC will revise the Pressure and Temperature Limits Report before reaching 20 EFPY, and will at that time project appropriate P-T limits to the end of the 60-year licensed operating period, in accordance with 10 CFR 54.21(c)(1)(ii).

4.2.4 Low Temperature Overpressure Protection (LTOP)

Summary Description

LTOP is required by Technical Specifications, Limited Condition for Operation 3.4.12, and is provided (in part) by the cold overpressurization mitigation system (COMS), which opens the power-operated relief valves at a setpoint determined by the currently-applicable pressure-temperature limits analysis.

The calculation of the P-T limit curves depends on assumed neutron fluence at the end of the period to which the limits are applicable, and is therefore a TLAA, as described in Section 4.2.3. However, once the P-T curves have been calculated, the subsequent calculation of the COMS setpoint is time-dependent only because it depends on the P-T limits.

Other setpoints and features of the COMS are not time-dependent.

Analysis

The COMS setpoint is established in the Pressure and Temperature Limits Report (PTLR). See also Section 4.2.3. The existing COMS setpoint is expected to be limiting for the extended operating period.

Disposition: Revision, 10 CFR 54.21(c)(1)(ii)

The COMS setpoint is established in the PTLR, which will be revised for the period of extended operation as described in Section 4.2.3.

4.3 METAL FATIGUE ANALYSIS

This section addresses design of mechanical system components supported by fatigue analyses; and also of components whose design depends on an assumed number of load cycles without a calculated fatigue usage factor.

Section 4.6 describes fatigue in the containment vessel.

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" (ASME Section III Class 1).[2] Fatigue analyses may also be invoked for Class 1 pump and valve pressure boundaries.

The design of piping and vessels to certain other codes and code sections, including ASME Section III Class 2 and 3, ANSI-ASME B31.1, and ASME Section VIII Division 2, may assume a stated number of full-range thermal and displacement cycles.

Westinghouse license renewal topical report WCAP-14575-A, "Aging Management Evaluation for Class 1 Piping and Associated Pressure Boundary Components," and the NRC staff evaluation of it [Refs. 4.9.16 and 4.9.17], catalog aging effects and the Class 1 components affected by them, and propose dispositions for the period of extended operation consistent with 10 CFR 54. This Section, particularly Subsection 4.3.2, supplies additional WCGS-specific information necessary for disposition of these TLAAs.

This Section also describes fatigue analyses and evaluations of a limited number of other non-Class 1 components that were evaluated to these and similar rules.

Basis of Fatigue Analyses

ASME Section III Class 1 design specifications define a set of static and transient load conditions for which components are to be designed. Although original design specifications commonly state that the transient conditions are for a 40-year design life, the fatigue analyses themselves are based on the specified number of occurrences of each transient rather than on this lifetime. The design number of each transient was selected to be somewhat larger than expected to occur during the 40 licensed life of the plant, based on operating experience, and on projections of future operation based on innovations in the system designs.

[2] Titles are from the 1971 edition of the code, as used for the reactor vessel and steam generators. Later editions reorganized the Section III material and removed the Division 1 title, so that this subsection became "Division 1 — Subsection NB, Class 1 Components."

Operating experience at WCGS and at other similar units has demonstrated that the assumed frequencies of design transients, and therefore the number of transients assumed for a 40-year life, were conservative; and that with few exceptions the design number would not have occurred within a 60-year life. The exceptions were of two kinds.

First, the NRC, industry, and specific plants, including WCGS, have identified some transient loads on some components that were not foreseen in the original design process; for example thermally stratified flow in the pressurizer surge line and feedwater system, and the primary system acoustic events at WCGS. These cases have required evaluations to assess their significance and some have required revision to design specifications and analyses.

Second, plant and industry operating experience has identified a few cases where cycles were being accumulated more rapidly than originally anticipated. At WCGS, for example, unnecessary switching of charging flow between the alternate paths was accumulating charging nozzle usage factor faster than anticipated, and an operating change was therefore introduced to reduce the number of cycles and to distribute them more evenly.

WCGS has implemented a fatigue monitoring program to assure that actual plant experience remains bounded by the assumptions used in the design calculations. With these revisions to the analyses and to operating practice, the more-recent fatigue monitoring program cycle count and fatigue usage results indicate that none of the design transients should occur more than the currently-specified number of times before the end of a 60-year period of extended operation, nor should the code usage factor limit of 1.0 be exceeded.

4.3.1 Fatigue Aging Management Program

In accordance with Wolf Creek Technical Specifications, the present WCGS fatigue aging management program uses cycle counting and usage factor tracking to ensure that actual plant experience remains bounded by design assumptions and calculations reflected in the USAR. It was customized, verified, and validated under a 10 CFR 50 Appendix B quality assurance program for plant-specific implementation at WCGS.

The program will be enhanced and augmented in order to support safe operation of the WCGS for the period of extended operation, as summarized in Section 4.3.1.3 and Appendix B3.1. The revised WCGS cycle counting and fatigue management program will monitor plant transients and cumulative usage factors (CUFs) for a subset of ASME Section III Class 1 reactor coolant pressure boundary vessel and piping locations, to ensure that licensing basis limits on fatigue effects, in all locations, are not exceeded without being identified, and without appropriate corrective measures.

4.3.1.1 Present WCGS Fatigue Monitoring Program

Scope

The present WCGS program monitors the components and piping listed in Table 4.3-2.

Corrective Action

Corrective action is initiated whenever a cycle count or usage factor action limit is reached. See Section 4.3.1.3 for the action limits of the enhanced program.

Margins

Fatigue analyses incorporate several conservative assumptions and methods. These ensure that usage factors predicted by the design calculation will exceed (or "bound") the usage factors actually accumulated by the components:

Fatigue Design Curve with Margin for Uncertainties and Moderate Environmental Effects: The ASME Section III fatigue S-N curves (allowable alternating stress intensity versus number of cycles) are based on regression analysis of a large number of fatigue data points for samples strain-cycled in air, with adjustments for the elastic modulus, and departure from zero mean stress, less a design margin for uncertainties, including modest environmental effects (ASME Section III - 1965, Par. N-415). The design margin is a factor of 2 on stress or 20 on cycles, whichever produced the lower, more conservative allowable for the data set.

Bounding Parameters for Transients: Fatigue analyses assume a given number of cycles of each of a set of transient events, each event defined by limiting pressure and temperature transients and other load conditions. Actual event cycles are seldom as severe as those considered in the analysis, the resulting stress ranges are lower, and the contributions to cumulative usage factor are therefore lower.

Actual Number of Event Cycles: The analytic limit for a fatigue analysis is a cumulative usage factor at any location of 1.0, calculated as the sum of all contributing partial usage factors for the design basis number of each of the design basis cyclic loading events. Therefore, even if the analysis showed a calculated usage factor at the 1.0 limit for a location, and even if the design basis number of events were reached for one event of a set, but not for the remainder, some margin will remain to the 1.0 limit because not as many of the other events will have occurred as assumed, and they will therefore not have contributed as much to the usage factor as the analysis assumed.

Operating experience at WCGS indicates that the original design basis number of events should not be reached in a 60-year operating life (see Table 4.3-1), nor should the code usage factor limit of 1.0 be exceeded (see Table 4.3-2).

4.3.1.2 Present and Projected Status of Monitored Locations

The program was implemented in 1997. The usage factors calculated by the program include the effects of cycles incurred before the program was installed, in two periods. Effects were counted or estimated from the operating history for the period between initial cold hydro in February 1982 to the installation of the automated transient data acquisition system in March 1992. Data from that system and from operating records were used thereafter, up to the implementation of the program.

Cycle Counts

Table 4.3-1 includes the cycle counts to December 31, 2005, plus an estimate of the number of cycles expected at 60 years.

These estimates are from the report of the evaluation of effects of the reactor coolant system environment on fatigue life, as described in Section 4.3.4, and use the December 31, 2005 cycles to date plus a conservative estimator similar to that used for cumulative usage factor, below. The notes address the basis for transients with zero cycles to date and other special cases.

Cumulative Usage Factors

Table 4.3-2 includes the cumulative usage factors at the locations monitored by the current program to December 31, 2005, and an estimate of the expected CUF at 60 years, from the report of the evaluation of effects of the reactor coolant system environment on fatigue life described in Section 4.3.4. The 60-year estimates apply scaling rules to account for those cases where recent experience demonstrates a change in the rate of accumulation, and weigh recent history more heavily than earlier.

Since these locations were chosen to represent the highest usage factors in the Class 1 components and piping systems, these estimates demonstrate that the 60-year period of extended operation should not produce fatigue usage factors greater than 1.0.

This table does not address possible increases in effective usage factor due to effects of the reactor coolant environment. The WCGS fatigue management program monitors all of the “NUREG\CR-6260” sample locations to be addressed at WCGS, as described in Section 4.3.4 and Table 4.3-5 and also marked in Table 4.3-2. (The two charging nozzles in Table 4.3-2 count as a single NUREG\CR-6260 location in Section 4.3.4 and Table 4.3-5.)

Projected Status at 60 Years

With the support of additional information supplied in the notes, these estimates demonstrate that the transient cycles expected in a 60-year period of extended operation will not produce fatigue usage factors, in locations whose secondary stress ranges are controlled by them, significantly in excess of those calculated by the analyses that assumed a 40-year life; and should produce none exceeding the code limit of 1.0.

Table 4.3-1 Significant Transient Cycle Limits Tracked by the WCGS Fatigue Management Program

Transient **Boldface** are Technical Specification surveillance transients. "(M)" are manually recorded, all others are recorded automatically.	**Design Limit**	**Cycles to 12/31/2005**	**Estimated Cycles to 60-Year EOL**[3]
Normal Events			
1. RCS Heatup at ≤ 100 °F/hour, T_{avg} from ≤ 200 °F to ≥ 550 °F	**200**	**27**[(4)]	**60**
2. RCS Cooldown at ≤ 100 °F/hour, T_{avg} from ≥ 550 °F to ≤ 200 °F	**200**	**25**[(4)]	**57**
3. Pressurizer Heatup at ≤ 100 °F/hour, T_{avg} from ≤ 200 °F to ≥ 650 °F	200	27	60
4. Pressurizer Cooldown at ≤ 200 °F in any one hour, T_{avg} from ≥ 650 °F to ≤ 200 °F	**200**	**25**	**57**
5. **Reactor Coolant Leak Test, Pressurized to ≥ 2485 psig**	**50**[(5)]	**6**	**9**
6. Refueling (M)	80	14	38
7. Turbine Roll Test (M)	20	9	13[(6)]
8. Loop Out of Service (M) • Normal Loop Shutdown • Normal Loop Startup	 80 70	 NS[(7)] 0	 NS[(7)] 0

3 These estimates are also the basis for the evaluation of effects of the reactor coolant on fatigue life in Section 0.

4 The recorded transients include successive heatups without intervening cooldowns, indicating that the difference between the number of heatup and cooldown cycles is due to very slow cooldowns not counted as significant cooldown transients.

5 200 events in the original source and in USAR Table 3.9(N)-1. However "In actual practice the primary side will be pressurized [only] to the normal operating pressure…" [USAR § 3.9(N).1.1]. The allowed number of equivalent full-pressurization cycles has therefore been reduced to 50 for fatigue monitoring purposes.

6 This test is required primarily during plant startup and test, and should therefore not recur unless major components are replaced.

7 Not stated or not separately stated; no value reported.

Table 4.3-1 Significant Transient Cycle Limits Tracked by the WCGS Fatigue Management Program

Transient **Boldface** are Technical Specification surveillance transients. "(M)" are manually recorded, all others are recorded automatically.	**Design Limit**	**Cycles to 12/31/2005**	**Estimated Cycles to 60-Year EOL**(3)
9. Reduced Temperature Return to Power (M)	2,000	0	0
Auxiliary Events			
10. Accumulator Safety Injection (Inadvertent Accumulator Blowdown)	4	1	2[8]
11. Inadvertent Safety Injection Actuation (HHSI, By High-head Centrifugal Charging Pumps)	60	6	9
12. LHSI Injection	N/A	1	2
13. COMS (LTOP) Actuation (M)	N/A	0	0
14. Loss of Normal Charging [(Loop 1)]	120	34	53
15. Loss of Alternate Charging [(Loop 4)]	120	8	35
16. Loss of Letdown [and Return to Service]	200	18	44
Upset Events			
17. Loss of Load Without Immediate Turbine or Reactor Trip, ≥ 15% of Rated Thermal Power to 0% of Rated Thermal	**80**	**2**	**3**
18. Loss of Offsite AC Power (LOOP) to the ESF Busses	**40**	**7**	**10**
19. Loss of Flow in One Reactor Coolant Loop -Loss or Trip of Only One Reactor Coolant Pump	**80**	**2**	**3**

[8] The 60-year projection is 2 cycles, but operating changes should prevent any recurrence of this event.

Table 4.3-1 Significant Transient Cycle Limits Tracked by the WCGS Fatigue Management Program

Transient **Boldface** are Technical Specification surveillance transients. "(M)" are manually recorded, all others are recorded automatically.	**Design Limit**	**Cycles to 12/31/2005**	**Estimated Cycles to 60-Year EOL**[(3)]
20. Reactor Trip, **100% to 0% of Rated Thermal Power** • No Inadvertent Cooldown, or • Cooldown with Safety Injection, or • Cooldown with No Safety Injection • No Inadvertent Cooldown, with Turbine Overspeed (Included in the 230 with No Inadvertent Cooldown)	**400** 230 10 160 (20 of 230)	**55** 55 0 0 NS[(9)]	**99**[(10)] 99 0 0 -
21. Auxiliary Spray Actuation, **Spray Water Differential ≥ 320 °F**	**10**	**0**	**0**
22. Inadvertent RCS Depressurization (M)	20	0	0
23. Inadvertent Startup of Inactive Loop (M)	10	0	0
24. Excessive Feedwater Flow (M)	30	0	0
25. Operating Basis Earthquake (OBE) (M)	200[(11)]	0	0
Test Events			
26. Reactor Coolant Hydrostatic Test, **Pressurized to ≥ 3106 psig**	**5**	**1**	**1**[(12)]
27. Secondary System Hydrostatic Test, **Pressurized to ≥ 1350 psig**	**5**[(13)]	**4**	**4**
Emergency Events			
28. Small-Break Loss-of-Coolant Accident (LOCA) (M)	5	0	0

9 Not stated or not separately stated; no value reported in the periodic fatigue monitoring summary reports.
10 Sum of estimates below.
11 20 earthquakes of 10 cycles each.
12 This test is not expected to recur.
13 In each steam generator.

Table 4.3-1 Significant Transient Cycle Limits Tracked by the WCGS Fatigue Management Program

Transient **Boldface** are Technical Specification surveillance transients. "(M)" are manually recorded, all others are recorded automatically.	**Design Limit**	**Cycles to 12/31/2005**	**Estimated Cycles to 60-Year EOL**(3)
29. Small Steam Line Break (M)	5	0	0
30. Complete Loss of Flow (M)	5	0	0
Faulted Events			
31. Large-Break LOCA (M)	1	0	0
32. Large Steam Line Break, > 6 inch Steam Line (M)	**1**	**0**	**0**
33. Simultaneous Steam Line - Feedwater Line Break (M)	1	0	0
34. Post-LOCA Operation (M) (Not tracked by the fatigue management program)	1	0	0

Table 4.3-2 Limiting Locations Tracked by the WCGS Fatigue Management Program

Location	CUF to 12/31/2005	Estimated CUF to 60-Year EOL[14]
1. Residual Heat Removal Cold Leg Return - Accumulator Safety Injection (ACCSI) Nozzles (4, 10-inch, 45-degree, tracked as one) (NUREG\CR-6260 location)[14]	0.0509	0.0633
2. High Head Safety Injection Boron Injection Tank (BIT HHSI) Cold Leg Nozzles (4, 3-inch, tracked as one)[15] (NUREG\CR-6260 location)[14]	0.1164	0.1635
3. Reactor Vessel Inlet Nozzles (NUREG\CR-6260 location)[14] (4, tracked as one)	0.0612	0.1347
4. Reactor Vessel Outlet Nozzles (NUREG\CR-6260 location)[14] (4, tracked as one)	0.1120	0.216
5. Alternate CVCS Charging Nozzle (Loop 4) (NUREG\CR-6260 location)[14]	0.0235	0.0985
6. Normal CVCS Charging Nozzle (Loop 1) (NUREG\CR-6260 location)[14]	0.1087	0.1586
7. Hot Leg Surge Line Nozzle (Including Thermal Stratification Effects) (NUREG\CR-6260 location)[14]	0.0249	0.0585
8. Pressurizer Lower Head	0.00074	0.00170
9. Pressurizer Heater Penetrations (all penetrations, tracked as one)	0.00175	0.00411
10A. Stm Generator A FW Nozzle Loc. 1 Stm Generator A FW Nozzle Loc. 2 Stm Generator A FW Nozzle Loc. 3 Stm Generator A FW Nozzle Loc. 4	0.1657 0.0840 0.0420 0.0463	0.347 0.1767 0.0842 0.0956

[14] These usage factors do not include environmental effects of reactor coolant, for which see Section 4.3.4
[15] From the Boron Injection Tank (BIT).

Table 4.3-2 Limiting Locations Tracked by the WCGS Fatigue Management Program

Location	CUF to 12/31/2005	Estimated CUF to 60-Year EOL(14)
10B. Stm Generator B FW Nozzle Loc. 1 Stm Generator B FW Nozzle Loc. 2 Stm Generator B FW Nozzle Loc. 3 Stm Generator B FW Nozzle Loc. 4	0.1826 0.0938 0.0432 0.0439	0.387 0.1982 0.0892 0.0920
10C. Stm Generator C FW Nozzle Loc. 1 Stm Generator C FW Nozzle Loc. 2 Stm Generator C FW Nozzle Loc. 3 Stm Generator C FW Nozzle Loc. 4	0.1877 0.0982 0.0454 0.0433	0.396 0.208 0.0956 0.0945
10D. Stm Generator D FW Nozzle Loc. 1 Stm Generator D FW Nozzle Loc. 2 Stm Generator D FW Nozzle Loc. 3 Stm Generator D FW Nozzle Loc. 4	0.1507 0.1059 0.0275 0.1136	0.305 0.221 0.0563 0.230
11. Pressurizer Spray Nozzle	0.01025	0.0205
12. Pressurizer Surge Line Nozzle (Including Thermal Stratification Effects)	0.00497	0.01168
13. Pressurizer Surge Line (Including Thermal Stratification Effects)	0.000013	0.00003

4.3.1.3 Program Enhancements for the Period of Extended Operation

The WCGS cycle counting and fatigue management program will be enhanced and augmented principally by additional components to be monitored and by definition of some additional component-specific and evaluation-specific action limits.

Scope

The program monitors a representative set of locations within existing ASME Section III Class 1 vessel and piping fatigue analyses. This set includes the NUREG/CR-6260 sample locations discussed in Section 4.3.4, except one for which the CUF calculation including environmental effects has been successfully validated for a 60-year life. The monitored locations will be sufficient to ensure that fatigue in any other locations of concern, not included in the set, are within the same system and subject to the same transients, or within a system affected by the same transients.

Enhanced Corrective Action Limits

Corrective action will be initiated if the periodic evaluation prescribed by the program indicates that a cumulative usage factor (CUF) limit might be exceeded in the next operating cycle. Corrective action may include reanalysis, repair, evaluation of the program scope and action limits, or augmented inspection, as required; and as approved by the code or by the NRC. Reanalysis may include reducing the assumed number of cycles for events which operating history demonstrates is rarer than originally assumed, in order to accommodate those events which have occurred more frequently.

The period of extended operation will require two sets of corrective action limits to maintain the basis of safety determinations supported by fatigue analyses:

- The first is the set of calculated usage factors at the locations monitored, as reported in code design reports. This set of action limits will address the high-energy-line-break-location (HELB) and leak-before-break (LBB) TLAAs (Sections 4.3.2.10 and 4.3.2.11). If the monitoring program indicates that these calculated values are exceeded, the worst-location usage factor assumed by the primary loop LBB analysis may be exceeded and its basis no longer valid; and similarly, usage factors in additional locations of other Class 1 piping may have arisen above 0.1, indicating that the HELB analysis should be revised to add new break locations.

- The second is some fraction of the code acceptance criterion of 1.0 for each location. These address the code design analysis TLAAs (Section 4.3.2), and when F_{EN} is applied to the monitored values for the NUREG/CR-6260 sample locations (Section 4.3.4), they address the evaluation of effects of the reactor coolant environment on fatigue.

  The fraction of 1.0 used may vary from one monitored location to another, and should be consistent with the expected usage factor accumulation rate for each location.

  Note that these second action limits will be reached no earlier than the first.

Enhanced Corrective Actions

Corrective actions of the WCGS Metal Fatigue of the Reactor Coolant Pressure Boundary program will be enhanced to ensure that on approach to an action limit, an evaluation will determine whether the scope of the monitoring program must be enlarged to include additional affected reactor coolant pressure boundary locations; to ensure that other locations do not approach the code limit without an appropriate action and that the bases of the LBB and HELB analyses are maintained.

The WCGS Metal Fatigue of the Reactor Coolant Pressure Boundary program is summarized in Appendix B3.1. The scope enhancements are incorporated in Table 4.3-2. Other enhancements are summarized in Appendix B3.1.

These enhancements will be required to address fatigue TLAAs in the period of extended operation. Wolf Creek Nuclear Operating Corporation will therefore complete these program enhancements before the end of the current licensed operating period. Changes in available monitoring technology or in the analyses themselves may by that time permit different action limits and action statements, or may re-define the program features and actions required to address the fatigue TLAAs.

4.3.2 ASME Section III Class 1 Fatigue Analysis of Vessels, Piping, and Components

Fatigue analyses are performed for ASME Section III Division 1 Class 1 piping, vessels, heat exchangers, pumps, and valves; and if applicable, their supports. Table 4.3-3 lists all Class 1 vessels, heat exchangers, pumps, piping and subcomponents that might be subject to Class 1 analyses, and the subsection of this chapter which addresses them.

The reactor vessel internals are not designed to ASME Section III Class 1 but are analyzed to ASME Section III Subsection NG. See Section 4.3.3.

Table 4.3-3 WCGS Class 1 Components and Piping

Component	WCGS Number[16]	Subsection
Reactor Pressure Vessel, Head, Studs, Shoes and Shims, and Supports	BB-RBB01	4.3.2.1
Control Rod Drive Motor (CRDM) Housings	[BB-RBB01]	4.3.2.2
CRDM Head Adapter Plugs	[BB-RBB01]	4.3.2.2
CRDM Seismic Support Platform, Spacer Plates, and Tie Rods	-	No fatigue analysis
Reactor Coolant Pump Casings, Supports, Main Flanges and Thermal Barrier Heat Exchangers	BB-PBB01A, B, C, D	4.3.2.3
Pressurizer	BB-TBB03	4.3.2.4
Steam Generators (Primary or Tube Side and Shell Side)[17]	BB-EBB01A, B, C, D	4.3.2.5
Pressure-Retaining Bolting (Included with the Reactor Vessel, Steam Generators, Reactor Coolant Pumps, Pressurizer, and Valves, as Applicable)	-	As noted
Valves	See list in 4.3.2.6	4.3.2.6
Piping	-	4.3.2.7

16 Brackets indicate a subcomponent.
17 The steam generator shell (steam) side is Class 2 but also received a Class 1 analysis.

Table 4.3-3 WCGS Class 1 Components and Piping

Component	WCGS Number(16)	Subsection
Main Reactor Coolant Loop Piping Nozzles and Thermowells	-	4.3.2.7
Supports for Class 1 Piping and Valves	-	No fatigue analysis

4.3.2.1 Reactor Pressure Vessel, Nozzles, Head, and Studs

Summary Description

The WCGS reactor vessel is designed to ASME Section III, Subsection NB (Class 1), 1971 Edition with addenda through Winter 1972.

Pressure-retaining and support components of the reactor pressure vessel are subject to an ASME Boiler and Pressure Vessel Code, Division 1, Section III, fatigue analysis. This analysis has been updated to incorporate redefinitions of loads and design basis events, operating changes, power rerate, and minor modifications. The currently-applicable fatigue analyses of these components are TLAAs.

See Section 4.3.2.9 for the evaluation of certain noise events affecting the fatigue analyses of the primary coolant system and reactor vessel.

Analysis

Effects of Power Rerate, T_{hot} Reduction, and up to 10 Percent Steam Generator Tube Plugging on the Vessel Fatigue Analysis

The WCGS power rerate modification included evaluation of a proposed reduction in normal operating hot leg temperature (T_{hot} reduction) and operation with up to 10 percent of steam generator tubes plugged. The code design report revision included review of operating conditions, including specified transient definitions, for the original power rating, rerated power, T_{hot} reduction, and maximum and minimum tube plugging, to determine the most limiting parameters. Stresses and fatigue usage were calculated for these bounding conditions. The calculated design stresses and fatigue usage factors in the revised design report therefore bound all operating conditions, at up to rerated power, with or without T_{hot} reduction, and for any level of tube plugging up to 10 percent.

The maximum effect of rerate on reactor vessel fatigue was an increase in cumulative fatigue usage factor for the core support lugs of only 0.001.

Effects of Cold Overpressure Mitigation System (COMS) Transients

Evaluation of the COMS transients determined that an increase in design basis usage factor of 0.06 would bound fatigue effects of these events at all locations in the vessel.

Effects on the Fatigue Analysis of the Expanded Stud Elongation Tolerance Band (Reduced-Pass Tensioning)

An amendment to the reactor vessel code design report supported an increase in the stud elongation tolerance band. The analysis found that the calculated 40-year cumulative usage factor in the studs increased from 0.478 to 0.610, or 0.670 with the conservative allowance for COMS transients.

Effects on the Fatigue Analysis of the Vessel, Head, and Studs of Operating with One Stud Detensioned

An addendum to the reactor vessel code design report supported operation for a single cycle with one stud detensioned. This is a contingency because of difficulties encountered in removing some of the studs from the vessel flange during one refueling outage. The threads in some of the stud holes were subsequently repaired to alleviate the problem. The analysis shows operation for one cycle with a stud detensioned has a negligible effect on fatigue usage.

WCGS has never operated without a stud detensioned. However this analysis remains valid and could be invoked if needed.

Effects on the Head Lifting Lug Fatigue Analysis from the Tensioner Clearance and Simplified Head Assembly (SHA) Modifications, COMS Transients, and Noise Events

The outside corners of the lifting lugs were trimmed off to provide clearance for the head tensioner, and the SHA modification increased the mass of the lifting assembly attached to the lifting lugs. These modification increased lifting stresses and the design basis loads on the lifting lugs during the 400 OBE cycles assumed for the fatigue analysis.

Evaluation of these modifications plus effects of the COMS and acoustic event transients (see Section 4.3.2.9) found that the stresses remain well within allowables and that the design basis maximum usage factor in the lifting lug holes is 0.31.

Effects on the Head and Lower Penetration Fatigue Analysis of the DMIMS Accelerometer Installation

An evaluation of accelerometer installations on the lifting lugs and on lower head instrument penetrations for the Digital Metal Impact Monitoring System (DMIMS, loose parts monitoring system) reported margins in allowable stresses, and estimated increases in those stresses; but did not calculate numerical values of the insignificant increases in fatigue usage factors.

Summary of Analyses

The limiting components for fatigue in the reactor pressure vessel pressure boundary and its supports (except the studs) are the bottom-mounted instrument tubes and the inlet and outlet nozzles. The design basis cumulative usage factors in these components do not exceed 0.4. Other components of the reactor pressure vessel pressure boundary and its supports are affected by similar loads and transients. The closure flanges, studs, and nuts are also subject to boltup cycles. However the maximum 40-year usage factor in the head and flanges is only about 0.08, including the COMS transient allowance. The maximum 40-year usage factor in the studs, including effects of an increased elongation tolerance and the conservative COMS transient allowance, is 0.672.

The reactor vessel primary coolant inlet and outlet nozzles and lower-head-to-shell juncture are evaluated for effects of the reactor coolant environment on fatigue behavior of these materials, consistent with NUREG/CR-06260. See Section 4.3.4.

Disposition: Validation, 10 CFR 54.21(c)(1)(i); and Aging Management, 10 CFR 54.21(c)(1)(iii)

Fatigue usage factors in the reactor vessel pressure boundary do not depend on effects that are time-dependent at steady-state conditions, but depend only on effects of operational, abnormal, and upset transient events, principally on startup and shutdown transients and on boltup. Table 4.3-1 demonstrates that at the current rate of accumulation of operating, abnormal, and upset event cycles, including head flange boltup cycles, the design basis number of events should be sufficient for 60 years of operation, and that the calculated usage factors should not be exceeded. The existing reactor vessel fatigue analyses will therefore remain valid for the period of extended operation, in accordance with 10 CFR 54.21(c)(1)(i).

The WCGS fatigue management program will ensure that this remains so, or that appropriate reevaluation or other corrective measures maintain the design and licensing basis by other acceptable means. Effects of fatigue in the reactor pressure vessel pressure boundary and its supports will thereby be managed for the period of extended operation, in accordance with 10 CFR 54.21(c)(1)(iii).

The WCGS Metal Fatigue of the Reactor Coolant Pressure Boundary program is described in Appendix B3.1.

4.3.2.2 Control Rod Drive Mechanism (CRDM) Pressure Housings, Adapter Plugs, and Canopy Seals

Summary Description

The WCGS CRDM housings are designed to ASME Section III, Subsection NB (Class 1), 1974 Edition with addenda through Winter 1974.

Pressure-retaining components of the reactor control rod drive mechanisms - the CRDM pressure housings, adapter plugs, and the added canopy seal clamp assemblies - are ASME Section III Class 1 components and have a Class 1 fatigue analysis. The analysis was reexamined for the power rerate and T_{hot} reduction modification, and for addition of canopy seal clamp assemblies.

Analysis

The highest calculated fatigue usage factor in the CRDM housings is 0.1093, significantly less than 1.0.

Effects of Power Rerate, T_{hot} Reduction, and up to 10 Percent Steam Generator Tube Plugging on the CRDM Adaptor Plug Analysis and CRDM Nozzle and Housing Analysis

The WCGS power rerate modification included evaluation of a proposed reduction in normal operating hot leg temperature and operation with up to 10 percent of steam generator tubes plugged. This rerating had no effect on the number of transients nor on the resulting stress ranges in the CRDM adapter plugs, and therefore none on their fatigue analysis. It similarly had only a diminishing effect on the thermal analysis of other CRDM pressure boundary components, and therefore the original fatigue analysis of these components remained valid.

Canopy Seal Clamp Assembly Modifications

WCGS experienced leakage at canopy seal welds on spare CRDM penetrations. The leaking welds were encapsulated by canopy seal clamp assemblies. The modification also included evaluation of similar seal weld clamp assemblies for spare core exit thermocouple penetrations. The clamp assemblies are qualified for a 40-year design life.

The code analysis for this modification examined the worst-case loads and fatigue usage factors for core exit thermocouple, active CRDM, and spare nozzles. The fatigue evaluation for this modification confirmed the previously-calculated maximum usage factor of 0.1093, at the worst-case CRDM housing to head weld.

Disposition: Validation, 10 CFR 54.21(c)(1)(i)

The maximum calculated usage factor in the CRDM pressure housings indicates that the design is adequate for nine times the number of specified design transients. Table 4.3-1 above demonstrates that at the current rate of accumulation of operating, abnormal, and upset event cycles the design basis number of events will be sufficient for 60 years of operation. The evaluation of fatigue effects in the CRDM pressure housings will therefore remain valid for the period of extended operation, in accordance with 10 CFR 54.21(c)(1)(i).

4.3.2.3 Reactor Coolant Pump Pressure Boundary Components

Summary Description

The pump pressure boundary was designed to ASME Section III, 1971 edition with addenda through Summer 1973. Subarticle NB-3400 of this edition and addenda, "Design of Class 1 Pumps," does not require a fatigue analysis, but the vendor specified a fatigue analysis.

Subparagraph NB-3222.4(d) includes provision for waiver of the fatigue analysis if limiting criteria are met. The original analysis included a Subparagraph NB-3222.4(d) fatigue waiver analysis, which demonstrated that no pump pressure boundary components required a fatigue analysis. However the vendor elected to perform conservative, simplified fatigue analyses for a number of components, and subsequent load definition changes eventually resulted in fatigue waivers or analyses applicable to a number of additional locations in the pump pressure boundary. These fatigue and fatigue waiver analyses have been updated to incorporate redefinitions of loads and design basis events, operating changes, power rerate, and minor modifications. The fatigue analyses are TLAAs. The fatigue waiver analyses are also TLAAs because they depend in part on the assumed numbers of design basis normal and upset transient cycles.

The WCGS reactor coolant pump casings and their support feet are one-piece castings. The casing therefore requires no internal weld inspections, and Code Case N-481 inspection relief is not applicable.

Analysis

A review of the code design reports finds that a Subparagraph NB-3222.4(d) fatigue waiver still applies to many components. Confirming, conservative fatigue analyses were applied to some of the components for which a fatigue waiver applies. The maximum design basis calculated cumulative usage factor for all components exceeds 0.8. Many of the analyses are conservative, since few of the components experience significant alternating stress, and the alternating stress ranges used for the fatigue analyses were therefore taken from zero to the limit stress for the particular transient, resulting in overly-conservative stress ranges. The most significant contributors to usage factor in all locations are startup and shutdown cycles.

Disposition: Validation, 10 CFR 54.21(c)(1)(i); and Aging Management, 10 CFR 54.21(c)(1)(iii)

Fatigue usage factors in the reactor coolant pumps do not depend on effects that are time-dependent at steady-state conditions, but depend only on effects of operational, abnormal, and upset transient events, principally on startup and shutdown transients. Table 4.3-1 above demonstrates that at the current rate of accumulation of operating, abnormal, and upset event cycles the design basis number of events will be sufficient for 60 years of operation. Therefore, the contribution of these transient events to fatigue usage in the reactor coolant pumps should not exceed that originally calculated without being identified, and without an appropriate evaluation and any necessary mitigating actions. The evaluation of fatigue effects in the reactor coolant pump pressure boundaries should therefore remain valid for the period of extended operation, in accordance with 10 CFR 54.21(c)(1)(i).

The WCGS fatigue management program will track events to ensure either that this remains so, or that appropriate reevaluation or other corrective action is taken if a design basis number of events is exceeded, or if usage factors approach the limit of 1.0. Effects of fatigue in the reactor coolant pump pressure boundaries will thereby be managed for the period of extended operation, in accordance with 10 CFR 54.21(c)(1)(iii).

The WCGS Metal Fatigue of Reactor Coolant Pressure Boundary aging management program is described in Appendix B3.1.

4.3.2.4 Pressurizer and Pressurizer Nozzles

Summary Description

The WCGS pressurizer is designed to ASME Section III, Subsection NB (Class 1), 1974 Edition.

Pressure-retaining and support components of the pressurizer are subject to an ASME Boiler and Pressure Vessel Code, Division 1, Section III, fatigue analysis. This analysis has been updated from time to time to incorporate redefinitions of loads and design basis events, operating changes, power rerate, and minor modifications; including the effects of thermal stratification in the lower head, surge nozzle, and surge line not included in the original analyses. The currently-applicable fatigue analyses of the pressurizer components are TLAAs.

The pressurizer and its nozzles are the subject of a Westinghouse Owners Group (WOG) License Renewal Topical Report, WCAP-14574-A, “License Renewal Evaluation: Aging Management Evaluation for Pressurizers.”

Analysis

Effects of Power Rerate, T_{hot} Reduction, and up to 10 Percent Steam Generator Tube Plugging on the Pressurizer Fatigue Analysis

The WCGS power rerate modification included evaluation of a proposed reduction in normal operating hot leg temperature (T_{hot} reduction) and operation with up to 10 percent of steam generator tubes plugged. The code design report revision included review of operating conditions, including specified transient definitions, for the original power rating, rerated power, T_{hot} reduction, and maximum and minimum tube plugging, to determine the most limiting parameters. Stresses and fatigue usage were calculated for these bounding conditions. The calculated design stresses and fatigue usage factors in the revised design report therefore bound all operating conditions, at up to rerated power, with or without T_{hot}

reduction, and for any level of tube plugging up to 10 percent. The evaluation required no revision to the pressurizer fatigue analysis.

Effects of NRC Bulletin 88-11 Thermal Stratification Transients

The current code design report includes a revision to the maximum usage factor in the surge nozzle, including effects of NRC Bulletin 88-11 thermal stratification.

For related thermal stratification effects in the surge line, see Section 4.3.2.8.

Insurge-Outsurge Transients

Insurge-outsurge events during startup or shutdown can introduce cooler hot leg water into the pressurizer, against the wall previously heated by hot pressurizer water, which thereby causes a significant thermal gradient in the pressurizer wall.

Surge effects in the pressurizer are mitigated by Technical Specification heatup and cooldown rate limits; and by the use of continuous spray during heatup and cooldown transients, which maintains a small flow from the pressurizer to the hot leg during heatup and cooldown. This maintains a uniform fluid temperature below the pressurizer heaters and in the upper portion of the surge line to prevent thermal stratification. These operating limits and the use continuous spray flow were instituted in 1993, and have been very effective in reducing fatigue usage accumulation in the lower pressurizer components since that time. Based on this experience, WCGS has concluded that a generic Westinghouse analysis of fatigue usage, including insurge/outsurge transient effects, is conservative for WCGS for 60 years of operation.

Effect of a Pinned Support on the Relief Line to BB-V-8010C

A pinned support in the discharge line from this valve had been recognized in 1987, and the effect of thermal cycles under this condition on the pressurizer nozzle usage factor was calculated and included in the analysis and in the design report. The pinned support also produced a plastic displacement in the relief valve line. An evaluation of the effect of the plastic displacement on the code fatigue analysis of the line found a small effect in the line, by comparison determined that the additional effect on the nozzle was negligible (<0.001), and therefore initiated no change to the pressurizer fatigue analysis.

Summary of Analyses

With the basis set of transients, including the power rerate and T_{hot} modification and other effects above, worst-case fatigue usage factors for the present design exceed 0.9 in a few pressurizer components.

Although the surge and spray nozzles and lower head are more subject to significant operating thermal cycles from thermal stratification and insurge-outsurge transients not considered in the original code analysis, operating procedure changes have minimized these transients, and updated generic analyses confirm that fatigue usage factors in the affected pressurizer components will be within acceptable limits for the originally-specified design transients, plus the number of these additional transients expected for an operating life of 60 years.

Disposition: Aging Management, 10 CFR 54.21(c)(1)(iii)

With the exception of thermal stratification effects in the surge nozzle, fatigue usage factors in the pressurizer pressure boundary and support components do not depend on effects that are time-dependent at steady-state conditions, but depend only on effects of operational, abnormal, and upset transient events. Table 4.3-1 above demonstrates that at the current rate of accumulation of operating, abnormal, and upset event cycles, the 40-year design basis number of events should be sufficient for 60 years of operation, and that the calculated usage factors should not be exceeded. The WCGS cycle counting and fatigue management program will track events to ensure either that this is so, or that appropriate reevaluation or other corrective measures maintain the design and licensing basis by other acceptable means.

The pressurizer surge nozzle, spray nozzle, and lower head may be subject to significant operating thermal stress cycles due to thermal stratification and insurge-outsurge cycles, and are therefore expected to be the limiting pressurizer components for fatigue. The fatigue usage factors of these locations are therefore specifically monitored. Table 4.3-2 shows that the expected usage factors in these locations should be acceptable for 60 years of operation.

Effects of fatigue in the pressurizer Class 1 pressure boundary and supports will thereby be managed for the period of extended operation, in accordance with 10 CFR 54.21(c)(1)(iii).

The WCGS Metal Fatigue of Reactor Coolant Pressure Boundary program is described in Appendix B3.1.

4.3.2.5 Steam Generator ASME Section III Class 1, Class 2 Secondary Side, and Feedwater Nozzle Fatigue Analyses

Summary Description

The steam generators are designed to ASME Section III, Subsection NB (Class 1) and Subsection NC (Class 2), 1971 Edition with addenda through Summer 1973.

Pressure-retaining and support components of the primary coolant side of the steam generators are subject to an ASME Boiler and Pressure Vessel Code, Division 1, Section III fatigue analysis. Although the secondary side is Class 2, pressure retaining parts of the steam generator satisfy the Class 1 criteria, including the Class 2 secondary side boundaries. These analyses have been updated to incorporate redefinitions of loads and design basis events, operating changes, power rerate, primary loop T_{hot} reduction, and minor modifications. The currently-applicable fatigue analyses of these components are TLAAs.

Outboard of the steam generator feedwater nozzles, there are also some fatigue evaluations of feedwater lines and of the auxiliary feedwater tees. However, none of these evaluations have to date produced licensing basis commitments or safety determinations supported by fatigue analyses of the auxiliary feedwater tees or any other portions of the feedwater or auxiliary feedwater systems, and therefore no fatigue calculation TLAAs.

Analysis

Steam Generator Tube Code Fatigue Analysis Not a TLAA

The design of the steam generators includes a code fatigue analysis of the steam generator tubes. This analysis would be a TLAA if the safety determination depended upon it. However the code fatigue analysis has not proved sufficient to support the safety determination.

The various tube degradation mechanisms not anticipated in the original design have required stringent periodic inspection programs in order to ensure adequate steam generator tube integrity. The steam generator tubes are, in effect, (1) no longer qualified for a licensed design life (10 CFR 54.3(a) Criterion 3), and the (2) the fatigue analysis is therefore no longer the basis of the safety determination; in this case that the tubes will maintain their pressure boundary function between primary and secondary systems (Criterion 5).

Therefore, even in installations (such as WCGS) with excellent material and chemistry control, the safety determination for integrity of steam generator tubes now depends on managing aging effects by a periodic inspection program rather than on the fatigue analysis, and the code fatigue analysis of the tubes is therefore not a TLAA.

Steam Generator Fatigue Analysis Including Effects of Power Rerate, T_{hot} Reduction, and up to 15 Percent Steam Generator Tube Plugging

The WCGS power rerate modification included evaluation of a proposed reduction in normal operating hot leg temperature (T_{hot} reduction) and operation with up to 10 percent of steam generator tubes plugged.

The current steam generator code design report reflects refinements in the analyses of some components and resulting reductions in calculated usage factors, including a design-life qualification of secondary closure bolting by analysis; and qualification of the primary manway studs by test. It also includes effects of up to 15 percent steam generator tube plugging, revised design basis transients, revised seismic spectra, and feed line acoustic pressure pulse transients. The calculated design stresses and fatigue usage factors in the revised design report therefore bound known operating conditions, at up to rerated power, with or without T_{hot} reduction, and for any level of tube plugging up to 15 percent.

With power rerate and the T_{hot} modification the worst-case usage factors calculated for the specified set of design basis transients exceed 0.9 in several steam generator components.

However, excepting the tubes (for which the safety determination depends on managing aging effects by a periodic inspection program rather than on the fatigue analysis), fatigue usage factors in the steam generator components do not depend on flow-induced vibration or other effects that are time-dependent at steady-state conditions, but depend only on effects of operational and upset transient events. The WCGS fatigue management program tracks these operational and upset events to ensure that the design basis number of them is not exceeded without an appropriate evaluation and any necessary mitigating actions. Table 4.3-1 demonstrates that the design basis number of these transients should not be exceeded in a 60-year design life.

Primary Manway Studs, with Power Rerate and T_{hot} Reduction

The primary manway bolts were replaced by bored studs to permit hydraulic tensioning and measurement of preload. The replacement studs met code stress criteria, but high calculated usage factors would have required their periodic replacement, at the rate of transient cycle accumulation implied by the original 40-year design life. The original bolts similarly required more frequent replacement. The studs were therefore qualified by test for the design basis set of lifetime transients.

Secondary Manway Bolts, Handhole (Inspection Port) Bolts, and Instrument Opening Bolts, with Power Rerate and T_{hot} Reduction

The high calculated usage factor in bolting for these openings originally required their periodic replacement, at the rate of transient cycle accumulation implied by the original 40-year design life. The increased rate of accumulation of fatigue usage factor with rerate and T_{hot} reduction reduced the secondary manway bolt replacement interval from 20 to 18 years. Since the bolting replacement interval was less than the design life, its basis was not at that point a TLAA. However refinements in the fatigue analyses of the current code design report demonstrate calculated design basis usage factors of less than 1.0 in the secondary manway bolts, handhole bolts, and instrument opening bolts, these bolts are therefore no longer periodically replaced, and the fatigue analyses of closure bolting for these openings are now therefore TLAAs. However, if the number of load cycles assumed by the fatigue analysis is not exceeded, the predicted usage factor remains within the allowable of 1.0.

Stub Barrels and Channel Heads Drilled and Tapped for DMIMS-DX Loose Parts Monitor Accelerometer Mountings

A 2004 addendum to the code stress report includes effects of tapping 1/4” - 28 UNF2B holes in the stub barrel and channel head of each steam generator for mounting digital metal impact monitoring system (DMIMS) accelerometers. The revised 40-year fatigue usage factors in these locations, calculated conservatively, are a significant fraction of the code limit of 1.0. Extending these results for a 60-year licensed operating period, at the rate of stress cycle accumulation assumed for the original 40-year design life, would predict a worst-case cumulative usage factor, at the mounting hole in the stub barrel, of greater than 1.0. However, if the number of load cycles assumed by the fatigue analysis is not exceeded, the predicted usage factor will remain within the allowable of 1.0.

Finite Element Analysis in Support of Feedwater Nozzle Thermal Stratification Transfer Functions for Stress-Based Fatigue Monitoring Not a TLAA

NRC Information Notices 91-38 “Thermal Stratification in Feedwater System Piping” and 98-11 “Thermal Fatigue Cracking of Feedwater Piping to Steam Generators” identified concerns with thermal stratification in feedwater piping and nozzles. The WCGS resolution of this problem included thermal monitoring over several operating cycles to assess the severity of the problem, analysis of these effects that indicated more-rapid-than-design accumulation of fatigue usage factor, which then prompted operating changes and addition of a startup feedwater heating system.

A finite element analysis identified the limiting locations, and provided scaling for global-to-local transfer functions to permit stress-based fatigue monitoring at the limiting locations. However, thermal monitoring following these changes did not indicate any significant alteration of the code analysis results. The code analysis therefore does not reflect these effects and the finite element analysis used to develop the fatigue transfer functions has therefore not been incorporated into the code stress analysis, and is therefore not a TLAA.

Repair of Primary Chamber Drains

The 2005 refueling outage inspections found cracked welds at the connection of the C and D steam generator primary drains to the lower heads. The welds and the drain couplings in all four steam generators were excavated and replaced, and the steam generator analysis was amended. However the limiting usage factor at these drains is inside the heads (locations unaffected by the repair), is unchanged, and remains limiting at this location in the heads.

Disposition: Aging Management, 10 CFR 54.21(c)(1)(iii)

The fatigue analysis of the steam generator tubes does not support the safety determination and is therefore not a TLAA. Fatigue usage factors in other steam generator pressure boundary and Class 1 support components, and qualification of the primary manway studs by test, do not depend on effects that are time-dependent at steady-state conditions, but depend only on effects of operational, abnormal, and upset transient events.

Manway, Handhole, and Instrument Opening Bolting – Possible Requalification or Replacement

Appropriate corrective measures will ensure that the design basis of the bolting is maintained if fatigue monitoring indicates that the original numbers of load cycles assumed by the original fatigue analysis may be exceeded, and therefore that usage factors in the secondary closure bolting may exceed 1.0 or that the basis for the qualification by test may be exceeded.

All Components

Table 4.3-1 above demonstrates that the specified set of design basis transient events should be sufficient for 60 years of operation, and that the calculated usage factors should not be exceeded. The WCGS fatigue management program will track events to ensure either that this remains so, or that appropriate reevaluation or other corrective action is taken if a design basis number of events is exceeded, and will maintain a current record of cumulative usage factor for each monitored location.

Effects of fatigue in the steam generator pressure boundaries and their supports will thereby be managed for the period of extended operation, in accordance with 10 CFR 54.21(c)(1)(iii).

The WCGS Metal Fatigue of Reactor Coolant Pressure Boundary program is described in Appendix B3.1.

4.3.2.6 ASME Section III Class 1 Valves

Summary Description

WCGS Class 1 valves (power-operated relief, pressurizer safety, control, motor- and air-operated, manual, and check) are designed to ASME Section III, Subsection NB, 1974 Edition and later addenda. Class 1 fatigue analyses are TLAAs only for Class 1 valves with inlets greater than four inches nominal.

Analysis

A review of WCGS Class 1 valve analyses and specifications found that fatigue analyses and possible TLAAs were performed only for the 6-inch pressurizer safety valves, for Class 1 check and gate valves over 4 inches nominal, and for one model of 1 1/2-inch angle globe valves.

However, the fatigue analysis for the 1 1/2-inch angle globe valves was required by neither code nor specification, is not discussed in any licensing basis document, was therefore not the basis for a safety determination, and is therefore not a TLAA. With that exception, no fatigue analyses were applied to any valves of four inches nominal inlet or less, and therefore no Class 1 fatigue analysis TLAAs support design of valves with inlets four inches or less. Conversely, fatigue analyses were applied to Class 1 valves with inlets greater than four inches, and all of these analyses of larger valves are TLAAs.

TLAA fatigue analyses or evaluations were performed for the following Class 1 valves:

Table 4.3-4 Class 1 Valves With TLAA Fatigue Analyses

Tag Number	Description	Normal Duty Ops N_A	CUF I_t
BB8010A, B, C	6" x 6" Pressurizer Safety Valves	$>10^6$	<0.4
BBPV8702A, B EJHV8701A, B	12" RHR Suction Gate Valves	$>10^6$	<1.0
BB8949A,B,C,D EJ8841A,B EP8818A,B,C,D	6" Swing Check Valves	$>10^6$	<0.4
BB8948A,B,C,D EP8956A,B,C,D	10" Swing Check Valves	820,000	<1.0

The allowed NB-3545.3 N_A normal duty operations far exceed those expected to occur. The calculated usage factors I_t for NB-3550 cyclic loads are less than the code limit of 1.0, and in all but the 12" RHR gate valves and 10 swing checks I_t is less than 0.4.

Disposition: Validation, 10 CFR 54.21(c)(1)(i); and Aging Management, 10 CFR 54.21(c)(1)(iii)

The calculated worst-case usage factors for Class 1 pressurizer safety valves and for 6" swing check valves indicate that the designs have large margins, and therefore that the pressure boundaries would withstand fatigue effects for at least two of the original design lifetimes. The design of these valves for fatigue effects is therefore valid for the period of extended operation, in accordance with 10 CFR 54.21(c)(1)(i).

The calculated worst-case usage factors for the Class 1 12 inch RHR suction gate valves and the 10 inch Class 1 check valves exceed 0.4. However, fatigue usage factors in these valves do not depend on effects that are time-dependent at steady-state conditions, but depend only on effects of operational, abnormal, and upset transient events. As discussed in Section 4.3.2.7, the current rate of accumulation of operating, abnormal, and upset event cycles on Class 1 piping systems containing valves indicates that the 40-year design basis number of events will be sufficient for 60 years of operation, and that the calculated usage factors should not be exceeded. (The exceptions discussed in Section 4.3.2.7 are the surge line and surge line nozzle. This line has no valves).

The WCGS Metal Fatigue of Reactor Coolant Pressure Boundary program will ensure either that this remains so, or that appropriate reevaluation or other corrective action is taken if a design basis number of events is exceeded. Effects of fatigue in Class 1 valve pressure boundaries will thereby be managed for the period of extended operation, in accordance with 10 CFR 54.21(c)(1)(iii).

The WCGS Metal Fatigue of Reactor Coolant Pressure Boundary program is described in Appendix B3.1.

4.3.2.7 ASME Section III Class 1 Piping and Piping Nozzles

Summary Description

Class 1 reactor coolant main-loop piping designed and supplied by Westinghouse is designed to ASME Section III, Subsection NB, 1974 edition with addenda through Winter 1975. The main loop piping fatigue analysis was performed to the 1974 edition with addenda through Winter 1975. The fatigue analyses of piping outside the main loop used code addenda through summer 1979.

These analyses have been updated from time to time to incorporate redefinitions of loads and design basis events, operating changes, power rerate, and minor modifications. The currently-applicable fatigue analyses of these components are TLAAs.

For fatigue in the pressurizer surge line see Section 4.3.2.8.

For the evaluation of certain noise events affecting the fatigue analyses of the primary coolant system and reactor vessel see Section 4.3.2.9. The evaluation of these noise events found no effect on the primary coolant piping fatigue analysis.

Analysis

In the primary coolant system and large-bore emergency core cooling (ECCS) lines the attachment welds to the reactor vessel inlet and outlet nozzles, and the primary coolant system ECCS injection nozzles (Loop 1 and 4 CVCS charging nozzles, BIT (HHSI) nozzles, and accumulator safety injection (ACCSI) nozzles) have the most limiting calculated design basis usage factors, approximately 1.0 at some locations. The high usage factors in the ECCS injection nozzles are primarily due to transient thermal stresses from normal operating and upset injection events.

Calculated design basis usage factors in smaller Class 1 lines also exceed 0.9 at a number of locations, in many cases due to operating transients that specifically affect the location.

With the exception of the thermowells and pressurizer surge line nozzle discussed in this section and the pressurizer surge line discussed in Section 4.3.2.8, fatigue usage factors in these components do not depend on effects that are time-dependent at steady-state conditions, but depend only on effects of operational, abnormal, and upset transient events. Since the WCGS cycle counting and fatigue management program will track these events, the design basis fatigue usage factor limit (1.0) will not be exceeded in these locations without an appropriate evaluation and any necessary mitigating actions.

Analysis of Supports

Only the pressurizer surge line was re-evaluated to a code edition and addendum (1986, no addenda) which might have required design of the supports for stress limits based on a finite number of lifetime load cycles. However, the original code of record (1974 W'75, fatigue analysis to 1977 S'79) was the same as that for other Class 1 lines and did not invoke this requirement, and it was not invoked for the reanalysis. The supports were analyzed to the code of record. See Section 4.3.2.8.

Effects of NRC Bulletin 88-11 Thermal Stratification on the Hot Leg Pressurizer Surge Line Nozzle

The current code analysis includes this effect. See also Section 4.3.2.8. The WCGS fatigue management program calculates fatigue usage factor in this nozzle.

Effects of Power Rerate, T_{hot} Reduction, and Allowance for Increased Steam Generator Plugging on the Piping Fatigue Analyses

Evaluations performed to incorporate the effects of power rerate, T_{hot} reduction, and steam generator tube plugging selected parameters and transient descriptions that envelope worst case conditions for original power rating, rerated power, original T_{hot}, proposed (but not implemented) reduced T_{hot}, and steam generator tube plugging up to 10 percent. Therefore, the analysis results are conservative for any combination of these conditions.

Charging Lines and Nozzles

In 1990 Westinghouse identified concerns with CVCS injection path switching and containment isolation testing practices that might introduce a larger-than-design number of significant thermal transients in these nozzles. WCGS therefore revised operating procedures to ensure that significant injection nozzle thermal cycles are minimized. With these changes, Table 4.3-1 demonstrates that the specified set of design basis transient events will be sufficient for the 60-year period of extended operation, and Table 4.3-2 demonstrates that the projected usage factors in these nozzles should not exceed 1.0 in 60 years.

RTD Nozzles

The RTD piping has been removed and these nozzles will therefore accumulate no significant additional fatigue usage factor. Thermowells have been added at some of these nozzles, as described below.

Thermowells added at RTD Nozzles

The modification that removed RTD bypass piping added thermowells at the 12 primary loop hot leg RTD scoop nozzles (3 nozzles per hot leg) and at the 4 cold leg RTD nozzles, and capped the 4 return nozzles to the crossover legs. The thermowells were analyzed for fatigue due to flow-induced vibration. The maximum calculated usage factor for a 40-year life at 75 per cent availability is 0.025, in the cold leg thermowells

Fatigue due to these loads is proportional to operating time. The worst-case usage factor can therefore be projected to and validated for a 60-year life. The 90 per cent capacity factor now expected requires no more than about 98 per cent availability. Hence the worst usage factor in any of the RTD thermowell locations would be

$$CUF_{60} = CUF_{40} \times 0.98/0.75 \times 60/40$$

$$CUF_{60} = 0.025 \times 0.98/0.75 \times 60/40 = 0.049,$$

and therefore remains negligible.

Effects of NSAL-94-025 Reactor Coolant Pump Support Column Tilt on Main Loop Piping and Supports

Westinghouse identified a concern that reactor coolant pump support column tilt may have an adverse effect on main loop piping thermal stresses during heatup and cooldown transients. The Westinghouse evaluation found the effects on stresses and usage factors would not affect code compliance or the conclusions of the leak-before-break analysis (Section 4.3.2.11).

Disposition: Validation, 10 CFR 54.21(c)(1)(i); and Aging Management, 10 CFR 54.21(c)(1)(iii)

Validation

With the exception of the thermowells and surge line nozzle discussed above and the pressurizer surge line discussed in Section 4.3.2.8, usage factors in Class 1 piping pressure boundaries do not depend on effects that are time-dependent at steady-state conditions, but depend only on effects of operational, abnormal, and upset transient events. With these exceptions, Table 4.3-1 shows that at the current rate of accumulation of operating, abnormal, and upset event cycles, the 40-year design basis number of events should be sufficient for 60 years of operation, and the fatigue analyses of most primary system piping and nozzles are therefore validated for the period of extended operation as described above, in accordance with 10 CFR 54.21(c)(1)(i).

The fatigue analysis of primary loop thermowells has been validated for the period of extended operation, in accordance with 10 CFR 54.21(c)(1)(i).

Aging Management

The WCGS Metal Fatigue of Reactor Coolant Pressure Boundary program is described in Appendix B3.1. This program counts significant transient events and thermal cycles and tracks usage factors in the bounding set of sample locations listed in Table 4.3-2, including the surge line hot leg nozzle and other critical locations. The WCGS fatigue management program will ensure either that the original design basis number of events or usage factor is not exceeded, or that appropriate reevaluation or other corrective action is taken.

Primary coolant RTD nozzles will not be monitored because the attached piping has been removed and these nozzles will therefore accumulate no significant additional usage factor.

Effects of fatigue in the Class 1 piping pressure boundary will thereby be managed for the period of extended operation, in accordance with 10 CFR 54.21(c)(1)(iii).

See also Section 4.3.4 for effects of the reactor coolant environment on NUREG/CR-06260 sample locations in the surge line hot leg nozzle, charging nozzles, safety injection (BIT) nozzles, and ACCSI injection nozzles.

4.3.2.8 Bulletin 88-11 Revised Fatigue Analysis of the Pressurizer Surge Line for Thermal Cycling and Stratification

NRC Bulletin 88-11 “Pressurizer Surge Line Thermal Stratification” requested that licensees “establish and implement a program to confirm pressurizer surge line integrity in view of the occurrence of thermal stratification” and required them to “inform the staff of the actions taken to resolve this issue.”

A similar earlier Bulletin 88-08 “Thermal Stresses in Piping Connected to Reactor Coolant System” requested that licensees review the primary coolant pressure boundary and connected interfaces for possible effects of thermal cycles due to leaking interface valves. WCGS installed temperature monitoring to detect leakage past the auxiliary spray valve. Monitoring has not prompted a revision to the piping analysis.

See Section 4.3.2.4 for effects on the pressurizer surge nozzle. See Section 4.3.2.7 for effects on the hot leg surge nozzle.

Summary Description

The original surge line fatigue analysis used code addenda through summer 1979. The surge line design was re-evaluated 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. These results have been incorporated into the piping and main-loop nozzle code design reports.

Winter 1982 and later code addenda provide stress limits for high-cycle fatigue of Class 1 supports, under Subsubarticle NF-3330. However the re-evaluation of the surge line for NRC Bulletin 88-11 did not retroactively impose these requirements and therefore no TLAA arises for design of the supports.

Analysis

Effects of Thermal Stratification on the Surge Line Piping Fatigue Analysis

The maximum calculated CUF at any location in the surge lines, under the current analysis of record, including thermal stratification effects, is less than 0.1.

Effects of Power Rerate and T_{hot} Reduction on the Surge Line Piping Fatigue Analysis

The evaluation of these modifications found that the resulting changes in temperature ranges have negligible effect on the surge line analysis.

Disposition: Aging Management, 10 CFR 54.21(c)(1)(iii)

The surge line is subject to fatigue monitoring. The WCGS fatigue management program will ensure either that the usage factor remains valid for the period of extended operation or that appropriate corrective measures maintain the design and licensing basis by other acceptable means. Effects of fatigue in the Class 1 surge line will thereby be managed for the period of extended operation, in accordance with 10 CFR 54.21(c)(1)(iii).

The Metal Fatigue of Reactor Coolant Pressure Boundary program is described in B3.1.

4.3.2.9 Primary Coolant System Heatup Expansion Noise Events

Summary Description

Since 1990, abrupt audible events have been heard inside containment at WCGS toward the end of primary system heatups. They have been attributed to an abrupt release of differential expansion energy, originally believed to be at the crossover piping support saddle shims, later found to have probably also occurred between the reactor vessel support pads and shoes, under the vessel main loop nozzles. The evaluation of these effects on the vessel, piping, nozzle, and component fatigue analyses is a TLAA, as is the projection of shakedown effects in a reactor vessel support element.

Analysis

The driver for these events was modeled as the simultaneous sudden release of compressive loads on the reactor vessel nozzles. The resulting piping, support, and nozzle loads are within allowable limits, with the exception of a local region of the reactor vessel support cooling box, described below.

For purposes of evaluating fatigue effects the analysis assumed 330 such heatup noise events would occur in a 60-year design life.

Monitoring for the noise occurrence from Refuel 5 through Refuel 14 has detected 16 noise events, or about 1.6 per refueling cycle. Assuming a total of 30 cycles have already been expended, 300 cycles remain for the remaining life of the plant. Plant life from the present to the end of the extended operating period is an additional 40 years, or about an additional 27 refuelings at the present 18-month cycle. Up to 11 noise events could therefore occur per refueling cycle, at the magnitude assumed in the fatigue calculation, and still remain within the limits assumed by the fatigue calculation.

Reactor Pressure Vessel Structural Analysis

The increase in cumulative usage factor (CUF) in the affected inlet and outlet nozzle-to-shell junctures was calculated by combining the effects of 330 such peak stress range events with the appropriate ranges of related events from the original vessel fatigue analysis, under the Code stress range combination rules for fatigue. The resulting total CUFs are nominal, about 0.11 for the inlet nozzles, 0.18 for the outlet nozzles.

Reactor Coolant Loop Piping Analysis

Resulting stresses in piping are much less than the endurance limit, resulting moment stress ranges at piping nozzle welds are less than the T-Z limit; and therefore the events have no effect on fatigue usage nor on the conclusions of the piping analysis.

Reactor Coolant Loop Leak-Before-Break (LBB) Analysis

The recommended LBB margins are maintained, and the conclusions of the LBB analysis therefore remain valid.

Reactor Coolant Loop Primary Component Supports Evaluation

All of the primary equipment supports were qualified for normal and upset allowables for the sudden-release loads of the noise event.

Reactor Vessel Support Cooling Box Evaluation

The support cooling box is not a pressure boundary component. A local region of the cooling box, bearing on the imbedded steel, may have exceeded yield, but shakedown is occurring or has occurred and the support is and will remain stable. This was confirmed by an elastic-plastic shakedown analysis, and is indicated by the fact that the event occurred at increasingly higher temperatures with successive heatups, and finally at the same temperature for the last three heatups prior to the May 2001 report date.

Steam Generator Primary Nozzle Evaluation

The effect of these noise events on the steam generator primary nozzle fatigue analysis was evaluated assuming 330 noise events might occur through the end of an extended 60-year licensed operating period. The sum of the added fatigue usage factor due to the noise events, plus the originally-calculated 40-year usage factor, is only 0.063 at the worst location in the primary nozzles. If the originally-calculated 40-year usage factor were multiplied by 1.5 to account for the increased life, the sum of these two values would be only 0.087.

Monitoring Program

The analysis of data to date indicates no significant effects, and no increase and apparent declines in effects.

Effects of Power Rerate and T_{hot} Reduction on the Analysis of Effects of the Noise Events

The rerate report found that revised fatigue results "…accounted for both the noise program loadings and the modified design thermal transient conditions of the rerating program," and that other effects of rerate on the analysis of these events are negligible.

Disposition: Validation, 10 CFR 54.21(c)(1)(i)

Reactor Pressure Vessel, Reactor Coolant Loop, Primary Loop Component Supports, and LBB Analyses

The evaluation found that the effect of these events on the reactor pressure vessel and reactor coolant loop and support fatigue analyses, and on the reactor coolant loop LBB analysis, is zero or insignificant for the period of extended operation. The effect of these events has therefore been projected to the end of the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

Reactor Vessel Supports

The effect of this event on vessel supports is within normal and upset allowables, with the exception of a local region of the reactor vessel support cooling box. This region is shaking down or has shaken down to a stable response to these events, and will therefore be suitable for the period of extended operation. The effect of these events has therefore been projected to the end of the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

Steam Generator Primary Nozzles

The effect of these events on the steam generator primary nozzles has been projected to the end of the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

4.3.2.10 High Energy Line Break Postulation Based on Fatigue Cumulative Usage Factor

Summary Description

Selection of pipe failure locations for evaluation of the consequences on nearby essential systems, components, and structures, except for the reactor coolant loop, is in accordance with Regulatory Guide 1.46, and NRC Branch Technical Positions ASB 3-1 and MEB 3-1.

A revised stress analysis also permitted omission of the surge line intermediate breaks.

A leak-before-break analysis (LBB) eliminated large breaks in the main reactor coolant loops. See Section 4.3.2.11.

Analysis

The citation of MEB 3-1 means that breaks in piping with ASME Section III Class 1 fatigue analyses are identified based on cumulative usage factor (with the stated exception of the reactor coolant system primary loops), and that these determinations are therefore TLAAs.

The surge line intermediate break locations were eliminated based on usage factor. The most recent piping analysis confirmed the elimination of these break locations. The analysis that justified the elimination of these intermediate locations in the surge line is therefore a TLAA.

The same would be true of other line sections with no intermediate locations with fatigue usage factors above 0.1, if this analysis result were used to eliminate intermediate breaks - that is, the determination that there are no intermediate breaks in these sections based on a low usage factor would, for the same reason, be a TLAA. However, no additional cases similar to the surge line occur in the WCGS licensing basis. The scope of these HELB-location TLAAs is therefore limited to ASME Section III Class 1 piping analyses of other than the RCS primary coolant loops, including the surge line.

WCGS has containment penetration break exclusion regions ("no break zones"). However these contain no ASME Section III Class 1 piping with fatigue analyses, and their qualification is therefore based only on calculated stress. The break locations in these no break zones are therefore independent of time and are not supported by a TLAA.

Disposition: Validation, 10 CFR 54.21(c)(1)(i); and Aging Management, 10 CFR 54.21(c)(1)(iii)

Validation

Break locations which depend on usage factor, and their absence in the surge line, will remain valid as long as the calculated usage factors are not exceeded. With the possible exception of the pressurizer surge line, Table 4.3-1 demonstrates that the specified set of design basis transient events should not be exceeded during the 60-year period of extended operation, and therefore that the HELB break locations should remain valid in these lines for the period of extended operation, in accordance with 10 CFR 54.21(c)(1)(i).

Aging Management

The WCGS Metal Fatigue of Reactor Coolant Pressure Boundary program described in Appendix B3.1 will ensure that the calculated fatigue usage factors upon which the HELB break locations are based, and the HELB locations, will remain valid for the period of extended operation, or that appropriate corrective measures maintain the design and licensing basis by other acceptable means.

4.3.2.11 Fatigue Crack Growth Assessment in Support of a Fracture Mechanics Analysis for the Leak-Before-Break (LBB) Elimination of Dynamic Effects of Primary Loop Piping Failures

Summary Description

A leak-before-break analysis eliminated the large breaks in the main reactor coolant loops, which permitted omission of evaluations of their jet and pipe whip effects. This permitted omission of large jet barriers and whip restraints. The containment pressurization and equipment qualification analyses retained the large-break assumptions. A revised stress analysis also permitted omission of the surge line intermediate breaks.

The dynamic effects from postulated pipe breaks have been eliminated from the structural design basis of the reactor coolant system primary loop piping, as allowed by revised General Design Criterion 4. The elimination of these breaks is the result of the application of leak-before-break (LBB) technology which has been approved for WCGS by the NRC.

The final licensing basis leak-before-break submittal for WCGS is the proprietary WCAP-10691, “Technical Basis for Eliminating Large Primary Loop Pipe Rupture as a Structural Design Basis for Callaway and Wolf Creek Plants.”

The NRC approval of this use of leak-before-break at WCGS was granted with the Safety Evaluation Report for the original license as a 10 CFR 50.12 exemption from parts of General Design Criterion 4 (GDC-4). See Supplement 5 Section 3.6.1.1 of the NUREG-0881 SER for the original WCGS operating license.

The fracture mechanics analysis is not time-dependent and is therefore not a TLAA. However, the final leak-before-break submittal is also supported by a fatigue crack growth assessment for a 40-year design life (WCAP-10691 Section 6.0), which is a TLAA.

There is no licensing basis evaluation of embrittlement of the cast reactor coolant piping or other CASS at WCGS, apart from the LBB question.

Analysis

Fracture Mechanics Analysis (not a TLAA)

The fracture mechanics analysis depends in part on a material property, the crack initiation energy integral, J_{IN}. The primary coolant loops at WCGS are SA 351 Grade CF8A cast stainless steel, which at PWR operating temperatures is subject to time-dependent thermal embrittlement. Embrittlement reduces the J_{IN} integral.

Thermal embrittlement effects depend approximately logarithmically on time (more rapid initial change, achieving a saturation value after a long time). The available margins permitted use of a saturation value of J_{IN} for this analysis. Since a saturated J_{IN} is not time-dependent, this fracture mechanics analysis was therefore not a TLAA.

Other supporting parts of the fracture mechanics analysis are supported in part by calculation of J_{IN} values for WCGS for a 40-year life. These supporting analyses are therefore time-dependent. However the conclusion and safety determination of the LBB analysis does not depend on these supporting time-dependent analyses, and therefore they do not make the fracture mechanics analysis a TLAA. And since the supporting analyses do not determine the result of the safety determination, the supporting analyses are also not TLAAs.

Fatigue Crack Growth Assessment

The final leak-before-break submittal for WCGS includes a fatigue crack growth assessment for a typical-plant case representative of WCGS, for a range of materials, and at a worst-case location (i.e., with the highest alternating stress range). The analysis includes estimates of effects of the reactor coolant environment, and concludes that fatigue crack growth effects will be negligible.

The evaluation of 40-year LBB fatigue effects assumed load transients, stresses, and therefore fatigue usage factors which are also representative of the WCGS reactor coolant system primary loop design. Table 4.3-1 demonstrates that the specified set of design basis transient events should not be exceeded during the 60-year period of extended operation, and therefore that the basis for fatigue effects in the LBB analysis remains valid for the period of extended operation.

Effects of Power Rerate and T_{hot} Reduction on the LBB Analysis

The power rerate and T_{hot} reduction modifications had no effects on the LBB analysis.

Effects of the Primary System Heatup Expansion Noise Events on the LBB Analysis

The evaluation of effects of the primary system noise events considered possible effects on the LBB analysis and found that recommended LBB margins are maintained, and the conclusions of the LBB analysis therefore remain valid. See Section 4.3.2.9.

Effects of NSAL-94-025 Reactor Coolant Pump Support Column Tilt

Westinghouse identified a concern that reactor coolant pump support column tilt may have an adverse effect on main loop piping thermal stresses during heatup and cooldown transients. As described in Section 4.3.2.7, the Westinghouse evaluation found a large increase in the crossover and cold leg stresses at the reactor coolant pump, and a significant change in the load of the tilted column, but since original analysis stresses were low the effects on stresses and usage factors would not affect code compliance or the conclusions of the leak-before-break analysis.

Disposition: Validation, 10 CFR 54.21(c)(1)(i); and Aging Management, 10 CFR 54.21(c)(1)(iii)

Validation

The LBB analysis found that fatigue crack growth effects will be negligible. The basis for evaluation of fatigue crack growth effects in the LBB analysis will remain unchanged so long as the calculated usage factors are not exceeded. The calculated usage factors will not be exceeded so long as their basis remains unchanged. Table 4.3-1 demonstrates that the specified set of design basis transient events should not be exceeded during the 60-year period of extended operation, and therefore that the basis for fatigue effects in the LBB analysis should remain valid for the period of extended operation, in accordance with 10 CFR 54.21(c)(1)(i).

Aging Management

The WCGS Metal Fatigue of Reactor Coolant Pressure Boundary program (B3.1) will ensure that the maximum usage factor in the primary loop piping remains below the number assumed for the existing analysis of fatigue crack growth effects during the period of extended operation, or that appropriate corrective measures maintain the design and licensing basis by other acceptable means. These effects will thereby be managed the period of extended operation in accordance with 10 CFR 54.21(c)(1)(iii).

4.3.3 ASME Section III Subsection NG Fatigue Analysis of Reactor Pressure Vessel Internals

Summary Description

The WCGS reactor vessel internals were designed after the incorporation of Subsection NG into the 1974 Edition of Section III of the ASME Boiler and Pressure Vessel Code. The design meets the intent of paragraph NG-3311(c); that is, design and construction of *core support* structures meet Subsection NG in full, and other internals are designed and constructed to ensure that their effects on the core support structures remain within the core support structure code limits.

Analysis

Westinghouse topical report WCAP-14577, "License Renewal Evaluation: Aging Management for Reactor Internals" found that the only TLAAs supporting design of the reactor vessel internals are the fatigue analyses. The NRC staff safety evaluation noted this finding, and concluded that (1) the aging effects of fatigue will be adequately managed, and (2) although the fatigue calculations needed for the TLAA have not been performed and/or have not been updated by the Westinghouse Owners Group to reflect operations during the license renewal period, the screening process and methodology presented are acceptable for licensees' use in preparing plant-specific fatigue TLAA evaluations to support license renewal applications. The plant-specific requirements of 10 CFR 54.3 and 10 CFR 54.21(c)(1) for fatigue TLAAs must be addressed by the license renewal applicant.

Code Fatigue Analyses of Record of the WCGS Reactor Vessel Internals

The current reactor vessel internals analyses of record for WCGS are summarized in a Westinghouse supplementary design report that incorporates effects of power rerate and of the hot leg temperature reduction (T_{hot}). The supplementary design report identifies a number of usage factors above 0.66 for the specified set of design basis transient events and for 40 years of high-cycle effects, and several above 0.9.

The greater part of each calculated fatigue usage factor is due to effects of significant transients. Table 4.3-1 demonstrates that the specified number of each transient should not be exceeded during the 60-year period of extended operation, and the WCGS fatigue management program tracks these events. Therefore, the contribution of these transient events to fatigue usage in the internals should not exceed that originally calculated without being identified, and without an appropriate evaluation and any necessary mitigating actions.

However, some part of fatigue usage in internals is due to the high-cycle effects, and therefore depends on steady-state operating time rather than on the number of transients. High-cycle fatigue must therefore be evaluated separately in order to extend the conclusion of the supplementary design report to the end of the 60-year licensed operating period.

Fatigue Analyses of Barrel-to-Former and Baffle-to-Former Bolts

Cracked baffle-to-former bolts were found in a few offshore reactors with designs and materials similar to Westinghouse units, multiple failures have occurred in Alloy A-286 internals bolting in B&W reactors; and stress corrosion cracking has occurred in tack-welded Alloy X-750 bolts in offshore Siemens and Kraftwerk Union internals. The failures have been attributed to a combination of fatigue, neutron embrittlement, and irradiation-assisted stress corrosion cracking (IASCC). With extended operation the stresses induced by differential void swelling between the bolts and bolted members, and between the bolted members, may also become significant, although the stresses will probably be somewhat mitigated by irradiation and thermal creep relaxation. All of these effects are time-dependent and all except fatigue and thermal creep depend on neutron fluence.

Fatigue in these bolts is the subject of an ASME code analysis, which is a TLAA. No other evaluations of these other effects have been introduced into the licensing basis at WCGS, and these bolted connection designs are therefore supported by no TLAAs addressing effects other than fatigue. This finding agrees with the conclusion of Westinghouse topical report WCAP-14577-A.

The Westinghouse topical report observed that the barrel-to-former and baffle-to-former bolts are in the category of components "…where the cyclic loadings are sufficiently uncertain to preclude the effective use of detailed fatigue design analysis, …" and therefore for which "…alternatives for managing the effects of the age-related degradation are described…." The 40-year predicted usage factor in at least some of at least the baffle-to-former bolts is a significant fraction of the limit of 1.0. That is, the high predicted usage factor, the additional aging effects requiring mitigation, and the fact that some of these are synergistic (e.g., fatigue and the other cracking mechanisms) dictate that management of the fatigue usage factor in these bolts will be insufficient by itself, and that an aging management program must be constructed for the bolts which either adequately address all of these effects, or which will ensure their safety function despite these effects.

WCGS reviewed Westinghouse Technical Bulletin TB-03-2, "Reactor Internals Baffle-to-Former Bolt/Core Design Interface," and concluded that fatigue failures would not be expected during the original 40-year licensed operating period, but must be addressed for license renewal.

Disposition: Revision, 10 CFR 54.21(c)(1)(ii); and Aging Management, 10 CFR 54.21(c)(1)(iii)

Confirmation of Negligible Effects of High-Cycle Fatigue

Since fatigue usage factor does not depend strongly on flow-induced vibration or other high-cycle effects that are time-dependent at steady-state conditions, but depends more strongly on effects of operational, upset, and emergency transient events, the increase in operating life to 60 years should not have a significant effect on fatigue usage factor so long as the number of design basis transient cycles remains within the number assumed by the original analysis. WCGS will obtain a design report amendment to either quantify the increase in high-cycle fatigue effects, or to confirm that the increase will be negligible. WCGS will complete this action before the end of the current licensed operating period. The analysis of these fatigue effects in reactor internals will thereby be revised for the period of extended operation, in accordance with 10 CFR 54.21(c)(1)(ii).

Cycle Count and Usage Factor Tracking for the Balance of Reactor Internals with Fatigue Analyses

Table 4.3-1 demonstrates that the specified set of primary coolant design basis transient events should not be exceeded during the 60-year period of extended operation. Therefore, once the negligible effect of high-cycle fatigue on critical components is confirmed, or is satisfactorily quantified, transient cycle counting under the WCGS fatigue management program will ensure that the design basis fatigue usage factor limit (1.0) will not be exceeded in any analyzed location in the reactor internals without being identified, and without an appropriate evaluation and any necessary mitigating actions. Fatigue in the reactor vessel internals (other than the barrel-former and baffle-former bolts, below) will therefore be adequately managed for the period of extended operation, in accordance with 10 CFR 54.21(c)(1)(iii).

The WCGS Metal Fatigue of Reactor Coolant Pressure Boundary program is described in Appendix B3.1.

This disposition conforms to the “primary step” of an acceptable aging management program for fatigue effects in reactor internals described in WCAP-14577-A.

Aging Management for Barrel-to-Former and Baffle-to-Former Bolts

The WCGS aging management program for reactor vessel internals for the license renewal period is identified in Section B2.1.35, Reactor Coolant System Supplement. This program or programs will adequately manage combined effects of fatigue and other aging mechanisms in the barrel-to-former and baffle-to-former bolts for the period of extended operation, in accordance with 10 CFR 54.21(c)(1)(iii).

4.3.4 Effects of the Reactor Coolant System Environment on Fatigue Life of Piping and Components (Generic Safety Issue 190)

Summary Description

The fatigue data upon which the ASME Section III fatigue curves are based are the result of tests in air at room temperature and constant strain rate. Concerns with possible effects of elevated temperature, reactor coolant chemistry environments, and different strain rates prompted NRC-sponsored research to assess these effects, first presented in the 1993 NUREG/CR-5999, “Interim Fatigue Design Curves for Carbon, Low-Alloy, and Austenitic Stainless Steels in LWR Environments.” Subsequent research and studies, including NUREG/CR-6260, “Application of NUREG/CR-5999 Interim Fatigue Curves to Selected Nuclear Power Plant Components,” refined the methods.

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, GSI 190.

Although GSI 190 has been closed for plants with 40-year initial licenses, NUREG-1800 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.”

Analysis

Sample Locations

NUREG/CR-6260 identifies seven sample locations for newer Westinghouse plants such as WCGS:

- Reactor Vessel Lower Head to Shell Juncture
- Reactor Vessel Primary Coolant Inlet Nozzles
- Reactor Vessel Primary Coolant Outlet Nozzles
- Surge Line Hot Leg Nozzle
- Charging Nozzles
- Safety Injection Nozzles [BIT Nozzles]
- Residual Heat Removal Line Inlet Transition.

NUREG/CR-6260 does not distinguish between the “normal” (loop 1 cold leg) and “alternate” (loop 4 cold leg) charging nozzles. The two WCGS charging nozzles have equal calculated usage factors, but have had different operating histories.

The four WCGS 10-inch accumulator and RHR cold leg safety injection nozzles (ACCSI nozzles) correspond to the NUREG/CR-6260 "inlet transition." The WCGS evaluation therefore includes these four nozzles and both charging nozzles. See Table 4.3-5.

Analysis of Sample Locations

WCGS performed plant-specific calculations for the seven sample locations applicable to WCGS identified in NUREG/CR-6260 for newer Westinghouse plants. WCGS evaluated effects of the reactor coolant environment on fatigue calculations using the appropriate F_{en} factors 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 seven locations. See the notes for the method used for each F_{EN} multiplier.

At the first location, the vessel lower head to shell juncture, the expected 60-year fatigue usage factor was determined by multiplying the calculated design basis 40-year usage factor times 1.5. All others were projected from the historical and current rates of accumulation of transient cycles and usage factors, as described in Section 4.3.1.2.

Table 4.3-5 Summary of Fatigue Usage Factors at NUREG/CR-6260 Sample Locations, Adapted to WCGS

Location	Material	CUF Expected at 60 Years	F_{EN}	Expected 60-year CUF with F_{EN}
Reactor Vessel Lower Head to Shell Juncture (Not Monitored)	SA-533 Gr. B Cl. 1	0.1005	2.45[18]	0.2462
Reactor Vessel Primary Coolant Inlet Nozzle	SA-508 Cl. 3	0.13467	2.45[18]	0.3299
Reactor Vessel Primary Coolant Outlet Nozzle	SA-508 Cl. 2	0.21597	2.45[18]	0.5291
Surge Line Highest-CUF Location, Hot Leg Nozzle	SA-182 F316N	0.05849	8.593[19]	0.50257
Charging Nozzles -Normal, Loop 1	SA-182 F316N	0.15863	5.486[19]	0.87028
Charging Nozzles -Alt., Loop 4	SA-182 F316N	0.09847	5.486[19]	0.54024

18 Maximum F_{EN} for low dissolved oxygen.
19 Computed F_{EN} for low dissolved oxygen.

Table 4.3-5 Summary of Fatigue Usage Factors at NUREG/CR-6260 Sample Locations, Adapted to WCGS

Location	Material	CUF Expected at 60 Years	F_{EN}	Expected 60-year CUF with F_{EN}
Safety Injection (BIT) Nozzles	SA-182 F316N	0.16351	5.535[20]	0.9050
Accumulator and RHR Cold Leg Safety Injection Nozzles, "RHR Line Inlet Transition"	SA-351 Gr. CF8A	0.06328	15.35[21]	0.9713

Disposition: Validation, 10 CFR 54.21(c)(1)(i); and Aging Management, 10 CFR 54.21(c)(1)(iii)

Validation - Reactor Vessel Lower Head to Shell Juncture

The low design basis usage factor for this location permits a projection of the usage for a 60-year life, equal to 1.5 times the design basis usage factor and times a conservative F_{EN} for carbon steel, with considerable margin to the code allowable of 1.0. The evaluation of fatigue effects in this location, and effects of the reactor coolant on them, have thereby been validated and projected to the end of the period of extended operation, in accordance with 10 CFR 54.21(c)(1)(i).

Since the fatigue evaluation in this location has been successfully validated for a 60-year life, including environmental effects, it has been omitted from the fatigue management program.

Aging Management

The analysis showed that the fatigue usage factors in the NUREG/CR-6260 sample locations should remain less than 1.0 for the period of extended operation, including the effects of the reactor coolant environment, and that the safety determination supported by the code fatigue analyses will therefore remain valid. The fatigue management program described in Section 4.3.1 above and in Appendix B3.1 will include appropriate usage factor action limits to ensure that the usage factor at the remainder of these locations, including F_{EN}, does not exceed 1.0 before an evaluation is completed and appropriate actions have been identified.

20 Computed F_{EN} for low dissolved oxygen, similar plant.
21 Maximum F_{EN} for low dissolved oxygen and slow strain rate.

The effects of the reactor coolant environment on fatigue usage factors in these locations will thereby be managed for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(iii).

4.3.5 Assumed Thermal Cycle Count for Allowable Secondary Stress Range Reduction Factor in B31.1 and ASME Section III Class 2 and 3 Piping

Summary Description

Piping in the scope of license renewal that is designed to B31.1 or ASME Section III Class 2 and 3 requires the application of a stress range reduction factor to the allowable stress range for secondary stresses (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 are 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.

Analysis

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 S_A for 7000 equivalent full-temperature thermal cycles or less and is reduced in steps to 0.5 S_A for greater than 100,000 cycles. Partial cycles are counted proportional to their temperature range.

A review of ASME Section III Class 2 and 3 and B31.1 piping specifications found no indication of a number of expected lifetime full-range or equivalent full-range thermal cycles greater than 7,000 during the original 40-year plant life.

The EPRI license renewal “Non-Class 1 Mechanical Implementation Guideline and Mechanical Tools” includes temperature screening criteria 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. A systematic survey of plant piping systems in the scope of license renewal found that with the exception of reactor coolant sampling lines, described below, the piping and components in the scope of license renewal

- Do not meet the operating temperature screening criteria of the EPRI Mechanical Tools, and therefore do not experience significant thermal cycle stresses; or
- 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; or

- The assumed thermal cycle count for the analyses depends closely on reactor operating cycles, and can therefore conservatively be approximated by the thermal cycles used in the ASME Section III Class 1 vessel and piping fatigue analyses.

For this last case, see the reactor coolant system thermal cycles discussed in USAR Section 3.9(N) and listed in its Table 3.9(N)-1, and in Table 4.3-1. Of these, those 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-cooldown cycles plus 400 reactor trips (Table 4.3-1).

Other events may contribute a few full-range or a number of part-range cycles. However the total count of all design basis events (second column of Table 4.3-1) is only about 2000, discounting the reduced temperature return to power cycles, which are over-estimated and will contribute at most some part-range cycles to non-Class 1 systems, and noting that the RCS and pressurizer heatup-cooldown cycles are common. The total number of these actually expected in a 60-year extended period of operation (right-hand column of Table 4.3-1) is only about 340.

This is a reliable indication of the number of thermal cycles for most in-scope balance-of-plant support systems, as well as the CVCS and ECCS piping more directly connected to the reactor system. The total count of expected full-range thermal cycles for most of these systems is therefore certainly well under 1000 for a 40-year plant life. For the 60-year extended operating period the number of thermal cycles for piping analyses would be proportionally increased to less than 1500, which is only a fraction of the 7000-cycle threshold for which a stress range reduction factor is required in the applicable piping codes.

The WCGS review determined that piping calculations included appropriate stress ranges for any temperatures other than normal ambient, with one exception that has been satisfactorily addressed. The piping calculations included appropriate stress intensification factors, which do not depend on the number of cycles. Changes to allowable stress as the result of additional thermal cycles is therefore correctly addressed by the required changes to stress range reduction factor.

Reactor Coolant Sample Lines

The survey of plant piping systems found that the reactor coolant sample lines may be subject to more than 7000 thermal cycles. Review of operating practice determined that lines used for daily samples remain hot except for a Technical Specification leakage test about every two days and are therefore subject to less than about 11,000 cycles in 60 years, permitting an SRRF of 0.9. WCGS reviewed the design of this piping and identified three segments whose design calculations require revision to meet this SRRF.

Disposition: Validation, 10 CFR 54.21(c)(1)(i); and Revision, 10 CFR 54.21(c)(1)(ii)

For less than 7000 equivalent full-temperature thermal cycles the stress range reduction factor is 1. Therefore, so long as the estimated number of cycles remains less than 7000 for a 60-year life, the stress range reduction factor remains at 1 and the stress range reduction factor used in the piping analysis will not be affected by extending the operation period to 60 years.

Validation for Piping Other than Sample Lines and Other High-Thermal-Cycle Lines

The expected number of equivalent full-range thermal cycles for other than reactor coolant sample piping should be less than 1500 in 60 years, which is only a fraction of the 7000-cycle threshold for which a stress range reduction factor is required in the applicable piping codes. Therefore the existing analyses of 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, other than ASME Class 1 analyses and sample lines, are valid for the period of extended operation, in accordance with 10 CFR 54.21(c)(1)(i).

Validation or Revision for Reactor Coolant Sample Lines

Reactor coolant sample lines are subject to a thermal cycle about every two days in modes 1 through 4, and may therefore be subject to something less than 11,000 significant thermal cycles in a 60-year plant lifetime. For this case the design codes impose a stress range reduction factor (SRRF) of 0.9.

WCNOC reviewed the design analyses of these lines and has determined that the secondary stress ranges are within the limits imposed by the 0.9 SRRF in all but three line segments. With those exceptions the design of these sample lines has thereby been validated for the duration of the period of extended operation in accordance with10 CFR 54.21(c)(1)(i).

For the three line segments where secondary stress ranges were not within 0.9 of the allowable, WCNOC has determined that reanalysis should be able to demonstrate secondary stress ranges below this limit. WCNOC will complete these reanalyses, and any additional corrective actions or modifications indicated by them, before the end of the current licensed operating period. These analyses will thereby be revised in accordance with 10 CFR 54.21(c)(1)(ii), for the duration of the period of extended operation.

4.3.6 Fatigue Design of Spent Fuel Pool Liner and Racks for Seismic Events

Summary Description

The spent fuel pool racks were replaced in order to accommodate a larger inventory. The design of the replacement racks included a fatigue analysis of the racks and of high-stress locations in the pool liner. These analyses are described in USAR Section 9.1A.4.3.5.4.

Analysis

Fuel Racks

The specification for the replacement spent fuel storage racks requires them to be designed, fabricated, and installed to ensure operation for an intended period of 60 years.

However, examination of the design criteria document and the calculation found that the fatigue analysis did not increase the assumed number of SSE and OBE events above the number assumed for a 40-year license.

The replacement racks in the spent fuel pool were analyzed for fatigue effects of these event using methods similar to those for ASME Section III Class 1 analyses. The analysis calculated a cumulative usage factor of 0.404 for these events at the maximum-stress location, the pedestal rack to baseplate junction.

Since no seismic events have induced significant cyclic loads on these components in the 20-year operating history of the plant to date, 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 period of extended operation.

Spent Fuel Pool Liner

The docketed reracking licensing report also describes a fatigue evaluation of locations of the pool liner most affected by seismic loads imposed by the racks, and for the same 20 OBE plus 1 SSE events described above for the racks. The report does not state a calculated usage factor for the liner, but states that the result was acceptable for this set of cyclic loading events:

The question on fatigue in the liner was closed with a presentation of the analysis to NRC staff, permitting the conclusion that “Based on the maximum stress level in the liner, the cumulative usage factor was shown to be well below 1.0.”

Summary

The analysis for both the racks and liner depend only on the assumed number of OBE and SSE events. Although an ASME Section III Class 1 pressure boundary fatigue analysis would omit the faulted, SSE loads, this analysis included them because spent fuel storage must continue to function following these events. The analysis remains valid for any period for which the number of OBE events has not been and is not expected to be exceeded, assuming an additional SSE event might occur. Since the remaining plant life from the present to the end of the period of extended operation (2006 to 2045) is less than that of the original license to which the numbers of OBE and SSE events apply, and since no SSE or significant OBE has occurred, these analyses remain valid for the period of extended operation.

Disposition: Validation, 10 CFR 54.21(c)(1)(i)

Operating basis and safe-shutdown earthquakes (OBE and SSE) are the only design basis events for cyclic loading on the fuel pool liner and racks. No seismic events have induced significant cyclic loads on these components in the 20-year 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 period of extended operation. The analyses are therefore valid for the period of extended operation, in accordance with 10 CFR 54.21(c)(1)(i).

4.3.7 Fatigue Design and Analysis of Class IE Electrical Raceway Support Angle Fittings for Seismic Events

Summary Description

The design of Class IE electrical raceway included a fatigue evaluation of the effects of operating basis and safe shutdown earthquake loads (OBE and SSE loads) on angle fittings used at the connections of strut hangers to overhead supports, or at interhanger locations.

Analysis

A cumulative usage factor was calculated and compared to a fatigue curve. The usage factor was 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 five and one, respectively. The fatigue analysis was extremely conservative. Although an ASME Section III Class 1 pressure boundary fatigue analysis would omit the faulted, SSE loads, this analysis included them. The analysis assumes 150 alternating stress cycles per OBE or SSE seismic event, based on a design basis maximum acceleration period “in the neighborhood of 15 seconds,” and a conservative support first-mode resonance of 10 Hz, or a total of 750 cycles for the 5 OBE events assumed plus 150 for the single SSE. Neither a significant OBE nor an SSE have occurred in the first 20 years of operation, so that qualification for the original design basis number of OBE and SSE events is sufficient for both the 20 years remaining in the original license from the time of this application, and thence to the end of the period of extended operation.

The analysis used a fatigue curve of angular rotation vs. cycles to failure for the specific Power Strut Welded-Fillet PS-608 angle fittings. This fatigue failure curve is asymptotic to infinity beyond 1000 cycles; that is, angular deflections below that for which 1000 cycles are permitted are below the endurance limit. A limiting angular deflection was used, calculated from the manufacturer’s allowed ultimate moment. Although this calculated angular deflection at this ultimate moment was less than 60 percent of the angular deflection at 1000 cycles-to-failure, and therefore also less than 60 percent of the angular deflection that would permit an infinite number before failure, 1000 cycles was assumed as the allowable for the usage factor evaluation. This is extremely conservative since neither the design fatigue curve nor the failure curve provides any finite limits in this region.

A realistic usage factor would therefore be significantly less than the 0.9 reported (900 actual/1000 allowable cycles). The calculation could have concluded, with equal validity, that the resulting usage factor is negligible.

Disposition: Validation, 10 CFR 54.21(c)(1)(i)

The seismic fatigue analysis of Class IE electrical support angle fittings was extremely conservative, assuming 1000 allowable cycles for a deflection considerably less than the endurance limit. Operating basis and safe-shutdown earthquakes (OBE and SSE) are the only design basis events for cyclic loading on these support angle fittings. Furthermore, no seismic events have induced significant cyclic loads on these components in the 20-year 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 period of extended operation. The analysis is therefore valid for the period of extended operation, in accordance with 10 CFR 54.21(c)(1)(i).

4.4 ENVIRONMENTAL QUALIFICATION (EQ) OF ELECTRICAL EQUIPMENT

10 CFR 50.49, "Environmental Qualification of Electric Equipment Important to Safety for Nuclear Power Plants" requires that certain electrical and instrument and control equipment 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.

Summary Description

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. 10 CFR 50.49(k) and (l) permit different qualification criteria to apply based on plant vintage. Supplemental Environmental Qualification regulatory guidance for compliance with these different qualification criteria is provided in the Regulatory Guide 1.89, Revision 1, "Environmental Qualification of Certain Electric Equipment Important to Safety for Nuclear Power Plants," and NUREG-0588, "Interim Staff Position on Environmental Qualification of Safety Related Electrical Equipment."

The WCNOC EQ program is consistent with the requirements of 10 CFR 50.49, and the guidance of NUREG-0588. Qualified components and their service requirements and environments are identified in a controlled Equipment Qualification Summary Document (EQSD) containing a program description, a master list of affected equipment, replacement and maintenance information, and local environment descriptions. The qualification evaluation records for specific component types are maintained in Equipment Qualification Work Packages (EQWPs).

Analysis

The EQ program manages applicable component thermal, radiation, and cyclic aging effects through the aging evaluations for the current operating license using methods of demonstrating qualification for aging and accident conditions established by 10 CFR 50.49(f). Under 10 CFR 54.21(c)(1)(iii), plant EQ programs, which implement the requirements of 10 CFR 50.49 (as further defined and clarified by NUREG-0588 and Regulatory Guide 1.89, Rev. 1), are an Aging Management Program (AMP) for license renewal. Re-analysis of an aging evaluation to extend the qualification of components is performed on a routine basis as part of the EQ program. Maintaining qualification through the extended license renewal period requires that existing EQ evaluations (EQWPs) be re-evaluated. 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), as discussed below.

<u>Analytical Methods:</u> The analytical models used in the reanalysis of an aging evaluation are the same as those previously applied during the original 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 X 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 by reevaluating material activation energy, to justify a higher value that would 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. Any changes to material activation energy will be justified.

<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 requalify the component if reanalysis is unsuccessful).

Disposition: Aging Management, 10 CFR 54.21(c)(1)(iii)

The Environmental Qualification (EQ) of Electrical Components program (B3.2) is an existing program that 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. Aging effects addressed by the EQ program will thereby be managed for the period of extended operation, in accordance with 10 CFR 54.21(c)(1)(iii).

4.5 CONCRETE CONTAINMENT TENDON PRESTRESS ANALYSIS

Summary Description

The WCGS containment is a prestressed concrete, hemispherical-dome-on-a-cylinder structure, with a steel membrane liner. Post-tensioned tendons compress the concrete and permit the structure to withstand design basis accident internal pressures. 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, an inspection program confirms that the tendon prestress remains within design limits throughout the life of the plant.

The original design predictions of loss of prestress and the regression analyses of surveillance data that predict the future performance of the post-tensioning system to the end of design life are TLAAs.

The post-tensioning system consists of two tendon groups:

- 86 vertical, inverted-U-shaped tendons, extending up through the basemat, through the full height of the cylindrical walls and over the dome.
- 165 horizontal circumferential (hoop) tendons, in two subgroups, at intervals from the basemat to about the 45-degree elevation of the dome. There are 135 tendons in the cylinder hoop subgroup and 30 in the dome hoop subgroup.

The vertical inverted-U tendons are anchored through the bottom of the basemat. The basemat is conventionally-reinforced concrete. The horizontal hoop tendons are anchored at three exterior buttresses, 120 degrees apart. Each hoop tendon extends 240 degrees around the containment building, passing under an intervening buttress. The tendons are not bonded to the concrete but were inserted in tendon ducts, after concrete cure, and tensioned in the prescribed sequence. Each tendon consists of up to 170, ¼ - inch high-strength steel wires, with cold-formed button heads on each end bearing on stressing washers. The total tendon load is then carried by a shim stack to steel bearing plates embedded in the structure.

Analysis

Tendon Surveillance Program

The tendon surveillance program is described in Appendix B3.3. The program is consistent with requirements of ASME Section XI Subsection IWL, 1998 edition. The design acceptance criterion is that the average prestress shall equal or exceed the design prestress. The design acceptance criterion is ensured by surveillance program acceptance criteria that are consistent with IWL-3221.1.

The program specifies sample size and specific tendons to be tested, and provides for increasing the sample size if expected limits are not met. Tendon surveillance testing is every five years (plus or minus one year), in accordance with IWL-2420. Initial inspections were performed at one and three years.

The program inspects a random sample of tendons from each group (vertical and hoop) in each inspection interval to confirm that acceptance criteria are met, and therefore that tendon prestresses will remain above minimum required values (MRVs) for the succeeding inspection interval. At each inspection the program also recalculates the regression analysis trend lines of these two groups, based on individual tendon forces, to confirm whether average prestresses are expected to remain above their MRVs for the remainder of the licensed operating period. The most recent trend lines confirm this to the end of the period of extended operation.

Tendon Group Lift-off Forces and Limits (Acceptance Criteria)

The acceptance criteria are based on

- Minimum required design prestress lift-off forces (minimum required values, MRVs) for each of the three vertical, dome hoop, and cylinder hoop tendon subgroups; and

- Predicted lift-off force (predicted force) lines for each of the two vertical and hoop tendon groups.

The MRVs and the predicted force lines were developed during the original design to confirm the adequacy for the original 40-year licensed operating term.

The acceptance criteria of the WCGS program plan and surveillance specification are consistent with those of IWL-3221.1:

- If the average of all measured prestressing forces for each tendon surveillance group is not above the minimum required prestress for that group (minimum required value, MRV) the condition is not acceptable [Ref. IWL-3221.1(a)].

- If the measured prestressing force of a tendon is above 95 percent of the predicted force line the tendon is acceptable [Ref. IWL-3221.1(b)].

- If (1) the measured prestressing force is between 90 and 95 percent of the predicted force line, and (2) lift-offs of adjacent tendons are measured and found to be above 95 percent, and (3) all three are restored to an acceptable prestress, the three tendons are acceptable. If any two fall below 95 percent the condition is not acceptable [Ref. IWL-3221.1(a) and (b)].

- If the measured prestressing force of any tendon lies below 90 % of the predicted force line, the condition is not acceptable, and the tendon must be detensioned and additional lift-offs measured to determine the cause and extent of the condition.

- An IWL-3300 Engineering Evaluation is required if current and past measurements of prestress forces indicate that prestress forces may fall below the minimum required values before the next surveillance test [Ref. IWL-3221.1(c)].

- If elongation at load differs by more than 10 percent of that measured at installation, the cause must be investigated [Ref. IWL-3221.1(d)].

Since no surveillance data have fallen to an action limit defined by the predicted force lines, these lines have not been revised. The predicted force lines, when projected to 60 years, will remain above the minimum required design prestress values (MRVs).

Surveillance Program Predicted Loss of Prestress

See Figure 4.5-1.

- The original predicted force lines for each of the horizontal and vertical groups define the IWL-3221.1 acceptance criteria for the program.

- The trend lines are the current best prediction of average tendon performance for the remainder of plant life.

Consistency with Regulatory Guidance

Current regression analysis trend lines: The program calculates current predicted average trend lines by regression of the full set of individual tendon lift-off data, for each tendon group. These analyses are revised following each tendon surveillance. The surveillance data trend line regression analyses are consistent with Information Notice 99-10 "Degradation of Prestressing Tendon Systems in Prestressed Concrete Containments", Attachment 3.

Surveillance program minimum required values and predicted values: The tendon prestress minimum required values (MRVs) and the surveillance program predicted force lines were developed from the loss of prestress model used during the original design. The calculations of prestress force lines are consistent with NRC Regulatory Guide 1.35.1 (Revision 0) "Determining Prestressing Forces for Inspection of Prestressed Concrete Containments."

Surveillance Results

The most recent regression analysis is included in the 2005, 20 year tendon surveillance report. The 2005, 20-year tendon surveillance found some excessive grease void volumes, but (1) no significant abnormal degradation,[22] and (2) no lift-off values from this surveillance below the predicted force lines, nor any from previous surveillances approaching the first action limit at 95 percent of a predicted force line. The regression analyses were extended to 60 years. The regression analysis trend lines indicate lift-offs in excess of the MRV for at least 60 years.

The following tables and figure summarize input data and results of the most recent regression analyses. In the tables, common tendons (those surveyed at each inspection) are marked in boldface.

[22] None except a small area of inactive level three corrosion on a bushing, not affecting the component function.

Inverted-U vertical tendons are Numbers V1 through V86.

Table 4.5-1 2005, 20-Year Vertical Tendon Regression Analysis Input Data

Nominal Year post-SIT[23]	Tendon	Tendon Force (Kips)	Time Under Stress (Years)
20	V13	1366.3	23.45
	V30	1338.9	23.02
	V65	**1382.3**	**23.02**
15	V9	1387.5	18.27
	V65	**1393.5**	**17.81**
	V76	1366.0	18.23
10	V39	1357.9	12.43
	V65	**1392.0**	**12.03**
	V81	1425.0	12.03
5	V27	1335.0	7.82
	V41	1376.0	7.84
	V65	**1403.5**	**7.40**
	V84	1363.5	7.85
3	V1	1385.4	5.53
	V18	1437.0	5.20
	V47	1438.9	5.19
	V65	**1417.6**	**5.19**
1	V20	1400.0	3.61
	V35	1339.0	4.05
	V65	**1432.0**	**3.62**
	V74	1404.0	4.08

[23] Following the Structural Integrity Test.

Cylinder hoop tendons (between basemat and spring line) are numbers 1AC through 45CB (1AC, 1BA, 1CB, … 45CB). Dome hoop tendons (above the spring line) are numbers 46AB through 55CB. The letters refer to the anchoring buttresses. The hoop tendon regression includes both cylinder and dome hoop tendons.

Table 4.5-2 2005, 20-Year Horizontal (Hoop) Tendon Regression Analysis Input Data

Nominal Year post-SIT[23]	Tendon	Tendon Force (Kips)	Time Under Stress (Years)
20	1AC	1375.0	23.13
	45BA	**1320.5**	**22.80**
	22CB	1332.2	22.92
15	18AC	1336.0	17.71
	45BA	**1344.5**	**17.56**
	17CB	1329.5	17.90
10	**45BA**	**1377.5**	**11.82**
	3CB	1340.0	12.09
	25CB	1281.0	12.16
5	12AC	1356.0	7.29
	20AC	1281.0	7.27
	7BA	1339.5	7.44
	20BA	1338.0	7.25
	38BA	1301.0	7.48
	45BA	**1357.0**	**7.13**
	20CB	1297.5	7.28
3	5AC	1395.1	5.28
	14BA	1392.9	5.09
	18BA	1420.5	5.07
	35BA	1408.2	5.05
	45BA	**1429.9**	**5.00**
	47BA	1305.0	5.006
	11CB	1385.5	5.26

Table 4.5-2: 2005, 20-Year Horizontal (Hoop) Tendon Regression Analysis Input Data (Continued)

Nominal Year post-SIT[23]	Tendon	Tendon Force (Kips)	Time Under Stress (Years)
1	9AC	1358.0	3.71
	26AC	1359.0	3.79
	5BA	1381.0	3.69
	45BA	**1409.0**	**3.44**
	51BA	1348.0	3.48
	1CB	1422.0	3.69
	9CB	1387.0	3.71

Table 4.5-3: 2005, 20-Year Tendon Regression Analysis Results

	Vertical Tendons	**Horizontal Tendons**
MRV[24]	**1159 kips**	**Cylinder: 1227 kips** **Dome: 1119 kips**
Forecast Year	**Forecast Value (kips)** **(Trend Line)**	**Forecast Value (kips)** **(Trend Line)**
1	1430	1417
3	1409	1384
5	1399	1369
10	1385	1348
15	1377	1335
20	1372	1327
25	1367	1320
30	1364	1314
35	1361	1310
40	1358	1306
45	1356	1302
50	1354	1299
55	1352	1296
60	1350	1294

[24] Based on 170 wires per tendon.

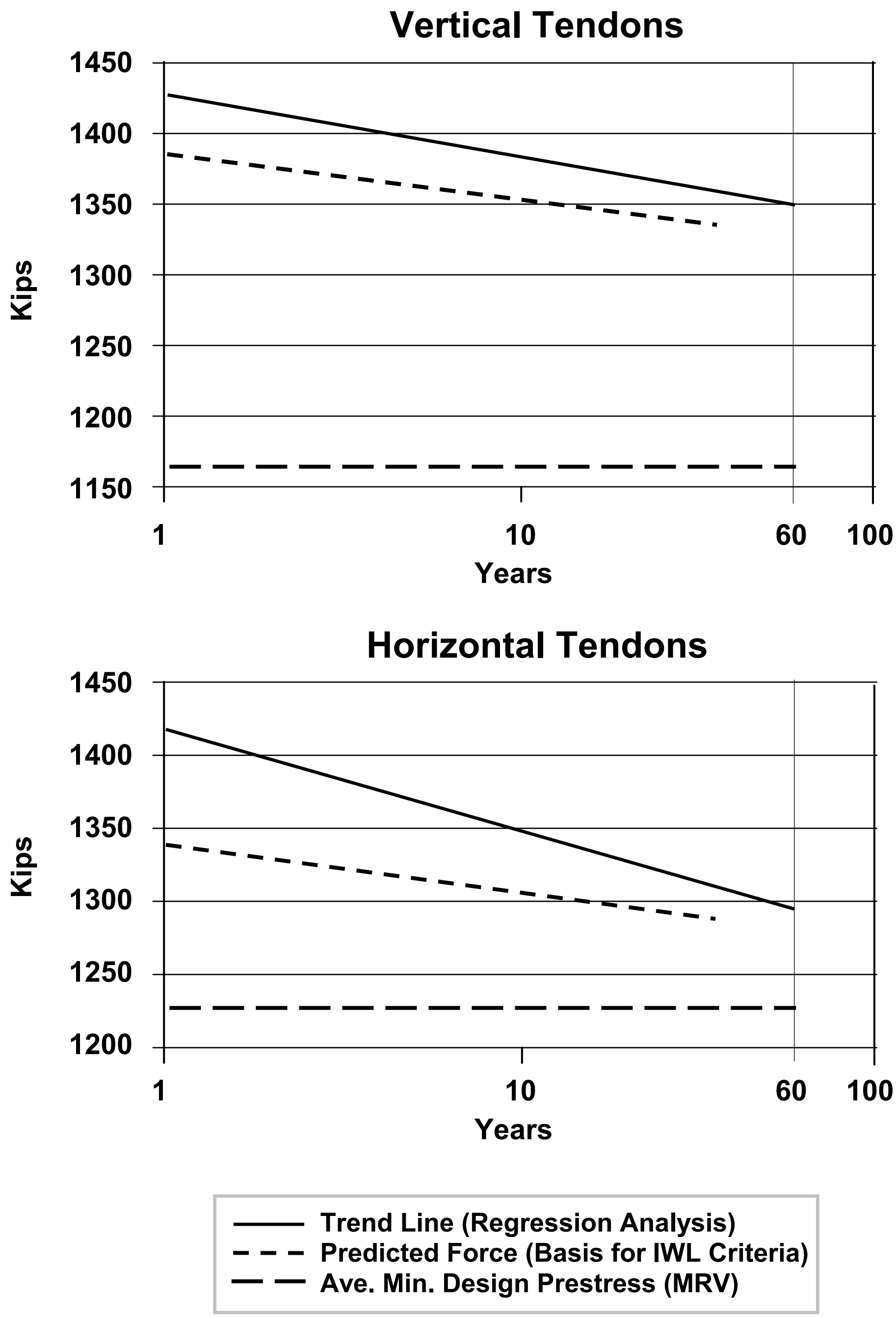


Figure 4.5-1: Regression Analysis of Tendon Lift-off Data through the 2005, 20-Year Surveillance, Original Design Predicted Forces, and MRVs

(See Notes, next page.)

Notes to Figure 4.5-1:

1. Each of the two trend lines is a regression analysis of the entire set of individual tendon lift-off data for each of the two tendon groups.

2. "Trend line" and "minimum required value" (MRV) are equivalent to the same terms in NUREG-1800 Chapter 4 and NUREG-1801 Section X.S1.

3. The dome and cylinder horizontal hoop tendons are sampled and tested as a single group, and the horizontal trend line was developed from surveillance data of a sample that includes both dome and hoop tendons. However the dome tendons have about 4 percent lower initial prestresses, and a lower MRV. The MRV shown on this horizontal tendon plot is the greater of the two, for cylinder tendons.

4. The surveillance program predicted force lines were calculated "per wire." The values plotted here assume 170 wires per tendon. Some tendons have fewer due to failure to meet acceptance criteria at installation, or due to removal for surveillance testing.

Disposition: Validation, 10 CFR 54.21(c)(1)(i); and Aging Management, 10 CFR 54.21(c)(1)(iii)

Validation

The condition of the WCGS containment prestressing system meets criteria for validation for the period of extended operation as described in NUREG-1800, Section 4.5.3.1.1. (1) The recent surveillance data for individual tendons have all fallen above the predicted force; and (2) the regression analysis of surveillance lift-off data has extended the trend lines for both the vertical and horizontal cylinder tendons to 60 years. Both trend lines remain well above their minimum required values for at least 60 years.

The lift-off trend lines are calculated by regression of individual tendon lift-off data, including results of the most recent 2005, 20-year surveillance. These calculations are therefore consistent with NRC Information Notice 99-10, Attachment 3.

The surveillance data regression analysis trend lines are above the surveillance program predicted force lines.

The current regression analysis of the WCGS vertical and horizontal cylinder tendons is therefore valid for the period of extended operation, in accordance with 10 CFR 54.21(c)(1)(i).

Aging Management

The existing WCGS tendon surveillance program ensures that the average tendon prestress in each of the vertical and hoop tendon groups will thereby be maintained above its design basis minimum required value (MRV) for the period of extended operation, in accordance with 10 CFR 54.21(c)(1)(iii).

The WCGS Concrete Containment Tendon Prestress program is described in Appendix B3.3.

4.6 CONTAINMENT LINER PLATE, METAL CONTAINMENTS, AND PENETRATION FATIGUE ANALYSIS

The WCGS post-tensioned concrete containment vessel is designed to Bechtel Topical Report BC-TOP-5A Revision 3 [Ref. 4.9.14]. It is poured against a steel membrane liner designed to BC-TOP-1 Revision 1 [Ref. 4.9.13]. 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, and its electrical, process, personnel access, and equipment hatch penetrations are part of the containment pressure boundary.

4.6.1 Absence of a TLAA for Containment Liner Plate, Polar Crane Bracket, and Containment Penetration Design (Except Main Steam Penetrations)

Fatigue in containment liners, their anchors to the concrete pressure vessels, and their penetrations are described in NUREG 1800 Section 4.6, in the Westinghouse Owners' Group WCAP-14756-A topical report for license renewal for containment, and in the NRC staff safety evaluation of it.

Design of the polar crane for a finite number of loads is a TLAA (Section 4.7.1). At some plants, though not at WCGS, the supporting crane rail brackets or other supporting structural elements may also have been designed for these cyclic loads.

This subsection therefore documents the absence of a TLAA for design of the containment liner, the polar crane brackets, and most of the penetrations; excepting only the main steam penetrations, Section 4.6.2. A thorough search of the licensing and design basis discovered no indication of any analyses of these components which might be supported by TLAAs.

Liner Plate

The liner plate is a gas-tight barrier to prevent uncontrolled release of fission products from the reactor building during operation, and also in the unlikely event of an accident. NUREG-1800, Section 4.6.1 notes that in some designs "Fatigue of the liner plates or metal containments may be considered in the design based on an assumed number of loading cycles for the current operating term." However, with the exception of the main steam penetrations, the containment liner and penetrations were designed to stress limit criteria, independent of the number of load cycles, and with no fatigue analyses. The liner plate design considers creep and shrinkage, prestress combined with concrete creep and shrinkage; and deadload, earthquake, wind, tornado, hydrostatic, vacuum, pressure, and thermal loads.

Bechtel containment design topical report BC-TOP-5A is invoked by the WCGS containment design specification. Neither of these documents, nor the code editions and addenda invoked by them, impose an analysis for cyclic loading to other than quasi-static stress criteria. Although the containment design specification includes cyclic loads, it does not specify their number, and therefore does not supply fatigue or other time-dependent design criteria.

The BC-TOP-1 design report for the liner plate reports no fatigue analysis, nor any other design for a stated number of cyclic loads or events, for the liner, or for its anchors or embedments. Part II of this report does include cyclic design of the main steam penetrations.

Polar Crane Brackets

The polar crane is supported on a system of girders which are supported by a series of brackets that are supported by the containment structure. BC-TOP-1 Revision 1 includes review of the design of these brackets, but reports no fatigue analysis, nor any other design for a stated number of crane lifts, cyclic loads, or other events for the polar crane brackets.

Penetrations

A thorough search of the licensing basis, and review of the design documents as described above for the containment liner and polar crane brackets, found no evidence of any TLAAs applicable to penetrations, except for the main steam penetration design described in Section 4.6.2.

The containment penetrations include no bellows or expansion joints whose design is supported by a TLAA.

4.6.2 Design Cycles for the Main Steam Line Penetrations

Summary Description

The main steam penetrations are designed for cyclic loads. The BC-TOP-1 "Containment Building Liner Plate Design Report" [Ref 4.9.13, Part II, Section 1.1] includes:

- 100 lifetime steady state operating thermal gradient plus normal operating cyclic loads ("Loading Condition V"), and
- 10 steady state operating thermal gradient plus steam pipe rupture cyclic loads ("Loading Condition IV").

Analysis

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 to compare the maximum allowed alternating stress range S_a for the assumed number of cycles to the calculated maximum alternating stress intensity for this load combination, $S'_a = S_a K_e$, where K_e is a simplified elastic-plastic multiplier (or fatigue stress intensity multiplier). S_a for the number of event cycles is taken from the applicable ASME Section III-1971 Figure I-9-1 S-N diagram. The line for material with ultimate tensile strength ≤ 80,000 psi on the S-N diagram applies to this SA 516 Grade 70 or A 516 Grade 70, 70,000 psi ultimate tensile material [BC-TOP-1, Sections 4.1 and 5.1.1, strength from ASME Section III-1971 Table I-7.1].

Loading Condition IV - Normal Plus Pipe Rupture - 10 Cycles

Design for this combination is not a TLAA, since it in fact represents a single end-of-design life event which is not affected by the design lifetime. It is however the subject of a simplified elastic-plastic analysis of the fatigue effects.

For 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, 600,000 psi, to the calculated maximum alternating stress intensity for this load combination,

$$S'_a = S_a K_e = 322{,}000 \text{ psi}$$

—which is acceptable, since S'_a is less than S_a [Ref. 4.9.13, Section 5.3.4.(d)].

The analysis used 10 cycles instead of just 1 for this load combination because 10 is the lowest number of cycles on the S-N diagram. This loading condition meets the definition of a “faulted event,” and therefore if addressed within an ASME Section III Class 1 fatigue analysis, would not contribute to the predicted fatigue cumulative usage factor. However, the main steam penetrations are (1) not ASME Section III Class 1 components, but (2) must function for faulted events in other components, such as a main steam line break inside containment, which concurrently imposes the worst load on the penetration.

For license renewal purposes, the following estimate of usage factor due to these Condition IV faulted events permits an assessment of the possible additive effect of this event when combined with the effect of Loading Condition V, below. Referring to the S-N diagram, about 37 cycles are allowed for the 322,000 psi applied stress range S'_a, for an equivalent usage factor of

$$10/37 = 0.270$$

—for the 10 cycles assumed, or

$$1/37 = 0.027$$

—for a single design basis pipe rupture event.

Loading Condition V - Normal Penetration Thermal Gradient Plus Startup-Shutdown - 100 Cycles

For 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, 200,000 psi, to the calculated maximum alternating stress intensity for this load combination,

$$S'_a = S_a K_e = 52{,}800 \text{ psi}$$

—which is acceptable, since S'_a is less than S_a [Ref. 4.9.13, Section 5.3.5.(c)].

Again, BC-TOP-1 did not calculate a usage factor for this case, but referring to the ASME Section III-1971 Figure I-9-1 S-N diagram, about 3,600 cycles are allowed for the 52,800 psi applied stress range S'_a, for an equivalent usage factor of

$$100/3{,}600 = 0.028$$

—for the 100 cycles assumed.

Estimated Number of Loading Condition V Events in 60 Years

The operating history to date indicates that the original design basis 100 operating cycles assumed for main steam penetrations will be adequate for the 60-year extended operating period. Table 4.3-1, Item 1 shows only 27 startup cycles in the 19 years through 2004, and projects about 62 in 60 years. Since there are no inboard MSIVs in this PWR design, main steam penetration thermal cycles do not occur separately from reactor coolant system startup-shutdown cycles. Therefore, the same number of main steam penetration full-range thermal cycles (BC-TOP-1 Part II “Condition V” events) is expected in 60 years.

Combined Effect of Loading Conditions IV and V with a Large Increase in the Number of Condition V Events

The faulted Loading Condition IV event would not affect the fatigue calculation for an ASME Section III Class 1 pressure boundary component. The fatigue evaluation for this load is also not time-dependent and is therefore not a TLAA; but the main steam penetrations are not ASME Section III Class 1 components and must also function following this faulted event. To assess the combined effect, the effect of the Condition V normal operating loads is therefore combined with the effect of the Condition IV faulted event.

Even if the main steam penetrations experience a very large number of BC-TOP-1 Part II Condition V events, an examination of the analysis basis demonstrates that the design is more than adequate. The Condition V events do not contribute significantly to usage factor, and a revised BC-TOP-1 analysis for any reasonably expected increase in the number of these events demonstrates adequate margin to the stress limit determined by the elastic-plastic analysis.

As noted above, ASME Section III-1971 Figure I-9-1 indicates that about 3,600 cycles could be accommodated by the BC-TOP-1 simplified elastic-plastic analysis at $S_a' = 52{,}800$ psi, as calculated for the worst-case Condition V event.

Alternatively, adding the usage factor estimated above for 10 Loading Condition IV events to 25 times the usage factor estimated above for the original 100 normal Condition V operating cycles, for as many as 2500 Condition V events, would still result in a usage factor estimate less than 1.0, and therefore would not affect the conclusion of the analysis:

$$0.270 + 25.0 \times 0.028 = 0.970.$$

Disposition: Validation, 10 CFR 54.21(c)(1)(i)

The original number of thermal cycles assumed for the main steam line penetrations is adequate for the period of extended operation; and there is more than sufficient margin in the design for any possible increase in operating cycles above the original estimate. The design of the main steam penetrations is therefore valid for the period of extended operation, in accordance with 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 Fuel Handling Machine CMAA-70 Load Cycle Limits

Summary Description

USAR Section 9.1.4 and licensing correspondence describe design of these lifting machines to Crane Manufacturers Association of America Specification No. 70 (CMAA-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. The design of cranes for these standard numbers of lifts for the plant lifetime is therefore a TLAA.

Analysis

Design Lifts of Heavy-Lift Cranes

The cask handling crane is CMAA-70 Class A and the polar crane is Class C. CMAA-70 (1975) Class A and B cranes are designed for 20,000 to 100,000 full-capacity lifts in a design lifetime, Class C cranes for 100,000 to 500,000. To reach 100,000 full-capacity lifts in 60 years a crane would have to perform 1,666 per year, which is not possible in these services.

The cask handling crane has raised no significant number of heavy lifts to date. WCGS has not yet shipped spent fuel, nor yet moved any to on-site storage outside the spent fuel pool. This 150-ton Class A crane was used to rerack the spent fuel pool, which required only light lifts; about 24 old-rack lifts of 22 tons plus about 30 new-rack lifts of lower weight. The crane was probably used for a comparable number of similar light lifts during construction.

About two cask lifts per refueling outage will occur when either offsite shipment or dry storage commence, for about 60 heavy lifts, 100 at most, in a 60-year life.

The polar crane trolley is rated at 260 tons (520,000 lbf.). The bridge is designed for 520 tons and rated for 440 tons. A second temporary 260-ton design, 220-ton rated trolley was installed to permit heavier lifts during construction, with a 500-ton design, 420-ton rated lifting beam between the two trolleys. Polar crane duty for the remainder of plant life is largely determined by refueling cycles. WCGS now refuels on 18-month cycles. Refuel 14 was mid-2005. WCGS therefore expects about 41 or 42 refuelings in 60 years.

The polar crane technical specification required 16 rated lifts per year, which would be 640 rated lifts for the original 40-year design life. Table 4.7-1 demonstrates that not even this specified number of rated loads will occur in a 60-year extended period of operation, much less the 100,000 to 500,000 allowed by the polar crane CMAA-70 Class C design rating.

Table 4.7-1 Estimated Polar Crane Lifetime Significant Lifts

Lifts, vs. rated bridge, or rated trolley,	**980,000 lbf. 520,000 lbf.**	**No.**	**Every-**	**Number in 60 years**
Maximum Construction Load [USAR Table 9.1-7]	950,000 lbf	14	—	14
Initial Construction (conservative estimate)	≤520,000 lbf	70	—	70
Refuel 13 Overload (see below)	866,000 lbf	1	—	1
Missile Shield (Installation through Refuel 13, removed at Refuel 13)	118,400 lbf	2	Refuel	28
Reactor Vessel Head —Additional Lifts	400,000 lbf	2 64(1)	Refuel —	84 64
Upper Internals —Additional Lifts	200,000 lbf	2 28(2)	Refuel —	84 28
Lower Internals	300,000 lbf	2	10 years	12
Reactor Coolant Pump motor or internals —Additional Lifts	100,000 lbf	2 18(3)	Refuel —	84 18
			Estimated Total Lifetime Significant Lifts	**487**

Notes to Table 4.7-1 :

1. Conservative estimate based on a review of the outage history, which identified the following head lifts in addition to the normal two-per-outage refueling lifts:

Six refuels with two head removals = two extra lifts per outage x 6	12
One outage with three extra lifts to inspect and clean O-ring	3
Refuels 3 – 9: One extra head removal per outage for O-ring inspection and shielding, 7 x 2 lifts	14
Refuel 7: Four head removals in addition to the Refuel 3 – 9 O-ring inspections	8
Refuel 13: Two extra lifts	2
Total additional head lifts to date	**39**
Additional allowance (assumes no scheduled head inspections, such as the O-ring inspections)	25
Total estimated additional lifetime head lifts	**64**

2. Conservative estimate based on the same review as Note 1:

Six refuels with two internals removals = two extra lifts per outage x 6	12
Refuel 13: Two extra lifts	2
Additional allowance	14
Total estimated additional lifetime head lifts	**28**

3. Additional lifts due to issues and failures in the eight years preceding the 2005 outage: Four pump internals replacements due to the industry cap screw issue (16 lifts), and one locked-rotor motor (2 lifts).

Polar Crane Overload Evaluation

At Refuel 13 an attempted lift loaded the polar crane main hook to about 433 tons, about 166 percent of the 260 ton trolley and main hook rating. The bridge is designed for 520 tons and its nameplate rating is 440 tons. The bridge was therefore unaffected.

The overload evaluation determined that stresses were well within the elastic range of all critical elements in the load path. Minor damage was however suspected in the sheave bearings. The hook sheave bearings were therefore replaced, and inspected to determine the need to replace the upper sheave bearings. The evaluation did not examine component fatigue lives, nor the possibility that this overload might reduce the number of rated lifts in the design life.

This is a CMAA-70 Class C crane. Class C cranes are rated for up to 500,000 lifetime heavy lifts, or 5 times the number for which a Class A crane, as usually furnished for this service, is rated. Since no more than perhaps 500 rated lifts will occur in a 60-year design life, this single overload event had no significant effect on the margin of safety in the design life of the polar crane.

Design Lifts of the Spent Fuel Bridge and Fuel Handling Machine

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.

NUREG-1774 [Ref. 4.9.15] identified two possible overload events for this machine. In 1986 the spent fuel pool overload cell was not tested prior to use, and the crane lifted a load that was greater than the maximum allowed. Although the load cell was set 200 pounds higher than permitted by Technical Specifications for movement over the fuel pool, the as-found overload cell setting was less than the hoist rating, no movements of loads greater than those allowed occurred, and there were no indications of overload from other causes.

In 1990 the spent fuel crane was moved while the handling tool was still connected to the fuel assembly in the test location. This event damaged a rod cluster control assembly (RCCA) and was the subject of a notice of violation. The documents indicate no actual overload.

The fuel handling 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.

Each of these machines is CMAA-70 Class A or better and therefore rated for up to 100,000 lifetime lifts. Whether for a full-core offload or a partial-core reload and shuffle, a refueling outage requires only about two lifts per fuel assembly per machine, for each of the fuel handling machine and spent fuel bridge. There are 193 assemblies in a full core, or perhaps 400 lifts per machine in a normal refueling outage. WCGS expects 42 refuels in a 60-year life, for about 16,800 fuel handling lifts per machine. The fuel storage pool gate moves add about 84 to 100 lifetime lifts for the spent fuel bridge crane. The fuel handling machine may also see infrequent loads up to 3,166 lb.

The fuel handing lifts are only about half the rating of the hoists. A fuel assembly lift consists of the assembly itself, 1647 lb at most; plus, for the spent fuel bridge crane, the 376 lb spent fuel tool, for an average total of about 1 ton or less.

Each of these machines will therefore experience only a fraction of its rated lifetime number of lifts, most of them half or less of rated capacity.

Disposition: Validation, 10 CFR 54.21(c)(1)(i)

The design standard number of full-capacity lifts far exceeds the number expected of each machine for a 60-year period of extended operation. The lifting machine designs therefore remain valid for the period of extended operation, in accordance with 10 CFR 54.21(c)(1)(i).

4.7.2 Absence of a TLAA for Reactor Vessel Underclad Cracking Analyses

NUREG-1800, Table 4.1-3 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 at WCGS, nor therefore, analyzed, in the absence of which no such TLAA exists. This phenomenon has also been addressed in the vessel by weld cladding processes designed to avoid these defects, consistent with Regulatory Guide 1.43.

The Westinghouse Owners Group (WOG) License Renewal Topical Report, WCAP-15338-A, "A Review of Cracking Associated with Weld Deposited Cladding in Operating PWR Plants" [Ref. 4.9.6] summarizes fatigue crack growth analyses and ASME Section XI allowable flaw size evaluations for typical Westinghouse vessels. The NRC safety evaluation of WCAP-15338-A notes that "Underclad cracks … have been reported … only in SA-508, Class 2 reactor vessel forgings manufactured to a coarse grain practice and clad by high-heat-input submerged arc processes."

Qualification of Clad Welding Processes to Avoid Underclad Cracking

In the WCGS vessel only the carbon steel forgings are SA-508 Class 2 or 3. The clad is stainless steel weld metal, Analysis A8; and Ni-Cr-Fe Weld Metal, F-Number 43. Although the 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). [USAR, Section 5.3.1.2.g]

- Westinghouse practices achieve the same purpose as 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. [USAR Appendix 3A, In Re Reg. Guide 1.43, Revision 0, “Control of Stainless Steel Weld Cladding of Low-Alloy Steel Components”]

Applicability of Westinghouse Owners Group Topical Report WCAP-15338-A to WCGS

WCAP-15338-A reports a generic 60-year flaw growth analysis which assumes 1.5 times the number of 40-year design basis cycles, and found that the expected maximum flaw predicted by the crack growth analysis is less than the Section XI allowable flaw size. It thereby demonstrated that these effects are acceptable for a 60-year period of extended operation. 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.

WCAP-15338-A could be applied to WCGS. The cyclic and transient load assumptions of this topical report bound those expected in the vessel for the 60-year period of extended operation. If invoked, WCAP-15338-A would therefore be valid for the period of extended operation, in accordance with 10 CFR 54.21(c)(1)(i). Since these analyses qualify vessels for the extended 60-year rather than the current 40-year operating term, they would not be TLAAs under 10 CFR 54.3(a) Criterion 3.

The Metal Fatigue of the Reactor Coolant Pressure Boundary program (B3.1) will ensure either that the assumed number of cyclic and transient events is not exceeded, or that appropriate reevaluation or other corrective action is taken if a design basis number of events is exceeded. Cyclic and transient loadings that might affect growth of underclad cracking in the vessel will thereby be managed for the period of extended operation, in accordance with 10 CFR 54.21(c)(1)(iii).

4.7.3 Absence of a TLAA in a Reactor Coolant Pump Flywheel Fatigue Crack Growth Analysis

NUREG-1800 Table 4.1-3 identifies “Fatigue analysis of the reactor coolant pump flywheel” as a potential TLAA. At WCGS, fatigue in the flywheels is a recognized and analyzed aging effect, but the analysis is not a TLAA.

The licensing basis for protection against flywheel burst is currently supported by an inservice inspection program. A probabalistic risk assessment consistent with Regulatory Guide 1.174 supports an extended 20-year flywheel inspection interval during the current 40-year licensed operating period. The risk assessment is supported by a 60-year fatigue crack growth analysis.

Under 10 CFR 54.3 Criterion 3, neither the risk assessment nor the supporting crack growth analysis is a TLAA, (1) because these analyses support a 20-year inspection interval rather than a qualified design life, and (2) because the fatigue crack growth analysis is for a 60-year period of extended operation rather than for the term of the current operating license.

WCGS License Amendment 153 extended the surveillance interval for the flywheels to 20 years based on Westinghouse Topical Report WCAP-15666, “Extension of Reactor Coolant Pump Motor Flywheel Examination” [Ref. 4.9.8]. WCAP-15666 is based on Regulatory Guide 1.174 risk assessment methods. The NRC accepted WCAP-15666 for use in license applications [Ref. 4.9.9], in support of Technical Specification improvements.

The supporting WCAP-15666, Section 2 fatigue crack growth analysis assumes an initial flaw from a flywheel bore keyway equal to 10 percent of the keyway-to-outer-radius dimension, and demonstrates that 6000 start-stop cycles (over an assumed 60-year life) will produce only about an 80 mil extension of the crack. Since this evaluation was based on the extended rather than the current licensed operating period, it is not a TLAA.

Though not a TLAA, the 60-year crack growth analysis was used to support this licensing amendment permitting a 20-year surveillance interval during the current 40-year licensed operating period. The question remains whether the assumptions of this analysis for a 60-year licensed operating period are valid at WCGS. That depends only on a demonstration that pumps will experience less than 6000 start-stop cycles during the 60-year period of extended operation.

WCGS now refuels on 18-month cycles. Refuel 14 was mid-2005. WCGS therefore expects about 41 or 42 refuelings in 60 years. The forced outage history through early 2005 (20 years of operation) includes 70 events, of which only about 50 required a pump restart. Recent capacity factors have exceeded 90 percent. A conservative estimate would therefore require no more than about 3 pump stop-start cycles per year for forced outages plus about 2 per refuel, or about 165 in a 60-year life. As many as 10 per fuel cycle would require only about 400 in a 60-year life. Furthermore, pumps are usually rebuilt at least every 15 to 20 years, and the present 20-year inspection interval, and the inspection methods, ensure detection of any incipient flaws long before they might reach critical size.

Another Westinghouse Topical Report, WCAP-8163, “Reactor Coolant Pump Integrity in LOCA” [Ref. 4.9.5], is also referenced in USAR Section 5.4.15 and from USAR 5.4.1 for flywheel integrity. The fracture mechanics analysis of Section 6 of this topical report is not time-dependent.

4.8 TLAAS SUPPORTING 10 CFR 50.12 EXEMPTIONS

One 10 CFR 50.12 exemption, for use of a leak-before-break analysis for the primary coolant loops, is based in part on a time-limited aging analysis of fatigue effects. See Section 4.3.2.11.

4.9 REFERENCES

4.9.1 US NRC NUREG 0881. Safety Evaluation Report Related to the Operation of Wolf Creek Generating Station, Unit No. 1. Washington: USNRC, April 1982 [WFCK_NUREG0881V01.pdf].

4.9.2 Federal Register Notice at 68 FR 60422. "Notice of Availability of Model Application Concerning Technical Specification Improvement Regarding Extension of Reactor Coolant Pump Motor Flywheel Examination for Westinghouse Plants Using the Consolidated Line Item Improvement Process." 22 October 2003.

4.9.3 WCNOC letter WO04-0001, Britt T. McKinney, Site Vice President; to US NRC Document Control Desk. "Docket No. 50-482: Application for Technical Specification Improvements to Extend the Inspection Interval for Reactor Coolant Pump Flywheels Using the Consolidated Line Item Improvement Process." 9 February 2004.

4.9.4 US NRC letter, Jack N. Donohew, Senior Project Manager, Section 2, Project Directorate IV, Division of Licensing Project Management, Office of Nuclear Reactor Regulation; to Rick A. Muench, President and Chief Executive Officer, WCNOC. "Wolf Creek Generating Station - Issuance of Amendment Re: Extending the Inspection Interval for Reactor Coolant Pump Flywheels." 16 June 2004.

With attached Safety Evaluation by the Office of Nuclear Reactor Regulation Related to Amendment No. 153 to Facility Operating License No. NPF-42. Wolf Creek Nuclear Operating Corporation, Wolf Creek Generating Station, Docket No. 50-482. 16 June 2004.

4.9.5 WCAP-8163, Topical Report, Reactor Coolant Pump Integrity in LOCA. Pittsburgh: Westinghouse, September 1973

4.9.6 WCAP-15338-A. Warren Bamford and R. D. Rishel. Westinghouse Owners Group Generic License Renewal Program Topical Report. A Review of Cracking Associated with Weld Deposited Cladding in Operating PWR Plants. Pittsburgh: Westinghouse Electric Company LLC, October 2002.

4.9.7 USNRC Letter, Grimes (NRC) to Newton (WOG). "Safety Evaluation of WCAP-15338, 'A Review of Cracking Associated With Weld Deposited Cladding in Operating PWR Plants.'" 15 October 2001.

4.9.8 WCAP-15666. Westinghouse Topical Report. P. L. Strauch et al. Extension of Reactor Coolant Pump Motor Flywheel Examination. For the Westinghouse Owners Group (WOG). Pittsburgh: Westinghouse, July 2001.

4.9.9 US NRC Letter, Herbert N. Berkow, Director, Project Directorate IV, Division of Licensing Project Management,Office of Nuclear Reactor Regulation; to Robert H. Bryan, Chairman, Westinghouse Owners Group. "Safety Evaluation of Topical Report WCAP-15666, 'Extension of Reactor Coolant Pump Motor Flywheel Examination'." 5 May 2003.

4.9.10 WCAP-16028. Westinghouse Report. Laubham, T. J., J. Conermann, and R. J. Hagler. Analysis of Capsule X from Wolf Creek Nuclear Operating Corporation, Wolf Creek Reactor Vessel Radiation Surveillance Program. Rev. 0, March 2003.

4.9.11 WCAP-16030. Westinghouse Report. Laubham, T. J. Evaluation of Pressurized Thermal Shock for Wolf Creek. Rev. 0, May 2003.

4.9.12 US NRC Letter, Jack Donohew, Senior Project Manager, Section 2, Project Directorate IV, Division of Licensing Project Management, Office of Nuclear Reactor Regulation; to Rick A. Meunch, President and CEO, WCNOC. "Wolf Creek Generating Station - Test Results for the Withdrawal of Surveillance Capsule X." 21 January 2004.

With Attached Evaluation by the Office of Nuclear Reactor Regulation Related to Capsule X Surveillance Capsule Program Report, Summary of Findings (Reactor Vessel Integrity Neutron Irradiation), Wolf Creek Nuclear Operating Corporation, Wolf Creek Generating Station, Docket No. 50-482. 21 January 2004.

4.9.13 BC-TOP-1. Bechtel Topical Report Johnson. T. E, and B. W. Weddelsborg. Containment Building Liner Plate Design Report, Rev. 1. Bechtel Corporation, December 1972.

4.9.14 BC-TOP-5-A. Bechtel Topical Report. Reuter, H. R. et al. Prestressed Concrete Nuclear Reactor Containment Structures, Rev. 3. Los Angeles: Bechtel Power Corporation, February 1975.

4.9.15 NUREG-1774. R. L. Lloyd. A Survey of Crane Operating Experience at U. S. Nuclear Power Plants from 1968 through 2002," USNRC. July 2003.

4.9.16 WCAP-14575-A. Frank Klanica and Charlie Gay. Westinghouse Owners Group Generic License Renewal Program Topical Report. *Aging Management for Class 1 Piping and Associated Pressure Boundary Components.* Pittsburgh: Westinghouse Electric Company LLC, December 2000. (Accepted version of WCAP-14575, Rev. 1, August 1996.

4.9.17 US NRC Letter, Grimes (NRC) to Newton (WOG). "Acceptance for Referencing of Generic License Renewal Program Topical Report Entitle, "License Renewal Evaluation: Aging Management for Class 1 Piping and Associated Pressure Boundary Components," WCAP-14575, Rev. 1, August 1996." 8 November 2000.

With attached "Final Safety Evaluation by the Office of Nuclear Reactor Regulation Concerning Westinghouse Owners Group Report, WCAP–14575, Revision 1, "License Renewal Evaluation: Aging Management for Class 1 Piping and Associated Pressure Boundary Components," Project No. 686".

APPENDIX A

UPDATED SAFETY ANALYSIS REPORT SUPPLEMENT

A0 APPENDIX A INTRODUCTION

Introduction

This appendix provides the information to be submitted in an Updated Safety Analysis Report Supplement as required by 10 CFR 54.21(d) for the WCGS 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. These summary descriptions of aging management program activities and time-limited aging analyses will be incorporated in the Updated Safety Analysis Report for the WCGS following issuance of the renewed operating license in accordance with 10 CFR 50.71(e).

A1 SUMMARY DESCRIPTIONS OF AGING MANAGEMENT PROGRAMS

A1.1 ASME SECTION XI INSERVICE INSPECTION, SUBSECTIONS IWB, IWC, AND IWD

ASME Section XI Inservice Inspection, Subsections IWB, IWC, & IWD inspections are performed to manage aging in Class 1, 2, and 3 piping and components within the scope of license renewal. The program includes periodic visual, surface, volumetric examinations and leakage tests of Class 1, 2 and 3 pressure-retaining components, including welds, pump casings, valve bodies, integral attachments, and pressure-retaining bolting. WCGS inspections meet ASME Section XI requirements and can manage aging such as cracking, surface and subsurface discontinuities, loss of material, loss of fracture toughness, and physical damage. WCGS weld examinations for Class 1 and Class 2 piping are performed in accordance with Risk-Informed Inservice Inspection (RI-ISI) selection and examination requirements. RI-ISI is based on the methodology described in EPRI Topical Report TR-112657. The WCGS ISI Program is in accordance with 10 CFR 50.55a and ASME Section XI, 1998 edition through 2000 addenda.

A1.2 WATER CHEMISTRY

The Water Chemistry program includes maintenance of the chemical environment in the reactor coolant system and related auxiliary systems containing treated borated water and includes maintenance of the chemical environment in the steam generator secondary side and the secondary cycle systems to limit loss of material and cracking. The Water Chemistry Program is based upon the guidelines of EPRI TR-105714 "PWR Primary Water Chemistry Guidelines" and EPRI TR-102134 "PWR Secondary Water Chemistry Guidelines."

A1.3 REACTOR HEAD CLOSURE STUDS

The Reactor Head Closure Studs program includes periodic visual, surface, 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 closure during primary system leakage tests. The program implements ASME Section XI code, Subsection IWB, 1998 Edition through the 2000 addenda and detects reactor vessel stud, nut and washer cracking, loss of material due to wear and corrosion, and reactor coolant leakage from the reactor vessel flange.

A1.4 BORIC ACID CORROSION

The Boric Acid Corrosion program manages loss of material due to boric acid corrosion. The program includes provisions to identify, inspect, examine and evaluate leakage, and initiate corrective actions. 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 program addresses recent operating experience noted in NRC Regulatory Issue Summary 2003, “NRC Review of Responses to Bulletin 2002-01, “Reactor Pressure Vessel Head Degradation and Reactor Coolant Pressure Boundary Integrity,” (which includes NRC Bulletin 2002-01, 2002-02, and NRC Order EA-03-009).

Prior to the period of extended operation, procedures will be enhanced to state that susceptible components adjacent to potential leakage sources will include electrical components and connectors.

A1.5 NICKEL-ALLOY PENETRATION NOZZLES WELDED TO THE UPPER REACTOR VESSEL CLOSURE HEADS OF PRESSURIZED WATER REACTORS

The Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactors program manages cracking due to primary water stress corrosion cracking and loss of material due to boric acid wastage in nickel-alloy vessel head penetration nozzles and includes the reactor vessel closure head, upper vessel head penetration nozzles and associated welds. This program was developed in response to NRC Order EA-03-009.

Detection of cracking is accomplished through implementation of a combination of bare metal visual examination (external surface of head) and non-visual examination (underside of head) techniques. Procedures are developed to perform reactor vessel head bare metal inspections and calculations of the susceptibility ranking of the plant. Examinations are performed by Level II or III VT-2 certified personnel. Inspections completed to date have indicated no evidence of cracking in the vessel head penetration nozzles. Completed testing to date verifies a susceptibility ranking of "Low" per EA-03-009, as amended. Plants in the "Low" category require bare metal visual inspections every third refueling outage or every five years (whichever comes first) and ultrasonic, eddy current, or dye penetrant testing every fourth refueling outage or every seven years (whichever comes first) per the Order, as amended.

Prior to the period of extended operation, procedures will be enhanced to indicate that detection of leakage or evidence of cracking in the vessel head penetration nozzles or associated welds will cause an immediate reclassification to the "High" susceptibility ranking, commencing from the same outage in which the leakage or cracking is detected.

A1.6 FLOW-ACCELERATED CORROSION

The Flow-Accelerated Corrosion (FAC) program manages aging effects of wall thinning due to FAC 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 objectives of the FAC program are achieved by (a) identifying system components susceptible to FAC, (b) an analysis using a predictive code such as CHECWORKS to determine critical locations for inspection and evaluation, (c) providing guidance of follow-up inspections, (d) repairing or replacing components, as determined by the guidance provided by the program, and (e) continual evaluation and incorporation of the latest technologies, industry and plant in-house operating experience.

Procedures and methods used by the FAC program are consistent with WCGS commitments to NRC Bulletin 87-01, "Thinning of Pipe Wall in Nuclear Power Plants," and NRC Generic Letter 89-08, "Erosion/Corrosion-Induced Pipe Wall Thinning."

A1.7 BOLTING INTEGRITY

The Bolting Integrity program manages the aging effects of cracking, loss of material, and loss of preload for pressure retaining bolting and ASME component support bolting. The program includes preload control, selection of bolting material, use of lubricants/sealants consistent with EPRI good bolting practices, and performance of periodic inspections for indication of aging techniques. The program also includes the inservice inspection requirements established in accordance with ASME Section XI, Subsections IWB, IWC, IWD, and IWF for ASME Class bolting.

WCGS good bolting practices are established in accordance with plant procedures. These procedures include requirements for proper disassembling, inspecting, and assembling of connections with threaded fasteners. The general practices that are established in this program are consistent with EPRI NP-5069, “Good Bolting Practices, Volume 1 and Volume 2,” and EPRI TR-104213, “Bolted Joint Maintenance and Applications Guide.”

A1.8 STEAM GENERATOR TUBE INTEGRITY

The Steam Generator Tube Integrity program includes the preventive measures, condition monitoring inspections, degradation assessment, repair and leakage monitoring activities necessary to manage cracking and loss of material. The aging management measures employed include non-destructive examination, visual inspection, sludge removal, tube plugging, in-situ pressure testing, maintaining the chemistry environment by removal of impurities and addition of chemicals to control pH and oxygen.

NDE inspection scope and frequency, and primary to secondary leak rate monitoring are conducted consistent with the requirements of WCGS Unit 1 Technical Specifications. Structural integrity limits consistent with Regulatory Guide 1.121, Revision 0, “Bases for Plugging Degraded PWR Steam Generator Tubes,” are applied. Steam generator management practices are consistent with NEI 97-06 “Steam Generator Program Guidelines” with minor exceptions that have been reviewed and provided with a technical justification.

A1.9 OPEN-CYCLE COOLING WATER SYSTEM

The Open-Cycle Cooling Water (OCCW) System program manages loss of material and reduction of heat transfer for components exposed to raw water. The program includes chemical treatment and control of biofouling; heat exchanger performance testing; and periodic inspections to ensure that the effects of aging will be managed on the OCCW systems or structures and components serviced by the OCCW systems for the period of extended operation. The program is consistent with commitments as established in WCGS responses to NRC Generic Letter 89-13 “Service Water System Problems Affecting Safety-Related Components.”

The Open-Cycle Cooling Water System program provides the general requirements for implementation and maintenance of programs and activities which mitigate aging of OCCW systems and components. The various aspects of the WCGS program (control, monitoring, maintenance and inspections) are implemented in station procedures.

A1.10 CLOSED-CYCLE COOLING WATER SYSTEM

The Closed-Cycle Cooling Water System Program manages loss of material, cracking, and reduction in heat transfer for components in closed cycle cooling water systems. The program includes maintenance of system corrosion inhibitor concentrations and chemistry parameters following the guidance of EPRI TR-107396 to minimize aging, and periodic testing and inspections to evaluate system and component performance. Inspection methods include visual, ultrasonic testing (UT) and eddy current testing (ECT).

Prior to the period of extended operation, a new periodic preventive maintenance activity will be developed to specify performing inspections of the internal surfaces of valve bodies and accessible piping while the valves are disassembled for operational readiness inspections to detect loss of material and fouling.

A1.11 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 the loss of material due to corrosion and the effects of rail wear for all cranes, trolley structural components and applicable rails within the scope of license renewal. The program is implemented through periodic visual inspections of components.

Crane inspection activities verify structural integrity of the crane components required to maintain the crane intended function. Visual inspections assess conditions such as loss of material due to corrosion of structural members, misalignment, flaking, side wear of rails, loose tie down bolts and excessive wear or deformation of monorails. The inspection requirements are consistent with the guidance provided by NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants" for load handling systems that handle heavy loads which can directly or indirectly cause a release of radioactive material, applicable industry standards (such as CMAA Spec 70 and ANSI B30.11) for other cranes within the scope of license renewal, and applicable OSHA regulations (such as 29 CFR Volume XVII, Part 1910 and Section 1910.179).

Prior to the period of extended operation, procedures will be enhanced to identify industry standards or WCGS specifications that are applicable to the component and to specifically inspect for loss of material due to corrosion or rail wear.

A1.12 FIRE PROTECTION

The Fire Protection program manages loss of material for fire rated doors, fire dampers, diesel-driven fire pump, and the halon fire suppression system, cracking, spalling, and loss of material for fire barrier walls, ceilings, and floors, and hardness and shrinkage due to weathering of fire barrier penetration seals. Periodic visual inspections of fire barrier penetration seals, fire dampers, fire barrier walls, ceilings and floors, and periodic visual inspections and functional tests of fire-rated doors are performed. Periodic testing of the diesel-driven fire pump ensures that there is no loss of function due to aging of diesel fuel supply lines.

Drop tests on approximately 10 percent of accessible horizontal and vertical fire dampers are performed on an 18 month basis. Fire dampers that are inaccessible for drop testing are visually inspected to assess integrity/availability. Visual inspections are performed on fire-rated doors at least once per year to verify the integrity of door surfaces and for clearances to detect aging of the fire doors. A visual inspection and function test of the halon fire suppression system is performed every 18 months. Approximately 10 percent of each type (electrical and mechanical as practical) of penetration seal is visually inspected at least once every 18 months. Fire barrier walls, ceilings, and floors including coatings and wraps (structural steel fireproofing, raceway fire wrap and hatch covers) are visually inspected at least once every 18 months.

Prior to the period of extended operation, fire damper inspection and drop test procedures will be enhanced to inspect damper housing for signs of corrosion and to specify fire barriers and doors described in USAR Appendix 9.5A, “WCGS Fire Protection Comparison to APCSB 9.5-1 Appendix A,” and WCGS Fire Hazards Analysis. Training for technicians performing the fire door and fire damper visual inspections will be enhanced to include fire protection inspection requirements and training documentation.

A1.13 FIRE WATER SYSTEM

The Fire Water System program manages loss of material for water-based fire protection systems. Periodic hydrant inspections, fire main flushing, sprinkler inspections, and flow tests are performed considering applicable National Fire Protection Association (NFPA) codes and standards. Nuclear Electric Insurance Limited (NEIL) performance based guidance is utilized for fire protection system inspection, testing, and maintenance intervals. The fire water system discharge pressure is continuously monitored such that loss of system pressure is immediately detected and corrective actions are initiated. The Fire Water System program conducts an air or water flow test through each open head spray/sprinkler head to verify that each open head spray/sprinkler nozzle is unobstructed. The Fire Water System program tests a representative sample of fire protection sprinkler heads or replaces those that have been in service for 50 years, using the guidance of NFPA 25, 2002 Edition, and tests at 10 year intervals thereafter during the period of extended operation to ensure that signs of aging are detected in a timely manner. Visual inspections of the fire protection system exposed to water, evaluating wall thickness to identify evidence of loss of material due to corrosion, are covered by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program (A1.22).

A1.14 FUEL OIL CHEMISTRY

The Fuel Oil Chemistry program manages loss of material on the internal surface of components in the emergency diesel fuel oil storage and transfer system and diesel fire pump fuel oil system. The program includes (a) surveillance and monitoring procedures for maintaining fuel oil quality by controlling contaminants in accordance with applicable ASTM Standards, (b) periodic draining of water from fuel oil tanks, (c) visual inspection of internal surfaces during periodic draining and cleaning, (d) ultrasonic wall thickness measurements from external surfaces of fuel oil tanks, (e) inspection of new fuel oil before it is introduced into the storage tanks, and (f) one-time inspections of a representative sample of components in systems that contain fuel oil by the One-Time Inspection program.

Prior to the period of extended operation, the emergency fuel oil day tanks will be added to the ten year drain, clean, and internal inspection program. Procedures will be enhanced to provide for supplemental ultrasonic thickness measurements if there are indications of reduced cross sectional thickness found during the visual inspection of the emergency fuel oil storage tanks.

A1.15 REACTOR VESSEL SURVEILLANCE

The Reactor Vessel Surveillance program is consistent with ASTM E 185. Actual reactor vessel coupons are used, but an exemption in the original license permits use of other than beltline weld material for the weld coupons. 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.

The schedule has been revised by removal of the last two coupon sets to the spent fuel pool, at exposures greater than those expected at the beltline wall at 60 years. This withdrawal therefore 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. Vessel fluence is now determined by ex-vessel dosimetry. This schedule change has been approved by the NRC, as required by 10 CFR 50 Appendix H, “Reactor Vessel Material Surveillance Program Requirements.”

A1.16 ONE-TIME INSPECTION

The One-Time Inspection program conducts one-time inspections of plant system piping and components to verify the effectiveness of the Water Chemistry program (A1.2), Fuel Oil Chemistry program (A1.14), and Lubricating Oil Analysis program (A1.23). The aging effects to be evaluated by the One-Time Inspection program are loss of material, cracking, and reduction of heat transfer. The One-Time Inspection program determines NDE sample size using the method described in EPRI Report TR-107514 and specifies piping/component location selection that is based on service period, operating conditions, and design margins. The One-Time Inspection program specifies corrective actions and increased sampling of components if aging effects are found during an inspection that leads to loss of component intended function.

This new program will be implemented and completed within the ten year period prior to the period of extended operation.

A1.17 SELECTIVE LEACHING OF MATERIALS

The Selective Leaching of Materials program manages the loss of material due to selective leaching for brass (>15% zinc) and gray cast iron components exposed to raw water or closed-cycle cooling water within the scope of license renewal. The Selective Leaching of Materials program is in addition to the Open Cycle Cooling Water program and the Closed Cycle Cooling Water program in these cases.

The program includes a one-time inspection (visual, mechanical methods) of a selected sample of component internal surfaces to determine whether loss of material due to selective leaching is occurring. If indications of selective leaching are confirmed, follow up examinations or evaluations are performed.

The Selective Leaching of Materials program is a new program that will be implemented prior to the period of extended operation.

A1.18 BURIED PIPING AND TANKS INSPECTION

The Buried Piping and Tanks Inspection program manages loss of material of buried components in the essential service water system, emergency diesel engine fuel oil storage and transfer system, auxiliary feedwater system, high pressure coolant injection system (borated refueling water storage system), and the fire protection system. Visual inspections monitor the condition of protective coatings and wrappings found on carbon steel, gray cast iron or ductile iron components and assess the condition of stainless steel components with no protective coatings or wraps. The program includes opportunistic inspection of buried piping and tanks as they are excavated or on a planned basis if opportunistic inspections have not occurred.

The Buried Piping and Tanks Inspection program is a new program that will be implemented prior to the period of extended of operation. Within the ten year period prior to entering the period of extended operation, an opportunistic or planned inspection will be performed. Upon entering the period of extended operation a planned inspection within ten years will be required unless an opportunistic inspection has occurred within this ten year period.

A1.19 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 stainless steel ASME Code Class 1 piping less than or equal to 4 inches. This program is a part of the WCGS Risk-Informed Inservice Inspection (RI-ISI) program.

For ASME Code Class 1 small-bore piping, the RI-ISI program requires volumetric examinations (by ultrasonic testing) on selected weld locations to detect cracking. Weld locations are selected based on the guidelines provided in EPRI TR-112657. Ultrasonic examinations are conducted in accordance with ASME Section XI with acceptance criteria from Paragraph IWB-3131 and IWB-2430. The fourth interval of the ISI program at WCGS will provide the results for the one time inspection of ASME Code Class 1 small-bore piping.

A1.20 EXTERNAL SURFACES MONITORING PROGRAM

The External Surfaces Monitoring Program manages loss of material for external surfaces of steel components and hardening and loss of strength for elastomers in ventilation and mechanical systems. The External Surfaces Monitoring Program consists of periodic visual inspections for aging management of loss of material, leakage, elastomer hardening and loss of strength.

Loss of material for external surfaces is managed by the Boric Acid Corrosion program (A1.4) for components in a system with treated borated water or reactor coolant environment on which boric acid corrosion may occur, Buried Piping and Tanks Inspection program (A1.18) for buried components, and Structures Monitoring Program (A1.32) for supports, structural items, and electrical components.

A1.21 FLUX THIMBLE TUBE INSPECTION

The Flux Thimble Tube Inspection program performs 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 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 program implements the recommendations of NRC Bulletin 88-09, “Thimble Tube Thinning in Westinghouse Reactors.”

All flux thimble tubes are inspected during each outage. Wall thickness measurements are trended and wear rates are calculated. 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 outage, corrective actions are taken to reposition, cap or replace the tube.

A1.22 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 and hardening - loss of strength. Visual inspections of the internal surfaces of piping, piping components, ducting and other components that are not covered by other aging management programs is included in this program.

The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program uses the work control process to conduct and document inspections. The program performs visual inspections during periodic maintenance, predictive maintenance, surveillance testing and corrective maintenance to detect aging effects that could result in a loss of component intended function. For those systems or components where inspections of opportunity are insufficient, an inspection will be conducted prior to the period of extended operation to provide reasonable assurance that the intended functions are maintained.

The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program is a new program that will be implemented prior to the period of extended operation.

A1.23 LUBRICATING OIL ANALYSIS

The Lubricating Oil Analysis program manages loss of material and reduction of heat transfer for components within the scope of license renewal. The program maintains lubricating oil contaminants within acceptable limits, thereby preserving an environment that is not conducive to aging effects and includes acceptance criteria based on industry guidelines for oil chemical and physical properties, wear metals, contaminants, additives, and water. Increased impurities and degradation of oil properties provide an indication of aging of materials exposed to lubricating oil. Additionally, ferrography is performed on oil samples for trending of wear particle concentrations for the reactor coolant pumps upper and lower bearing oil and other components. Monitoring and trending of lubricating oil analysis results identifies component aging prior to loss of component intended function.

A1.24 ELECTRICAL CABLES AND CONNECTIONS NOT SUBJECT TO 10 CFR 50.49 ENVIRONMENTAL QUALIFICATION REQUIREMENTS

The Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program manages the aging effects of embrittlement, melting, cracking, swelling, surface contamination, or discoloration to ensure that electrical cables and 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 functions.

Non-EQ cables and connections within the scope of license renewal in accessible areas with an adverse localized environment are inspected. The inspections of Non-EQ cables and connectors in accessible areas are representative, with reasonable assurance, of cables and connections in inaccessible areas with an adverse localized environment. At least once every ten years, the Non-EQ cables and connections within the scope of license renewal in accessible areas are visually inspected for embrittlement, melting, cracking, swelling, surface contamination, or discoloration.

The acceptance criterion for visual inspection of accessible Non-EQ cable jacket and connection insulating material is the absence of anomalous indications that are signs of degradation. Corrective actions for conditions that are adverse to quality are performed in accordance with the corrective action program as part of the QA program.

The Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program is a new program that will be implemented prior to the period of extended operation.

A1.25 ELECTRICAL CABLES AND CONNECTIONS NOT SUBJECT TO 10 CFR 50.49 ENVIRONMENTAL QUALIFICATION REQUIREMENTS USED IN INSTRUMENTATION CIRCUITS

The scope of this program includes the cables and connections used in sensitive instrumentation circuits with sensitive, high voltage low-level signals within the Ex-core Neutron Monitoring System including the source range, intermediate range, and power range monitors.

This program provides reasonable assurance that the intended function of cables and connections used in instrumentation circuits with sensitive, low-level signals that are not subject to the environmental qualification requirements of 10 CFR 50.49 and are exposed to adverse localized environments caused by heat, 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 surveillance tests are used to manage the aging of the cable insulation and connections so that 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 calibration results will be completed prior to the period of extended operation and every 10 years thereafter.

A1.26 INACCESSIBLE MEDIUM VOLTAGE CABLES NOT SUBJECT TO 10 CFR 50.49 ENVIRONMENTAL QUALIFICATION REQUIREMENTS

The Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 EQ Requirements program manages the aging effects of inaccessible medium voltage cables within the scope of license renewal exposed to adverse localized environments caused by significant moisture simultaneously with significant voltage.

All cable manholes that contain in-scope Non-EQ inaccessible medium voltage cables will be inspected for water collection. Collected water will be removed as required. This inspection and water removal will be performed based on actual plant experience with the inspection frequency being at least once every two years.

The program provides for testing of in-scope Non-EQ inaccessible medium voltage cables to provide an indication of the conductor insulation condition. At least once every ten years, a polarization index test as described in EPRI TR-103834-P1-2 or other testing that is state-of-the-art at the time of the testing is performed.

The Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 EQ Requirements program is a new program that will be implemented prior to the period of extended operation.

A1.27 ASME SECTION XI, SUBSECTION IWE

The ASME Section XI, Subsection IWE containment inservice inspection program provides aging management of the steel liner of the concrete containment building, including the containment liner plate, piping and electrical penetrations, access hatches, and the fuel transfer tube. Inspections are performed 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 exam requirements are specified in Article IWE-3000. In conformance with 10 CFR 50.55a(g)(4)(ii), the WCGS CISI 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 twelve months before the start of the inspection interval.

A1.28 ASME SECTION XI, SUBSECTION IWL

The ASME Section XI, Subsection IWL containment inservice inspection program manages aging of the concrete containment structure (including the tendon gallery ceiling), the concrete dome, and the post-tensioning system. Inspections are performed to identify and manage any containment concrete aging effects that could result in loss of intended function. In conformance with 10 CFR 50.55a(g)(4)(ii), the WCGS 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 twelve months before the start of the inspection interval.

Prior to the period of extended operation, procedures will be enhanced to include two new provisions regarding inspection of repair/replacement activities.

A1.29 ASME SECTION XI, SUBSECTION IWF

The ASME Section XI, Subsection IWF program manages aging effects that could result in loss of intended function for Class 1, 2 and 3 component supports. There are no Class MC supports at WCGS. In conformance with 10 CFR 50.55a(g)(4)(ii), the WCGS 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 twelve months before the start of the inspection interval.

A1.30 10 CFR 50, APPENDIX J

The 10 CFR Part 50, Appendix J program monitors leakage rates through the containment pressure boundary, including the penetrations and access openings, in order to detect degradation of containment pressure boundary. Seals, gaskets, and bolted connections are also monitored under the program.

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; Regulatory Guide 1.163, Revision 0, "Performance-Based Containment Leak-Testing 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.

A1.31 MASONRY WALL PROGRAM

The Masonry Wall Program, which is part of the Structures Monitoring Program, manages aging of masonry walls, and structural steel restraint systems of the masonry walls, within scope of license renewal based on guidance provided in IE 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.

Prior to the period of extended operation, procedures will be enhanced to identify unreinforced masonry in the radwaste building within the scope of license renewal that requires aging management.

A1.32 STRUCTURES MONITORING PROGRAM

The Structures Monitoring Program manages the cracking, loss of material, and change in material properties by monitoring the condition of structures and structural supports that are within the scope of license renewal. The Structures Monitoring Program implements the requirements of 10 CFR 50.65 and is consistent with the guidance of NUMARC 93-01, Revision 2 and Regulatory Guide 1.160, Revision 2.

The Structures Monitoring Program provides inspection guidelines and walkdown checklists for concrete elements, structural steel, masonry walls, treated wood, structural features (e.g., caulking, sealants, roofs, etc.), structural supports, and miscellaneous components such as doors. The Structures Monitoring Program includes all masonry walls within the scope of license renewal. The Structures Monitoring Program also inspects supports for equipment, piping, conduit, cable tray, HVAC, and instrument components.

Prior to the period of extended operation, procedures will be enhanced to add inspection parameters for treated wood.

A1.33 RG 1.127, INSPECTION OF WATER-CONTROL STRUCTURES ASSOCIATED WITH NUCLEAR POWER PLANTS

The Regulatory Guide 1.127, Inspection of Water Control Structures Associated with Nuclear Power Plants program manages aging due to extreme environmental conditions and the effects of natural phenomena that may affect water-control structures. WCGS meets the recommendations of Regulatory Guide 1.127, Revision 1.

This program includes inspection and surveillance activities for dams, slopes, canals, and other water-control structures associated with emergency cooling water systems or flood protection.

The program includes periodic visual inspections of in-scope concrete structures, periodic monitoring of the hydraulic and structural condition of the Ultimate Heat Sink (UHS), as well as associated structures, main dam service spillway, and auxiliary spillway, periodic dredging of the UHS reservoir and channel connecting the reservoir to the essential service water pumphouse, and survey of the UHS dam for vertical movement.

Prior to the period of extended operation, procedures will be enhanced so that the main dam service spillway and the auxiliary spillway will be inspected in accordance with the same specification, to clarify the scope of inspections for the spillways, to add the 5 year inspection frequency for the main dam service spillway, and to add cavitation to the list of concrete aging effects for surfaces other than spillways.

A1.34 NICKEL ALLOY AGING MANAGEMENT PROGRAM

The Nickel Alloy Aging Management Program manages cracking due to primary water stress corrosion cracking in all plant locations that contain Alloy 600, with the exception of steam generator tubing (aging management of steam generator tubing is performed by the Steam Generator Tubing Integrity program (A2.1.8)). Aging management requirements for nickel alloy penetration nozzles welded to the upper reactor vessel closure head noted in the Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of

Pressurized Water Reactors program (A2.1.5) are included here for review convenience. This includes reactor coolant system (RCS) pressure boundary, RCS non-pressure boundary, and ESF locations.

The Nickel Alloy Aging Management Program uses inspections, mitigation techniques, repair/replace activities and monitoring of operating experience to manage the aging of Alloy 600 at WCGS. Detection of indications is accomplished through a variety of examinations consistent with NRC Order EA-03-009, ASME Section XI Subsections IWB and IWC, EPRI Report 1010087 (MRP-139) issued under NEI 03-08 protocol, and commitments made in response to NRC Bulletin 2004-01. Mitigation techniques are implemented when appropriate to preemptively remove conditions that contribute to primary water stress corrosion cracking. Repair/replacement activities are performed to proactively remove or overlay Alloy 600 material, or as a corrective measure in response to an unacceptable flaw in the material. Mitigation and repair/replace activities are consistent with those detailed in MRP-139.

A1.35 REACTOR COOLANT SYSTEM SUPPLEMENT

Section 3.1 of NUREG-1800, “Standard Review Plan for the Review of License Renewal Applications for Nuclear Power Plants,” supplements the aging management programs for the reactor coolant system components with the following additional requirements.

WCNOC will:

A. Reactor Coolant System Nickel Alloy Pressure Boundary Components

Implement applicable (1) NRC Orders, Bulletins and Generic Letters associated with nickel alloys and (2) staff-accepted industry guidelines, and

B. Rector Vessel Internals

(1) Participate in the industry programs for investigating and managing aging effects on reactor internals; (2) evaluate and implement the results of the industry programs as applicable to the reactor internals; and (3) upon completion of these programs, but not less than 24 months before entering the period of extended operation, WCNOC will submit an inspection plan for reactor internals to the NRC for review and approval.

A1.36 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 the effects of loosening of bolted connections due to thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion, and oxidation. A representative sample of electrical cable connections not subject to 10 CFR 50.49 environmental qualification requirements within the scope of license renewal is infrared thermography tested as part of the WCGS predictive maintenance. The sample is based upon application, circuit loading and environment. Infrared thermography testing is being performed at least once every 10 years.

Prior to the period of extended operation, the infrared thermography testing procedure will be enhanced to require an engineering evaluation when test acceptance criteria are not met. The evaluation will include identifying the extent of condition, the potential root cause for not meeting the test acceptance criteria, and the likelihood of recurrence.

A2 SUMMARY DESCRIPTIONS OF TIME-LIMITED AGING ANALYSIS AGING MANAGEMENT PROGRAMS

A2.1 METAL FATIGUE OF REACTOR COOLANT PRESSURE BOUNDARY

The WCGS Metal Fatigue of the Reactor Coolant Pressure Boundary program ensures that actual plant experience remains bounded by the assumptions used in the design calculations, or that appropriate corrective measures maintain the design and licensing basis by other acceptable means. The more-recent fatigue monitoring results indicate that none of the design transients will occur more than the currently-specified number of times before the end of a 60-year period of extended operation, and that fatigue usage factors will remain below the code allowable limit of 1.0, including effects of the reactor coolant environment as described by NUREG/CR-6260.

Prior to the period of extended operation, the Metal Fatigue of Reactor Coolant Pressure Boundary program will be enhanced to include:

- Action levels to ensure that if the fatigue usage factor calculated by the code analysis is reached at any monitored location, appropriate evaluations and actions will be invoked to maintain the analytical basis of the leak-before-break (LBB) analysis and of the high-energy line break (HELB) locations, or to revise them as required.
- Action levels to ensure that appropriate evaluations and actions will be invoked to maintain the bases of safety determinations that depend upon fatigue analyses, if the fatigue usage factor at any monitored location approaches 1.0, or if the fatigue usage factor at any monitored NUREG/CR-6260 location approaches 1.0 when multiplied by the environmental effect factor F_{EN}.
- Corrective actions, on approach to these action levels, that will determine whether the scope of the monitoring program must be enlarged to include additional affected reactor coolant pressure boundary locations in order to ensure that additional locations do not approach the code limit without an appropriate action, and to ensure that the bases of the LBB and HELB analyses are maintained.
- 10 CFR 50 Appendix B procedural and record requirements.

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 requirements of 10 CFR 50.49, and the guidance of NUREG-0588, "Interim Staff Position on Environmental Qualification of Safety-Related Electrical Equipment" and Regulatory Guide 1.89, "Environmental Qualification of Certain Electric Equipment Important to Safety for Nuclear Power Plants", Revision 1 for maintaining qualification of equipment.

Prior to the period of extended operation, program documents will be enhanced to describe methods that may be used for qualified life evaluations for the period of extended operation.

A2.3 CONCRETE CONTAINMENT TENDON PRESTRESS

The Concrete Containment Tendon Prestress program, within the WCGS Creek ASME Section XI Subsection IWL Program, manages the loss of tendon prestress in the post-tensioning system.

The WCGS post-tensioning system consists of inverted U-shaped tendons, extending up through the basemat, through the full height of the cylindrical walls and over the dome; and horizontal circumferential (hoop) tendons, at intervals from the basemat to about the 45-degree elevation of the dome. The basemat is conventionally reinforced. The tendons are ungrouted, in grease-filled glands.

Prior to the period of extended operation, procedures will be revised to extend the list of surveillance tendons to include random samples for the 40, 45, 50, and 55 year surveillances, to explicitly require a regression analysis for each tendon group after every surveillance; and to invoke and describe regression analysis methods used to construct the lift-off trend lines. Surveillance program predicted force lines for the vertical and hoop tendon groups will be extended to 60 years. Procedure descriptions of acceptance criteria action levels will be revised to conform to the ASME Code, Subsection IWL 3221 descriptions.

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 WCGS.

A3.1 REACTOR VESSEL NEUTRON EMBRITTLEMENT

Ferritic materials of the reactor vessel are subject to embrittlement (loss of fracture toughness) due to high-energy neutron exposure. The following predictions of neutron fluence and of its embrittlement effects are TLAAs:

- Neutron Fluence, Upper Shelf Energy, Adjusted Reference Temperature (Fluence, USE, and ART)
- Pressurized Thermal Shock (PTS)
- Reactor Vessel Thermal Limit Analysis and Pressure-Temperature (P-T) Limits
- Low Temperature Overpressure Protection (LTOP)

The Reactor Vessel Surveillance program is described in Section A1.15.

A3.1.1 Neutron Fluence, Upper Shelf Energy and Adjusted Reference Temperature (Fluence, USE, and ART)

Fluence

Neutron embrittlement depends on lifetime fluence of neutrons with energies greater than 1 MeV. The original design basis estimate for expected end-of-life fluence has been increased to account for increased unit rating and for increased plant capacity factors, but also reduced for low-leakage core loadings.

WCGS has evaluated projected fluences and their uncertainties based on the guidance of Regulatory Guide 1.190, “Calculational and Dosimetry Methods for Determining Pressure Vessel Neutron Fluence,” Revision 0. The ¼-t and ¾-t fluences in the vessel wall were also projected consistent with Regulatory Guide 1.99, “Radiation Damage to Reactor Vessel Materials,” Revision 2, Section 1.1, Equation 3, attenuation. The evaluation also projected the alternative displacements-per-iron atom (dpa) measure of embrittlement to 54 EFPY using methods consistent with ASTM E853 and E693, in support of dpa assessments consistent with Regulatory Guide 1.99, Revision 2.

Since the W and Z coupon exposure has now exceeded that expected at the end of the extended period of operation, these capsules have been removed to the spent fuel pool, and vessel neutron fluence is now confirmed by ex-vessel dosimetry.

USE and ART

For reactor vessel materials, 10 CFR 50 Appendix G requires the predicted end-of-life Charpy impact test upper-shelf absorbed energy (USE) to be at least 50 ft-lb, unless an approved analysis supports a lower value. The 60 year end-of-life USE and adjusted reference temperature (ART) of the limiting material was confirmed from test of the X-capsule coupons, with exposures nearly equal to the projected 54 EFPY, 60-year vessel wall fluence. The examination methods were consistent with 10 CFR 50 Appendices G and H, ASTM E185-82, and Westinghouse procedures. The X-coupon analysis demonstrates more-than-adequate EOL USE, and indicates that ART for the limiting material will remain modest and will permit adequate operating margins to P-T limits until the end of a 60-year period of extended operation. See Section A3.1.3 for P-T limits.

A3.1.2 Pressurized Thermal Shock (PTS)

If the reference temperature for pressurized thermal shock (RT_{PTS}) for each heat of material of the reactor pressure vessel does not exceed 270 ºF for plates, forgings, and axial welds; or 300 ºF for circumferential welds (the PTS screening criteria), only the reactor pressure vessel is "relied on to demonstrate compliance" with the 10 CFR 50.61 PTS rule. RT_{PTS} for the limiting material has been projected to remain well below its screening criterion until the end of a 60-year period of extended operation. The reactor pressure vessel therefore meets the PTS screening criteria and will continue to do so for the period of extended operation. Therefore no safety analysis by Regulatory Guide 1.154, "Format and Content of Plant-Specific Pressurized Thermal Shock Safety Analysis Reports for Pressurized Water Reactors," Revision 0, alternative methods is required, and the vessel is therefore the only component relied upon to demonstrate compliance with 10 CFR 50.61 throughout the period of extended operation.

A3.1.3 Pressure-Temperature (P-T) Limits

10 CFR 50 Appendix G requires a reactor vessel thermal limit analysis to determine operating pressure-temperature limits for heatup, cooldown, criticality, and inservice leakage and hydrostatic testing. The resulting P-T limit curves are operating limits, conditions of the operating license, and are included in the *Pressure and Temperature Limits Report* (PTLR), as required by Technical Specifications.

Because of the relationship between the operating pressure-temperature limits and the fracture toughness transition of the reactor vessel, the thermal limits analysis is valid only up to a stated vessel fluence limit. The currently-applicable PTLR is valid only up to 20 EFPY. WCGS will therefore require new P-T limit curves, both for the remainder of the current license beyond 20 EFPY, and for the extended period of operation.

A3.1.4 Low Temperature Overpressure Protection (LTOP)

LTOP is required by Technical Specifications and is provided (in part) by the cold overpressurization mitigation system (COMS), which opens the power-operated relief valves at a setpoint determined by the currently-applicable pressure-temperature limits analysis.

The COMS setpoint is established in the *Pressure and Temperature Limits Report* (PTLR), Section A3.1.3.

A3.2 METAL FATIGUE

This section describes:

- ASME Section III Class 1 Fatigue Analysis of Vessels, Piping, and Components
- ASME Section III Subsection NG Fatigue Analysis of Reactor Pressure Vessel Internals
- Effects of the Reactor Coolant System Environment on Fatigue Life of Piping and Components (Generic Safety Issue 190)
- Assumed Thermal Cycle Count for Allowable Secondary Stress Range Reduction Factor in B31.1 and ASME Section III Class 2 and 3 Piping
- Fatigue Design of Spent Fuel Pool Liner and Racks for Seismic Events
- Fatigue Design and Analysis of Class IE Electrical Raceway Support Angle Fittings for Seismic Events

At WCGS, no vessels, heat exchangers, or pumps were designed to ASME Section III Class 2 or 3, or ASME VIII Division 2 rules that required design for a stated number of load cycles.

Basis of Fatigue Analyses

ASME Section III Class 1 design specifications define a design basis set of static and transient load conditions. The design number of each transient was selected to be somewhat larger than expected to occur during the 40-year licensed life of the plant, based on operating experience, and on projections of future operation based on innovations in the system designs. Although original design specifications commonly state that the transients are for a 40-year design life, the fatigue analyses themselves are based on the specified number of occurrences of each transient rather than on this lifetime.

<u>Fatigue Management Program</u>

The WCGS Metal Fatigue of Reactor Coolant Pressure Boundary program described in Section A2.1 will ensure that actual plant experience remains bounded by the assumptions used in the design calculations, or that appropriate corrective measures maintain the design and licensing basis by other acceptable means. The more-recent fatigue monitoring cycle counts indicate that none of the design transients will occur more than the currently-specified number of times before the end of a 60-year period of extended operation, and consequently, that the fatigue analysis TLAAs based on those transients will remain valid for the period of extended operation.

A3.2.1 ASME Section III Class 1 Fatigue Analysis of Vessels, Piping, and Components

Fatigue analyses exist for ASME Section III Division 1 Class 1 piping, vessels, steam generators, pumps, and valves. The reactor vessel internals are not designed to ASME Section III Class 1 but are analyzed to ASME Section III Subsection NG. See Section A3.2.2.

A3.2.1.1 Reactor Pressure Vessel, Nozzles, Head, and Studs

The WCGS reactor vessel is designed to ASME Section III, Subsection NB (Class 1), 1971 Edition with addenda through Winter 1972. The analysis has been updated to incorporate redefinitions of loads and design basis events, operating changes, power rerate and T_{hot} reduction, minor modifications, and possible operating contingencies.

See Section A3.2.1.9 for the evaluation of certain noise events affecting the fatigue analyses of the primary coolant system and reactor vessel.

The reactor vessel primary coolant inlet and outlet nozzles and lower-head-to-shell juncture are evaluated for effects of the reactor coolant environment on fatigue behavior of these materials, consistent with the guidance of NUREG/CR-06260. See Section A3.2.3 of this document.

Fatigue usage factors in the reactor vessel pressure boundary do not depend on effects that are time-dependent at steady-state conditions, but depend only on effects of operational, abnormal, and upset transient events, principally on startup and shutdown transients and on boltup. The WCGS Metal Fatigue of Reactor Coolant Pressure Boundary program described in Section A2.1 ensures that the fatigue usage factors based on those transients will remain within the code limit of 1.0 for the period of extended operation, or that appropriate corrective measures maintain the design and licensing basis by other acceptable means.

A3.2.1.2 Control Rod Drive Mechanism (CRDM) Pressure Housings, Adapter Plugs, and Canopy Seals

The CRDM housings are designed to ASME Section III, Subsection NB (Class 1), 1974 Edition with addenda through Winter 1974. The analysis of pressure-retaining components was reexamined for the power rerate and T_{hot} reduction modification, and for addition of canopy seal clamp assemblies. The fatigue usage factors for the CRDM pressure housings, adapter plugs, and canopy seals have been evaluated and projected to remain below the ASME Code allowable of 1.0 for 60 years.

A3.2.1.3 Reactor Coolant Pump Pressure Boundary Components

The pump pressure boundary was designed to ASME Section III, 1971 edition with addenda through Summer 1973. Subarticle NB-3400, "Design of Class 1 Pumps," of this edition and addenda, does not require a fatigue analysis, but the nuclear steam supply vendor specified a fatigue analysis. Low stresses permitted a fatigue waiver analysis for many pump components. These fatigue and fatigue waiver analyses have been updated to incorporate redefinitions of loads and design basis events, operating changes, power rerate, and minor modifications.

Fatigue usage factors in the reactor coolant pumps do not depend on effects that are time-dependent at steady-state conditions, but depend only on effects of operational, abnormal, and upset transient events, principally on startup and shutdown transients. The WCGS Metal Fatigue of Reactor Coolant Pressure Boundary program described in Section A2.1 will ensure that the fatigue usage factors based on those transients will remain within the code limit of 1.0 for the period of extended operation, or that appropriate corrective measures maintain the design and licensing basis by other acceptable means.

A3.2.1.4 Pressurizer and Pressurizer Nozzles

The WCGS pressurizer is designed to ASME Section III, Subsection NB (Class 1), 1974 Edition. The analysis has been updated from time to time to incorporate redefinitions of loads and design basis events, operating changes, power rerate and T_{hot} reduction, and minor modifications; including the effects of thermal stratification in the lower head, surge nozzle, and surge line discussed in NRC Bulletin 88-11.

The pressurizer surge nozzle and lower head may be subject to significant operating thermal stress cycles due to thermal stratification and insurge-outsurge cycles, and are therefore expected to be the limiting pressurizer components for fatigue. The fatigue usage factors of these locations are specifically monitored. The expected usage factors in these locations should be acceptable for 60 years of operation.

With the exception of thermal stratification effects in the surge nozzle, fatigue usage factors in the pressurizer pressure boundary and support components do not depend on effects that are time-dependent at steady-state conditions, but depend only on effects of operational, abnormal, and upset transient events. The WCGS Metal Fatigue of Reactor Coolant Pressure Boundary program described in Section A2.1 will ensure that the fatigue usage factors based on those transients will remain within the code limit of 1.0 for the period of extended operation, or that appropriate corrective measures maintain the design and licensing basis by other acceptable means.

A3.2.1.5 Steam Generator ASME Section III Class 1, Class 2 Secondary Side, and Feedwater Nozzle Fatigue Analyses

The steam generators are designed to ASME Section III, Subsection NB (Class 1) and Subsection NC (Class 2), 1971 Edition with addenda through Summer 1973. Although the secondary side is Class 2, all pressure retaining parts of the steam generator satisfy the Class 1 criteria, including the Class 2 secondary side boundaries.

Although the steam generator tubes have a Class 1 fatigue analysis, the safety determination for integrity of steam generator tubes now depends on managing aging effects by a periodic inspection program rather than on the fatigue analysis, described in Section A1.8. The code fatigue analysis of the tubes is therefore not a TLAA.

Except for the tubes, fatigue usage factors in the steam generator components do not depend on flow-induced vibration or other effects that are time-dependent at steady-state conditions, but depend only on effects of operational and upset transient events. At the current rate of accumulation of these events the design basis number of events should be sufficient for 60 years of operation. The WCGS Metal Fatigue of Reactor Coolant Pressure Boundary program described in Section A2.1 ensures that the fatigue usage factors based on those transients remain within the code limit of 1.0 for steam generator components with fatigue analyses for the period of extended operation, or that appropriate corrective measures maintain the design and licensing basis by other acceptable means.

A3.2.1.6 ASME Section III Class 1 Valves

WCGS Class 1 valves are designed to ASME Section III, Subsection NB, 1974 Edition and later addenda. At WCGS, Class 1 fatigue analyses are TLAAs only for Class 1 valves with inlets greater than four inches nominal.

For all valves the allowed NB-3545.3 N_A normal duty operations far exceed those expected to occur.

The calculated worst-case usage factors I_t for Class 1 pressurizer safety valves and for six inch swing check valves indicate that the designs have large margins, and therefore that the pressure boundaries would withstand fatigue effects for at least two of the original design lifetimes. The design of these valves for fatigue effects is therefore valid for the period of extended operation.

The calculated worst-case usage factors for the 12 inch Class 1 RHR suction gate valves and the 10 inch Class 1 check valves exceed 0.4. However, fatigue usage factors in these valves do not depend on effects that are time-dependent at steady-state conditions, but depend only on effects of operational, abnormal, and upset transient events. As discussed in Section A3.2.1.7, the current rate of accumulation of these event cycles for Class 1 piping systems containing valves indicates that the 40-year design basis number of events should be sufficient for 60 years of operation, and that the calculated usage factors should not be exceeded. The WCGS Metal Fatigue of Reactor Coolant Pressure Boundary program described in Section A2.1 ensures that the assumed numbers of transient cycles for 12 inch Class 1 RHR suction gate valves and the 10 inch Class 1 check valves are not exceeded, and consequently, that the fatigue analysis TLAAs based on those transients remain valid for the period of extended operation, or that appropriate corrective measures maintain the design and licensing basis by other acceptable means.

A3.2.1.7 ASME Section III Class 1 Piping and Piping Nozzles

Class 1 reactor coolant main-loop piping supplied by Westinghouse is designed to ASME Section III, Subsection NB, 1974 edition with addenda through Winter 1975. The main loop piping fatigue analysis was performed to the 1974 edition with addenda through Winter 1975. The fatigue analyses of piping outside the main loop used code addenda through summer 1979 [USAR Table 5.2-1]. These analyses have been updated from time to time to incorporate redefinitions of loads and design basis events, operating changes, power rerate, and minor modifications.

See Section A3.2.1.8 for fatigue in the pressurizer surge lines.

See Section A3.2.1.9 for the evaluation of certain noise events affecting the fatigue analyses of the primary coolant system and reactor vessel. The evaluation of these noise events found no effect on the primary coolant piping fatigue analysis.

The hot leg surge nozzle is subject to possible thermal stratification effects. Fatigue at this location is specifically monitored, including the stratification effects.

Fatigue due to high-cycle vibration has been evaluated in thermowells added at former RTD nozzles. The calculated usage factor has been validated for the period of extended operation and remains negligible.

With the exception of the hot leg surge nozzle and thermowells, fatigue usage factors in Class 1 piping and nozzles do not depend on effects that are time-dependent at steady-state conditions, but depend only on effects of operational, abnormal, and upset transient events. The WCGS Metal Fatigue of Reactor Coolant Pressure Boundary program described in Section A2.1 ensures that fatigue usage factors based on those transients remain within the code limit of 1.0 for the period of extended operation, or that appropriate corrective measures maintain the design and licensing basis by other acceptable means.

A3.2.1.8 Bulletin 88-11 Revised Fatigue Analysis of the Pressurizer Surge Line for Thermal Cycling and Stratification

NRC Bulletin 88-11 requested that licensees establish and implement a program to confirm pressurizer surge line integrity in view of the occurrence of thermal stratification and required them to inform the staff of the actions taken to resolve this issue. The original surge line fatigue analysis used code addenda through summer 1979. The surge line design was re-evaluated 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. These results have been incorporated into the piping and main-loop nozzle code design reports. The current analysis includes effects of power rerate and T_{hot} reduction.

See Section A3.2.1.4 for effects on the pressurizer surge nozzle. See Section A3.2.1.7 for effects on the hot leg surge nozzle.

The maximum calculated CUF at any location in the surge lines, under the current analysis of record, including thermal stratification effects, is less than 0.1. The WCGS Metal Fatigue of Reactor Coolant Pressure Boundary program described in Section A2.1 monitors fatigue in the surge line and ensures that the fatigue usage factors based on those transients remain within the code limit of 1.0 for the period of extended operation, or that appropriate corrective measures maintain the design and licensing basis by other acceptable means.

The re-evaluation of the surge line for NRC Bulletin 88-11 under the 1986 code did not retroactively impose Subarticle NF-3330 stress limits for high-cycle fatigue of Class 1 supports.

A3.2.1.9 Primary Coolant System Heatup Expansion Noise Events

Since 1990, abrupt audible events have been heard inside containment at WCGS toward the end of primary system heatups. They have been attributed to an abrupt release of differential expansion energy, originally believed to be at the crossover piping support saddle shims, later found to have probably also occurred between the reactor vessel support pads and shoes, under the vessel main loop nozzles.

The evaluation of effects of these events found no effect, or only nominal effects, on stress and fatigue analyses of the reactor vessel inlet and outlet nozzles, reactor coolant piping, primary loop and component supports, steam generator nozzles, and primary loop leak-before-break analysis.

The heatup noise events have been evaluated and projected to remain within the 330 cycles assumed in the fatigue evaluation.

A3.2.1.10 High Energy Line Break Postulation Based on Fatigue Cumulative Usage Factor

A leak-before-break analysis (LBB) eliminated large breaks in the main reactor coolant loops. See Section A3.2.1.11. Outside the main loop breaks are selected in accordance with Regulatory Guide 1.46, Revision 0, “Protection Against Pipe Whip Inside Containment,” and Branch Technical Positions ASB 3-1 and MEB 3-1. See USAR Section 3.6.1.

The citation of MEB 3-1 means that “intermediate breaks,” “between terminal ends,” in piping with ASME Section III Class 1 fatigue analyses are identified at any location where cumulative usage factor is equal to or greater than 0.1, with the stated exception of the reactor coolant system primary loops.

A revised stress analysis of the surge line reduced all intermediate locations below 0.1, and thereby eliminated intermediate breaks in it.

Break locations that depend on usage factor, and their absence in the surge line, remain valid as long as the calculated usage factors are not exceeded. The WCGS Metal Fatigue of Reactor Coolant Pressure Boundary program described in Section A2.1 ensures that the originally-calculated maximum usage factors are not exceeded, or that appropriate corrective measures maintain the design and licensing basis by other acceptable means.

A3.2.1.11 Fatigue Crack Growth Assessment in Support of a Fracture Mechanics Analysis for the Leak-Before-Break (LBB) Elimination of Dynamic Effects of Primary Loop Piping Failures

USAR Section 3.6.1 describes a leak-before-break analysis that eliminated the large breaks in the main reactor coolant loops, which permitted omission of evaluations of their jet and pipe whip effects. This permitted omission of large jet barriers and whip restraints. The containment pressurization and equipment qualification analyses retained the large-break assumptions.

The fracture mechanics analysis depends on a saturated rather than a time-dependent crack initiation energy integral, is therefore not time-dependent, and is therefore not a TLAA. However, the final leak-before-break submittal is also supported by a fatigue crack growth assessment for a 40-year design life, which is a TLAA.

The Metal Fatigue of Reactor Coolant Pressure Boundary program described in Section A2.1 is written to confirm that the maximum usage factor in the primary loop piping remains below the number assumed for the existing analysis, and therefore that the basis for the LBB analysis remains valid for the period of extended operation, or that appropriate corrective measures maintain the design and licensing basis by other acceptable means.

A3.2.2 ASME Section III Subsection NG Fatigue Analysis of Reactor Pressure Vessel Internals

The WCGS reactor vessel internals were designed after the incorporation of Subsection NG into the 1974 Edition of Section III of the ASME Boiler and Pressure Vessel Code. The design meets the intent of paragraph NG-3311(c); that is, design and construction of core support structures meet Subsection NG in full, and other internals are designed and constructed to ensure that their effects on the core support structures remain within the core support structure code limits.

The current reactor vessel internals design report incorporates effects of power rerate and of hot leg temperature reduction (T_{hot}). It identifies usage factors for the specified set of design basis transient events and for 40 years of high-cycle effects.

The greater part of each calculated fatigue usage factor is due to effects of significant transients. The review and projection of transient event and usage factor accumulation to date indicates that the specified number of each transient should not be exceeded during the 60-year period of extended operation, and the WCGS fatigue management program tracks these events. Therefore, the contribution of these transient events to fatigue usage in the internals should not exceed that originally calculated without being identified, and without an appropriate evaluation and any necessary mitigating actions.

However, some part of fatigue usage in internals is due to the high-cycle effects, and therefore depends on steady-state operating time rather than on the number of transients. High-cycle fatigue must therefore be evaluated separately in order to extend the conclusion of the supplementary design report to the end of the 60-year licensed operating period.

WCNOC will obtain a design report amendment to either quantify the increase in high-cycle fatigue effects, or to confirm that the increase will be negligible. WCGS will complete this action before the end of the current licensed operating period.

Fatigue Analyses of Barrel-to-Former and Baffle-to-Former Bolts

Cracked baffle-to-former bolts were found in a few offshore reactors with designs and materials similar to Westinghouse units. The failures have been attributed to a combination of time-dependent effects. Fatigue in these bolts is the subject of an ASME code analysis, which is a TLAA.

The high predicted usage factor, the additional aging effects requiring mitigation, and the fact that some of these are synergistic (e.g., fatigue and the other cracking mechanisms) dictate that management of the fatigue usage factor in these bolts will be insufficient by itself, and that an aging management program must be constructed for the bolts which either adequately address all of these effects, or which will ensure their safety function despite these effects. The Wolf Creek aging management program for reactor vessel internals for the license renewal period has not been determined. See Section A1.35 for the commitment to develop this program.

A3.2.3 Effects of the Reactor Coolant System Environment on Fatigue Life of Piping and Components (Generic Safety Issue 190)

Concerns with possible effects of elevated temperature, reactor coolant chemistry environments, and different strain rates prompted NRC-sponsored research to assess these effects, culminating in the guidance of NUREG/CR-6260, “Application of NUREG/CR-5999 Interim Fatigue Curves to Selected Nuclear Power Plant Components.” Although GSI 190 has been closed for plants with 40-year initial licenses, the NUREG-1800 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.”

NUREG/CR-6260 Table 5-82 identifies seven sample locations for newer Westinghouse plants such as WCGS:

- Reactor Vessel Lower Head to Shell Juncture
- Reactor Vessel Primary Coolant Inlet Nozzle
- Reactor Vessel Primary Coolant Outlet Nozzle
- Surge Line Hot Leg Nozzle
- Charging Nozzles (Loop 1 and 4 nozzles are separately monitored at WCGS)
- Safety Injection Nozzles - Boron Injection tank (BIT) or High-Head Safety Injection (HHSI) Nozzles
- Residual Heat Removal Line Inlet Transition – 45-Degree Accumulator Safety Injection (ACCSI) and RHR Cold Leg Injection Nozzles.

WCGS performed plant-specific calculations for these seven sample locations using the appropriate F_{en} factors 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 location. The material-specific worst-case F_{EN} multiplier was calculated for each location, and applied to the fatigue usage factor expected at 60 Years at that location. Strain rate information was not used to determine F_{EN}.

All of these locations except the first, the vessel lower head to shell juncture, are included in the Metal Fatigue of Reactor Coolant Pressure Boundary program described in Section A2.1. The first location is not monitored because the low projected usage factor, when multiplied by the applicable F_{EN}, remains negligible. At the first location, the expected 60-year fatigue usage factor was determined by multiplying the calculated design basis 40-year usage factor times 1.5. All others were projected from the historical and current rates of accumulation of transient cycles and usage factors. When these projected 60-year usage factors are multiplied by the respective F_{EN}, the results are all less than the code limit of 1.0. The Metal Fatigue of Reactor Coolant Pressure Boundary program described in Section A2.1 is structured to continue to confirm that this is so, or to initiate appropriate evaluations and corrective measures.

A3.2.4 Assumed Thermal Cycle Count for Allowable Secondary Stress Range Reduction Factor in B31.1 and ASME Section III Class 2 and 3 Piping

None of ANSI B31.1 or ASME Section III Subsections NC and ND invokes fatigue analyses. However, 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 S_A for 7000 equivalent full-temperature thermal cycles or less and is reduced in steps to 0.5 S_A for greater than 100,000 cycles. Partial cycles are counted proportional to their temperature range.

A review of ASME Section III Class 2 and 3 and B31.1 piping specifications found no indication of a number of expected lifetime full-range or equivalent full-range thermal cycles greater than 7,000 during the original 40-year plant life.

The survey of all plant piping systems found that the reactor coolant sample lines may be subject to less than 11,000 cycles in 60 years requiring a reduction in stress range reduction factor (SRRF) to 0.9. The WCGS design analyses secondary stress ranges are within the limits imposed by the 0.9 SRRF in all but three line segments, and reanalysis should be able to demonstrate secondary stress ranges below this limit in these three lines. WCNOC will complete these reanalyses, and any additional corrective actions or modifications indicated by them, before the end of the current licensed operating period.

A3.2.5 Fatigue Design of Spent Fuel Pool Liner and Racks for Seismic Events

The WCGS spent fuel pool racks were replaced in order to accommodate a larger inventory. The design of the replacement racks included a fatigue analysis of the racks and of high-stress locations in the pool liner. These analyses are described in USAR Section 9.1A.4.3.5.4.

The analyses remain valid for any period for which the number of operating basis earthquake events (OBE) has not been and is not expected to be exceeded, assuming an additional safe shutdown earthquake (SSE) might occur. Since the remaining plant life from the present to the end of the period of extended operation (2006 to 2045) is less than that of the original license to which the numbers of OBE and SSE events apply, and since no SSE or significant OBE has occurred, these analyses remain valid for the period of extended operation.

A3.2.6 Fatigue Design and Analysis of Class IE Electrical Raceway Support Angle Fittings for Seismic Events

The design of Class IE electrical raceway included a fatigue evaluation of the effects of operating basis and safe shutdown earthquake loads (OBE and SSE loads) on angle fittings used at the connections of strut hangers to overhead supports, or at interhanger locations.

This analysis was extremely conservative, assuming 1000 allowable cycles for a deflection considerably less than the endurance limit. No seismic events have induced significant cyclic loads on these components in the 20-year 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 period of extended operation.

A3.3 ENVIRONMENTAL QUALIFICATION (EQ) OF ELECTRICAL COMPONENTS

Aging evaluations that qualify electrical and I&C components required to meet the requirements of 10 CFR 50.49 are evaluated to demonstrate qualification for the 40 year plant life are TLAAs. The existing WCGS Environmental Qualification program adequately 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.

Continuing the existing 10 CFR 50.49 EQ program ensures that the aging effects are managed and that the EQ components continue to perform their intended functions for the period of extended operation. The Environmental Qualification of Electrical Components program is described in Section A2.2.

A3.4 CONCRETE CONTAINMENT TENDON PRESTRESS

The WCGS containment is a prestressed concrete, hemispherical-dome-on-a-cylinder structure, with a steel membrane liner. Post-tensioned tendons compress the concrete and permit the structure to withstand design basis accident internal pressures. The reinforced concrete basemat is conventionally reinforced.

To ensure the integrity of the containment pressure boundary under design basis accident loads, design predictions of loss of prestress demonstrate that prestress should remain adequate for the design life. An inspection program confirms that the tendon prestress remains within design limits throughout the life of the plant [USAR Section 3.8.1, Technical Specification Surveillance Requirement SR 3.6.1.2].

Continuing the existing ASME Subsection IWL tendon surveillance program ensures that loss of prestress aging effects will be managed and that the containment tendons will continue to perform their intended functions for the period of extended operation. The program is described in Section A2.3.

A3.5 CONTAINMENT LINER PLATE, POLAR CRANE BRACKET, AND PENETRATION LOAD CYCLES

Design of the polar crane for a finite number of loads is a TLAA at WCGS (Section A3.6.1). At some plants, though not at WCGS, the supporting crane rail brackets or other supporting structural elements may also have been designed for these cyclic loads. NUREG-1800 Section 4.6.1 notes that in some designs "Fatigue of the liner plates or metal containments may be considered in the design based on an assumed number of loading cycles for the current operating term."

At WCGS however, the only metallic components of the containment pressure boundary that are designed for a specific number of load cycles in a design lifetime are the main steam penetrations. The containment liner and the remaining penetrations were designed to stress limit criteria, independent of the number of load cycles, and with no fatigue analyses.

A3.5.1 Design Cycles for the Main Steam Line Penetrations

The BC-TOP-1, "Containment Building Liner Plate Design Report," Part II Section 1.1, describes the main steam penetration design for cyclic loads. The design basis includes

- 100 lifetime steady state operating thermal gradient plus normal operating cyclic loads ("Loading Condition V"), and
- 10 steady state operating thermal gradient plus steam pipe rupture cyclic loads ("Loading Condition IV").

The operating history to date indicates that the original design basis 100 operating cycles assumed for main steam penetrations will be adequate for the 60-year extended operating period. For license renewal, an evaluation of an equivalent ASME Section III Class 1 fatigue usage factor found that the penetrations could withstand as many as 2500 lifetime full-range thermal cycles ("Condition V" events), plus the fatigue effects of an end-of-life main steam rupture inside containment (a "Condition IV" event), with a cumulative usage factor of less than 1.0.

There is therefore more than sufficient margin in the design for any possible increase in operating cycles above the original estimate. The design of the main steam penetrations is therefore valid for the period of extended operation.

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 Fuel Handling Machine CMAA-70 Load Cycle Limits

The USAR Section 9.1.4 describes design of these lifting machines to Crane Manufacturers Association of America Specification No. 70 (CMAA-70 (1975)). The CMAA-70 crane service classification ("class" or "design class") 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 significant lifts, i.e. those which approach or equal the design load, should not exceed the number of stress cycles assumed for that design class.

In all cases the design standard number of full-capacity lifts far exceeds the number expected of the machine for a 60-year period of extended operation. The lifting machine designs therefore remain valid for the period of extended operation.

A3.7 TLAAS SUPPORTING 10 CFR 50.12 EXEMPTIONS

One 10 CFR 50.12 exemption, for use of a leak-before-break analysis for the primary coolant loops, is based in part on a time-limited aging analysis of fatigue effects. See Section A3.2.1.11.

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 ten 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 the 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 statement of reasonable assurance that the program is effective, or will be effective, once enhanced.

For those programs that are plant specific, the above form is followed with the additional discussion of each of the ten elements.

B1.3 QUALITY ASSURANCE PROGRAM AND ADMINISTRATIVE CONTROLS

The WCNOC Quality Assurance Program implements the requirements of 10 CFR 50, Appendix B, Quality Assurance Criteria for Nuclear Power Plants and Fuel Processing Plants, and 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 WCNOC Quality Assurance Program includes the elements of corrective action, confirmation process, and administrative controls, and is applicable to the safety-related and nonsafety-related systems, structures, and components that are subject to aging management activities. Each of these three elements is applicable as follows:

Corrective Action

WCNOC applies its corrective action process to both safety-related and nonsafety-related systems, structures, and components. Corrective action process 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 Processing Plants. Conditions adverse to quality (such as failures, malfunctions, deviations, defective material and equipment, and nonconformances) are promptly identified and corrected. 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 repetition. In addition, the root cause of the significant condition adverse to quality and the corrective actions implemented are documented and reported to appropriate levels of management.

Confirmation Process

The WCNOC Quality Assurance Program requires that measures be taken to preclude repetition of significant conditions adverse to quality. These measures include actions to verify effective implementation of corrective actions.

Plant procedures include provisions for timely evaluation of adverse conditions and implementation of any corrective actions required, including root cause determinations 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 to ensure 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.

Follow-up inspections required by the confirmation process are documented in accordance with the corrective action process. The corrective action process constitutes the confirmation process for aging management programs and activities. Since the same 10 CFR 50

Appendix B corrective actions and confirmation process applies to nonconforming safety-related and nonsafety-related systems, structures, and components subject to aging management review.

Administrative Controls

WCNOC administrative controls require formal procedures and other forms of written instruction for the activities performed under the programs credited for managing aging. These WCNOC procedures contain or will contain objectives, program scope, responsibilities, methods for implementation, and acceptance criteria.

B1.4 OPERATING EXPERIENCE

Plant-specific and industry-wide operating experience data was reviewed during the aging management review process in order to assure that plant-specific aging effects were consistent with documented industry operating experience and to demonstrate that the identified aging effects are being adequately managed by existing programs.

Review of plant-specific operating experience was performed to identify aging effects experienced. WCGS Problem Identification Reports (PIRs) generated since 1988 and Work Orders (EMPAC database) generated since 1995 were identified based on key words associated with aging effects and reviewed during the aging management review process.

Industry operating experience reflected in NRC Bulletins, Generic Letters, and Information Notices was screened for aging effect and aging management program applicability and has been included in the operating experience portion of the aging management review process.

The operating experience applicable to each existing aging management program is discussed in this section as a part of each aging management program discussion.

B1.5 AGING MANAGEMENT PROGRAMS

The following aging management programs are described in the sections listed in this appendix. The programs are either discussed in NUREG -1801 or are plant specific. Plant specific programs are listed at the end of the table in Section B2.0.

- ASME Section XI In-service Inspection, Subsections IWB, IWC, and IWD (Section B2.1.1)
- Water Chemistry (Section B2.1.2)
- Reactor Head Closure Studs (Section B2.1.3)
- Boric Acid Corrosion (Section B2.1.4)

- Nickel-Alloy Penetration Nozzles Welded To The Upper Reactor Vessel Closure Heads of Pressurized Water Reactors (Section B2.1.5)
- Flow-Accelerated Corrosion (Section B2.1.6)
- Bolting Integrity (Section B2.1.7)
- Steam Generator Tube Integrity (Section B2.1.8)
- Open-Cycle Cooling Water System (Section B2.1.9)
- Closed-Cycle Cooling Water System (Section B2.1.10)
- Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (Section B2.1.11)
- Fire Protection (Section B2.1.12)
- Fire Water System (Section B2.1.13)
- Fuel Oil Chemistry (Section B2.1.14)
- Reactor Vessel Surveillance (Section B2.1.15)
- One-Time Inspection (Section B2.1.16)
- Selective Leaching of Materials (Section B2.1.17)
- Buried Piping and Tanks Inspection (Section B2.1.18)
- One-Time Inspection of ASME Code Class 1 Small-Bore Piping (Section B2.1.19)
- External Surfaces Monitoring Program (Section B2.1.20)
- Flux Thimble Tube Inspection (Section B2.1.21)
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (Section B2.1.22)
- Lubricating Oil Analysis (Section B2.1.23)
- Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (Section B2.1.24)
- Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits (Section B2.1.25)

- Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (Section B2.1.26)
- ASME Section XI, Subsection IWE (Section B2.1.27)
- ASME Section XI, Subsection IWL (Section B2.1.28)
- ASME Section XI, Subsection IWF (Section B2.1.29)
- 10 CFR 50, Appendix J (Section B2.1.30)
- Masonry Wall Program (Section B2.1.31)
- Structures Monitoring Program (Section B2.1.32)
- RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (Section B2.1.33)
- Nickel Alloy Aging Management Program (Section B2.1.34)
- Reactor Coolant System Supplement (B2.1.35)
- Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (Section B2.1.36)

B1.6 TIME-LIMITED AGING ANALYSIS PROGRAMS

The following time-limited aging analysis aging management programs are described in this section. These programs are discussed in NUREG -1801. All programs discussed in this section are existing plant programs.

- Metal Fatigue of Reactor Coolant Pressure Boundary (Section B3.1)
- Environmental Qualification (EQ) of Electrical Components (Section B3.2)
- Concrete Containment Tendon Prestress (Section B3.3)

B2 AGING MANAGEMENT PROGRAMS

The correlation between NUREG-1801, Generic Aging Lessons Learned (GALL) programs and WCGS programs is shown below. For WCGS 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 Studs	Reactor Head Closure Studs	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
XI.M11A	Nickel-Alloy Penetration Nozzles Welded To The Upper Reactor Vessel Closure Heads of Pressurized Water Reactors	Nickel-Alloy Penetration Nozzles Welded To The Upper Reactor Vessel Closure Heads of Pressurized Water Reactors	Existing	B2.1.5

NUREG-1801 NUMBER	NUREG-1801 PROGRAM	PLANT PROGRAM	EXISTING OR NEW	APPENDIX B REFERENCE
XI.M12	Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)	Not Credited	N/A	N/A
XI.M13	Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS)	Not Credited	N/A	N/A
XI.M14	Loose Parts Monitoring	Not Credited	N/A	N/A
XI.M15	Neutron Noise Monitoring	Not Credited	N/A	N/A
XI.M16	PWR Vessel Internals	Not Credited	N/A	N/A
XI.M17	Flow-Accelerated Corrosion	Flow-Accelerated Corrosion	Existing	B2.1.6
XI.M18	Bolting Integrity	Bolting Integrity	Existing	B2.1.7
XI.M19	Steam Generator Tube Integrity	Steam Generator Tube Integrity	Existing	B2.1.8
XI.M20	Open-Cycle Cooling Water System	Open-Cycle Cooling Water System	Existing	B2.1.9
XI.M21	Closed-Cycle Cooling Water System	Closed-Cycle Cooling Water System	Existing	B2.1.10
XI.M22	Boraflex Monitoring	Not Applicable to WCGS	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	B2.1.11
XI.M24	Compressed Air Monitoring	Not Credited	N/A	N/A
XI.M25	BWR Reactor Water Cleanup System	Not Applicable for a PWR	N/A	N/A
XI.M26	Fire Protection	Fire Protection	Existing	B2.1.12

NUREG-1801 NUMBER	NUREG-1801 PROGRAM	PLANT PROGRAM	EXISTING OR NEW	APPENDIX B REFERENCE
XI.M27	Fire Water System	Fire Water System	Existing	B2.1.13
XI.M28	Buried Piping and Tanks Surveillance	Not Credited	N/A	N/A
XI.M29	Aboveground Steel Tanks	Not Credited	N/A	N/A
XI.M30	Fuel Oil Chemistry	Fuel Oil Chemistry	Existing	B2.1.14
XI.M31	Reactor Vessel Surveillance	Reactor Vessel Surveillance	Existing	B2.1.15
XI.M32	One-Time Inspection	One-Time Inspection	New	B2.1.16
XI.M33	Selective Leaching of Materials	Selective Leaching of Materials	New	B2.1.17
XI.M34	Buried Piping and Tanks Inspection	Buried Piping and Tanks Inspection	New	B2.1.18
XI.M35	One-Time Inspection of ASME Code Class 1 Small-Bore Piping	One-Time Inspection of ASME Code Class 1 Small-Bore Piping	Existing	B2.1.19
XI.M.36	External Surfaces Monitoring Program	External Surfaces Monitoring Program	Existing	B2.1.20
XI.M37	Flux Thimble Tube Inspection	Flux Thimble Tube Inspection	Existing	B2.1.21
XI.M38	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	New	B2.1.22
XI.M39	Lubricating Oil Analysis	Lubricating Oil Analysis	Existing	B2.1.23
XI.E1	Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	New	B2.1.24

NUREG-1801 NUMBER	NUREG-1801 PROGRAM	PLANT PROGRAM	EXISTING OR NEW	APPENDIX B REFERENCE
XI.E2	Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits	Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits	Existing	B2.1.25
XI.E3	Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	New	B2.1.26
XI.E4	Metal-enclosed Bus	Not Applicable at WCGS	N/A	N/A
XI.E5	Fuse Holders	Not Credited	N/A	N/A
XI.E6	Electrical Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	Electrical Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	Existing	B2.1.36
XI.S1	ASME Section XI, Subsection IWE	ASME Section XI, Subsection IWE	Existing	B2.1.27
XI.S2	ASME Section XI, Subsection IWL	ASME Section XI, Subsection IWL	Existing	B2.1.28
XI.S3	ASME Section XI, Subsection IWF	ASME Section XI, Subsection IWF	Existing	B2.1.29
XI.S4	10 CFR 50, Appendix J	10 CFR 50, Appendix J	Existing	B2.1.30
XI.S5	Masonry Wall Program	Masonry Wall Program	Existing	B2.1.31
XI.S6	Structures Monitoring Program	Structures Monitoring Program	Existing	B2.1.32

NUREG-1801 NUMBER	NUREG-1801 PROGRAM	PLANT PROGRAM	EXISTING OR NEW	APPENDIX B REFERENCE
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	B2.1.33
XI.S.8	Protective Coating Monitoring and Maintenance Program	Not Credited	N/A	N/A
X.M1	Metal Fatigue of Reactor Coolant Pressure Boundary	Metal Fatigue of Reactor Coolant Pressure Boundary	Existing	B3.1
X.E1	Environmental Qualification (EQ) of Electrical Components	Environmental Qualification (EQ) of Electrical Components	Existing	B3.2
X.S1	Concrete Containment Tendon Prestress	Concrete Containment Tendon Prestress	Existing	B3.3
N/A	Plant Specific	Nickel Alloy Aging Management Program	Existing	B2.1.34
N/A	N/A	Reactor Coolant System Supplement	N/A	B2.1.35

B2.1 AGING MANAGEMENT PROGRAM DETAILS

B2.1.1 ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD

Program Description

ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD inspections are performed to manage cracking, surface and subsurface discontinuities, loss of fracture toughness, loss of material, and physical damage in Class 1, 2, and 3 piping and components within the scope of license renewal. The program includes periodic visual, surface, volumetric examinations and leakage tests of Class 1, 2 and 3 pressure-retaining components, including welds, pump casings, valve bodies, integral attachments, and pressure-retaining bolting. WCGS inspections meet ASME Section XI requirements. The WCGS ISI Program is in accordance with 10 CFR 50.55a and ASME Section XI, 1998 edition through 2000 addenda. WCGS weld examinations for Class 1 and Class 2 piping are performed in accordance with Risk-Informed Inservice Inspection (RI-ISI) selection and examination requirements. RI-ISI includes an evaluation for degradation mechanisms such as flow accelerated corrosion, water hammer, thermal fatigue, high cycle fatigue, corrosion and stress corrosion cracking and is based on the methodology described in EPRI TR-112657, "Revised Risk-Informed Inservice Inspection Evaluation Procedure."

In conformance with 10 CFR 50.55a(g)(4)(ii), the WCGS ISI Program is updated 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.

NUREG-1801 Consistency

The ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program is an existing program that is consistent, with exceptions, with NUREG-1801, Section XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD."

Exceptions to NUREG-1801

<u>Program Elements Affected</u>

Scope of Program – Element 1, Parameters Monitored or Inspected – Element 3, Detection of Aging Effects – Element 4, Monitoring and Trending –Element 5, Acceptance Criteria – Element 6, and Corrective Actions - Element 7

WCGS ASME Section XI ISI Program uses ASME Code, 1998 Edition through the 2000 addenda. NUREG-1801, Section XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD" is based on ASME Code, 2001 edition through 2002 and

2003 addenda. The use of the 1998 version of the ASME Code through 2000 addenda is consistent with provisions in 10 CFR 50.55a to use the Code in effect 12 months prior to the start of the inspection interval.

WCGS uses the RI-ISI program for ASME Section XI Tables IWB-2500-1 and IWC-2500-1, Examination Categories B-F, B-J, C-F-1 and C-F-2 for Class 1 and 2 piping welds.

WCGS ASME Section XI ISI Program uses Code Case N-623 for examination and inspection requirements for deferral of inspection of shell to flange and head to flange welds in the reactor vessel.

WCGS ASME Section XI ISI Program uses Code Case N-648-1 with the condition specified in Regulatory Guide 1.147 for examination and inspection requirements for Examination Category B-D, Full Penetration Welded Nozzles in Vessels, for reactor vessel nozzles.

WCGS ASME Section XI ISI Program uses 10CFR50.55a Section (b)(2)(xxi) for examination and inspection requirements for Examination Category B-D, Full Penetration Welded Nozzles in Vessels, for steam generator and pressurizer nozzles.

WCGS ASME Section XI ISI Program uses Code Case N-700 for examination and inspection requirements for Examination Categories B-K, C-C, and D-A (Welded Attachments for Vessels, Piping, Pumps, and Valves).

Enhancements

None

Operating Experience

Review of WCGS plant-specific operating experience for the WCGS ISI Program has not revealed any implementation issues with the ASME Section XI ISI Program.

The WCGS ISI Program is updated to account for industry operating experience. ASME Section XI is also revised every three years and addenda issued in the interim, which allows the code to be updated to reflect industry operating experience. The requirement to update the ISI Program to reference more recent editions of ASME Section XI at the end of each inspection interval ensures the ISI Program reflects enhancements due to operating experience that have been incorporated into ASME Section XI.

Conclusion

The continued implementation of the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD aging management 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 includes maintenance of the chemical environment in the reactor coolant system and related auxiliary systems containing treated borated water and includes maintenance of the chemical environment in the steam generator secondary side and the secondary cycle systems to limit aging effects associated with corrosion mechanisms and stress corrosion cracking. The Water Chemistry program is consistent with the guidelines of EPRI TR-105714 Revision 5 "PWR Primary Water Chemistry Guidelines," and specific actions for exceeding the Technical Requirements Manual limits of fluorides, chlorides and dissolved oxygen. The Water Chemistry program is consistent with TR-102134 Revision 6 "PWR Secondary Water Chemistry Guidelines" with one exception discussed below.

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 degradation by their influence on pH and dissolved oxygen levels. Water chemistry control is most effective in areas of 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 environmental conditions, and a one-time inspection of a representative group of components will provide verification of the effectiveness of the Water Chemistry program (refer to Section B2.1.16 “One-Time Inspection.”)

NUREG-1801 Consistency

The Water Chemistry program is an existing program that is consistent, with exception, to NUREG-1801, Section XI.M2, “Water Chemistry.”

Exceptions to NUREG-1801

<u>Program Elements Affected</u>

Scope of Program (Element 1)

When in wet layup conditions WCGS is meeting the requirements for mixing of the steam generator bulk solution. This ensures the chemistry of the bulk fluid is uniform and that samples are representative of the bulk steam generator secondary side water. The WCGS design incorporates pumps for periodic recirculation of the steam generator fluid in wet layup conditions. Operating experience has shown that a 33 hour recirculation period will provide adequate bulk mixing. If sample results after 33 hours of recirculation indicated a failure to meet the layup specifications, corrective action is taken to correct the layup mixture. After any chemical additions necessary to adjust chemistry, the steam generator is recirculated for another 33 hours prior to sampling. The intent of the EPRI Secondary Water Chemistry Guidelines for mixing is met after 33 hours of recirculation. Three samples per week are not necessary to demonstrate adequate mixing.

Enhancements

None

Operating Experience

The primary and secondary water chemistry control programs for WCGS have been developed in accordance with the EPRI Primary and Secondary Water Chemistry Control Guidelines, and therefore, benefit from the industry operating experience available when the EPRI guidelines were issued. The WCGS Strategic Primary Water Chemistry Plan incorporates nine specific topics of WCGS primary chemistry operating history into the top level document setting the primary chemistry control strategy. The Strategic Secondary Water Chemistry Plan incorporates WCGS secondary chemistry operating history regarding iron transport reduction, condenser integrity and dissolved oxygen control into the top level document setting the secondary chemistry control strategy.

Conclusion

The continued implementation of the Water Chemistry program, supplemented by the One-Time Inspection program (B2.1.16), 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 Studs

Program Description

The Reactor Head Closure Studs program conducts ASME Section XI inspections of reactor vessel flange stud hole threads, reactor head closure studs, nuts, and washers to identify and manage cracking and loss of material.

The program includes periodic visual, surface, 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 closure during primary system leakage tests. The program implements ASME Section XI code, Subsection IWB, 1998 Edition through the 2000 addenda and manages reactor vessel stud, nut and washer cracking, loss of material, and reactor coolant leakage from the reactor vessel flange.

In conformance with 10 CFR 50.55a(g)(4)(ii), the WCGS ISI Program is updated 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.

NUREG-1801 Consistency

The Reactor Head Closure Studs program is an existing program that is consistent, with exceptions, to NUREG-1801, Section XI.M3, “Reactor Head Closure Studs.”

Exceptions to NUREG-1801

Scope of Program – Element 1, Parameters Monitored or Inspected – Element 3, Detection of Aging Effects – Element 4, Monitoring and Trending –Element 5, Acceptance Criteria – Element 6, and Corrective Actions - Element 7

NUREG 1801, Section XI.M3 specifies the use of ASME Section XI, Subsection IWB, 2001 edition with addenda 2002 and 2003. WCGS third interval ISI Program is using ASME Section XI 1998 Edition through 2000 addenda as modified by 10 CFR 50.55a, and approved code cases. Use of the 1998 Code through 2000 addenda is consistent with provisions in 10 CFR 50.55a to use the ASME Code in effect 12 months prior to the start of the inspection interval.

NUREG 1801, Section XI.M3 specifies the use of ASME Section XI, Subsection IWB, Table 2500-1 for reactor vessel flange stud holes, reactor head closure studs, nuts, and washers. The WCGS ASME Section XI ISI Program uses approved Code Case N-652 for examination and inspection requirements for Examination Category B-G-1, Pressure Retaining Bolting Greater Than 2 inches in Diameter for WCGS reactor vessel flange stud holes, reactor head closure studs, nuts, and washers.

NUREG 1801, Section XI.M3 specifies the use of NRC Regulatory Guide 1.65, “Materials and Inspections for Reactor Vessel Closure Studs” for reactor head closure studs and nuts. WCGS is committed to Regulatory Guide 1.65 with three exceptions. These exceptions are discussed in USAR Appendix 3A as follows:

1. The use of modified SA-540, Grade B-24 stud material as specified in Code Case 1605 has been found acceptable to the NRC for this application within the limitations discussed in Regulatory Guide 1.85, “Materials Code Case Acceptability.”

2. The use of stud bolting material that does not exceed 170 ksi tensile strength - The closure stud bolting material is procured to a minimum yield strength of 130 ksi and a minimum tensile strength of 145 ksi. This strength level is compatible with the fracture toughness requirements of 10 CFR 50, Appendix G (paragraph I.C), although higher strength level bolting materials are permitted. Additional design considerations that permit visual and/or nondestructive inspection and prevent exposure to borated water also apply.

3. Inservice Inspection of the reactor vessel closure studs is performed in accordance with ASME Code Case N-652 and does not follow the guidance of regulatory Guide 1.65. The NRC has approved the use of Code Case N-652 in Regulatory Guide 1.147.

Enhancements

None

Operating Experience

As part of the Inservice Inspection Program, this program is updated to account for industry operating experience. ASME Section XI is revised every three years and addenda issued in the interim, which allows the code to be updated to reflect operating experience. The requirement to update the ISI Program to reference more recent editions of ASME Section XI at the end of each inspection interval ensures the ISI Program reflects enhancements due to operating experience that have been incorporated into ASME Section XI.

Review of plant-specific operating experience has dealt with minor surface discontinuities on reactor vessel stud nuts and washers, and flange stud hole thread damage identified while accomplishing reactor head closure stud inspections. No cases of cracking have been identified with WCGS reactor vessel studs, nuts, flange stud holes, or washers.

Conclusion

The continued implementation of the Reactor Head Closure Studs 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 due to borated water leakage. The program monitors mechanical, electrical, and structural components within the scope of license renewal susceptible to boric acid corrosion from systems that contain reactor coolant or treated borated water. 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 program addresses recent operating experience noted in NRC Regulatory Issue Summary 2003-013, "NRC Review of Responses to Bulletin 2002-01, "Reactor Pressure Vessel Head Degradation and Reactor Coolant Pressure Boundary Integrity," (which includes NRC Bulletin 2002-01, 2002-02, and NRC Order EA-03-009).

The Boric Acid Corrosion program includes provisions to identify leakage, inspect and examine for evidence of leakage, evaluate leakage, and initiate corrective actions. The program maintains a tracking and trending program for boric acid leakage from plant components and establishment of a component-based visual history of boric acid leakage/seepage.

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 enhancement will be implemented in the following program element:

Scope of Program - Element 1

Procedures will be enhanced to state that susceptible components adjacent to potential leakage sources will include electrical components and connectors.

Operating Experience

Industry operating experience indicates that boric acid leakage can cause significant corrosion damage to susceptible plant components. In response to recent NRC generic communications, the reactor coolant system pressure boundary integrity walkdowns have been revised to perform periodic visual inspection of the reactor pressure vessel safe-end nozzles and document any indication of leakage and to perform visual inspection of the reactor pressure vessel sides and bottom head, and document any indication of leakage.

A review of plant operating experience has indicated instances of boric acid crystals either on the components from which it leaked or on the surrounding equipment. Both active leakage and crystal buildup has occurred. The leakage source has been either packing, bolted connections or pump seal leakage and has not resulted in a loss of intended function due to boric acid corrosion. Leakage affecting nearby components was limited. The boric acid corrosion program initiates corrective actions upon identification of boric acid crystals or active leakage.

Conclusion

The continued implementation of the Boric Acid 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.

B2.1.5 Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactors

Program Description

The Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactors program manages cracking due to primary water stress corrosion cracking and loss of material due to boric acid wastage in nickel-alloy vessel head penetration nozzles and includes the reactor vessel closure head, upper vessel head penetration nozzles and associated welds. This program was developed in response to NRC Order EA-03-009.

Detection of cracking is accomplished through implementation of a combination of bare metal visual examination (external surface of head) and non-visual examination (underside of head) techniques. Procedures are developed to perform reactor vessel head bare metal inspections and calculations of the susceptibility ranking of the plant. Examinations are performed by Level II or III VT-2 certified personnel. Completed testing to date verifies a susceptibility ranking of "Low" per EA-03-009, as amended. Plants in the "Low" category require bare metal visual inspections every third refueling outage or every five years (whichever comes first) and ultrasonic, eddy current, or dye penetrant testing every fourth refueling outage or every seven years (whichever comes first) per the Order, as amended. Non-destructive examinations (ultrasonic, eddy current, or dye penetrant) of the reactor pressure vessel head penetration nozzles and associated welds will initially occur during the 2006 refueling outage in accordance with EA-03-009, as amended.

NUREG-1801 Consistency

The WCGS Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactors program is an existing program that, following enhancement, will be consistent with NUREG-1801, Section XI.M11A, “Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactors.”

Exceptions to NUREG-1801

None

Enhancements

Prior to the period of extended operation, the following enhancement will be implemented in the following program element:

Corrective Actions - Element 7

Procedures will be enhanced to indicate that detection of leakage or evidence of cracking in the vessel head penetration nozzles or associated welds will cause an immediate reclassification to the "High" susceptibility ranking, commencing from the same outage in which the leakage or cracking is detected.

Operating Experience

During a scheduled modification of the control rod drive mechanism cooling shroud, the presence of boron residue was discovered on the upper surface of the insulation in the vicinity of three control rod drive mechanisms. The insulation in the affected area was removed and the vessel head penetrations were examined in October 2003. No evidence of boric acid leakage was detected. The annulus area of the potentially affected penetrations was verified to be free of boric acid. Small accumulations of loose debris were found on the upper side of some penetrations. Loose boric acid crystals were observed on the head surface and transparent boron film was observed on both the penetration sleeves and the head surface. The amount and configuration of the debris and film was compared to as-left conditions from a reactor pressure vessel head bare metal inspection performed in Refuel 12. Amounts and configuration were comparable. The debris was removed and the boron film was cleaned.

There were no material deficiencies identified on the reactor pressure vessel head or penetration pressure boundaries. There were also no indications of leakage or potential leakage through the control rod drive mechanism penetrations. The boron residue on the head insulation that initiated the examination in accordance with the Order was determined to be residue that originated from head vent valve leakage during operation cycle 12.

A transient event walkdown was performed August 2004 and again in October 2004. A dry white residue was noted on control rod drive mechanism penetration P-52 at the lower canopy seal weld. The boron was in the area previously identified with boron accumulation from head vent valve leakage in Refuel 13. The area was cleaned and a PT was performed with no indication.

Conclusion

The continued implementation of the Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactors 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 Flow-Accelerated Corrosion

Program Description

The Flow-Accelerated Corrosion (FAC) program manages aging effects of wall thinning due to FAC 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 – Revision 3 for an effective FAC program to detect, measure, monitor, predict and mitigate wall thinning. To aid in the planning of inspections and choosing inspection locations, WCGS utilizes the EPRI computer program CHECWORKS which was developed solely for the management of FAC.

The objectives of the Flow-Accelerated Corrosion program are achieved by (a) identifying system components susceptible to FAC, (b) an analysis using a predictive code such as CHECWORKS to determine critical locations for inspection and evaluation, (c) providing guidance of follow-up inspections, (d) repairing or replacing components, as determined by the guidance provided by the program, and (e) continual evaluation and incorporation of the latest technologies, industry and plant in-house operating experience.

Procedures and methods used by FAC program are consistent with WCGS commitments to NRC Bulletin 87-01, "Thinning of Pipe Wall in Nuclear Power Plants," and NRC Generic Letter 89-08, "Erosion/Corrosion-Induced Pipe Wall Thinning."

NUREG-1801 Consistency

The Flow-Accelerated Corrosion program is an existing program that is consistent, with exception, to NUREG-1801, Section XI.M17, “Flow-Accelerated Corrosion.”

Exceptions to NUREG-1801

Program Elements Affected

Scope of Program – Element 1

The WCGS FAC program is in accordance with NSAC-202L-R3, “Recommendations for an Effective Flow-Accelerated Corrosion Program.” The WCGS FAC program, which adheres to the NSAC-202L-R3 guidance, is consistent with NSAC-202L-R2, for defining the scope of the WCGS FAC program.

Detection of Aging Effects – Element 4

The WCGS FAC program is in accordance with NSAC-202L-R3, “Recommendations for an Effective Flow-Accelerated Corrosion Program.” The WCGS FAC program, which adheres to the NSAC-202L-R3 guidance, is consistent with NSAC-202L-R2, for defining the detection of wall thinning due to FAC.

Enhancements

None

Operating Experience

Review of the work orders back to 1995 showed that there has been no reported FAC-related leak or rupture at WCGS. Most of the work orders identified the degradation of wall thinning during the inspection by the FAC program. There was no case where the wall thickness was found to violate the minimum acceptable thickness. Problems identified during implementation of the program activities were not significant impact to the safe operation of the plant, and adequate corrective actions were taken to prevent recurrence. Industry and plant operating experience and periodic self-assessments are incorporated into the FAC program as necessary.

Conclusion

The continued implementation of Flow-Accelerated Corrosion program provides reasonable assurance that the aging effect of wall thinning due to FAC wear 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 Bolting Integrity

Program Description

The Bolting Integrity program manages the aging effects of cracking, loss of material, and loss of preload for pressure retaining bolting and ASME component support bolting. The program includes preload control, selection of bolting material, use of lubricants/sealants consistent with EPRI good bolting practices, and the performance of periodic inspections for indication of aging effects. The program also includes the inservice inspection requirements established in accordance with ASME Section XI, Subsections IWB, IWC, IWD, and IWF for ASME Class bolting.

WCGS good bolting practices are established in accordance with plant procedures. These procedures include requirements for proper disassembling, inspecting, and assembling of connections with threaded fasteners. The general practices that are established in this program are consistent with EPRI NP-5067, “Good Bolting Practices, Volume 1 and Volume 2,” and EPRI TR-104213, “Bolted Joint Maintenance and Applications Guide.”

The following aging management programs supplement the Bolting Integrity program with management of loss of preload, cracking, and loss of material:

(a) ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program (B2.1.1) provides the requirements for in-service inspection of ASME Class 1, 2, and 3 safety-related pressure retaining bolting.

(b) ASME Section XI, Subsection IWF program (B2.1.29) provides the requirements for in-service inspection of safety-related component support bolting.

(c) External Surfaces Monitoring Program (B2.1.20) provides the requirements for the inspection of pressure boundary closure bolting within the scope of license renewal.

NUREG-1801 Consistency

The Bolting Integrity program is an existing program that is consistent, with exceptions, to NUREG-1801, Section XI.M18, “Bolting Integrity.”

Exceptions to NUREG-1801

Scope of Program – Element 1

NUREG-1801, Section XI.M18 specifies the use of ASME Section XI 1995 edition with the 1996 addenda. WCGS uses the ASME Section XI, 1998 Edition through 2000 addenda for the current third interval ISI Program. Use of the 1998 Code through 2000 addenda does not change the requirements regarding inspections, evaluations and corrective actions for safety-related bolting to ensure the integrity of the intended functions.

Scope of Program – Element 1 and Preventive Actions – Element 2

The procedures for ensuring bolting integrity identify preload requirements and general practices for in-scope bolting but do not directly reference EPRI NP-5769 or NUREG-1339 as applicable source documents for these recommendations. However, these procedures do reference and incorporate the good bolting practices identified in EPRI NP-5067 and EPRI TR-104213. EPRI NP-5769 and NUREG-1339 are very closely related with EPRI NP-5067 and EPRI TR-104213 and they cross-reference one another. EPRI NP-5769, Section 8, Good Bolting Practices refers to EPRI NP-5067 for the identification of bolting practices associated with disassembly and assembly of bolted joints, and the methods for minimizing bolted joint problems such as leaks, vibration loosening, fatigue, and stress corrosion cracking. Implementation of the recommendations in EPRI NP-5067 and EPRI TR-104213 is considered to be consistent with the recommendations in EPRI NP-5769 and NUREG-1339 to meet the NUREG-1801 recommendations.

Parameters Monitored or Inspected – Element 3

Loss of preload is not a parameter of inspection for the WCGS Bolting Integrity program. EPRI NP-5769, Vol. 2, Section 10, indicates that job inspection torque is non-conservative since for a given fastener tension more torque is required to restart the installed bolts. The techniques for measuring the amount of bolt tension in an assembled joint are both difficult and unreliable. EPRI NP-5769, Vol. 2, Section 10 suggests that inspection of preload is usually unnecessary if the installation method has been carefully followed. Torque values provided in the procedures are based on criteria of stretch to cover the expected relaxation of the fasteners over the life of the joint. Gasket stress is also considered for pressure boundary closure bolting.

Monitoring and Trending –Element 5

NUREG-1801, Section XI.M18 specifies that if bolting connections for pressure retaining components (not covered by ASME Section XI) are reported to be leaking, then they may be inspected daily. If the leak rate does not increase, the inspection frequency may be decreased to biweekly or weekly. WCGS procedures require the inspection frequency be adjusted as necessary based on the trending of inspection results to ensure there is not a loss of intended function between inspection intervals. For pressure retaining components reported to be leaking, the site corrective action process is initiated. Consideration is also given to adequate frequency of subsequent inspections to ensure the inspection interval is adequate to detect further aging degradation so that a loss of intended function is avoided.

Enhancements

None

Operating Experience

A review of plant operating experience identified issues with corrosion, missing or loose bolts, inadequate thread engagement, and improper bolt applications. There is no reported cracking of the bolts due to stress corrosion cracking. In all cases, the identified concern was corrected; no significant safety event resulted; and additional actions, such as procedural enhancements, were implemented as needed to prevent recurrence.

Conclusion

The continued implementation of Bolting Integrity 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 Steam Generator Tube Integrity

Program Description

The scope of the Steam Generator Tube Integrity program includes the preventive measures, condition monitoring inspections, degradation assessment, repair and leakage monitoring activities necessary to manage cracking, loss of material, denting, and wall thinning. The aging management measures employed include non-destructive examination, visual inspection, sludge removal, tube plugging, in-situ pressure testing and maintaining the chemistry environment by removal of impurities and addition of chemicals to control pH and oxygen. NDE inspection scope and frequency, and primary to secondary leak rate monitoring are conducted consistent with the requirements of WCGS Unit 1 Technical Specifications. Structural integrity limits consistent with Regulatory Guide 1.121, Revision 0, “Bases for Plugging Degraded PWR Steam Generator Tubes” are applied.

Steam generator management practices are consistent with NEI 97-06, “Steam Generator Program Guidelines” with minor exceptions that have been reviewed and are provided with a technical justification. A one-time license amendment request to use alternate repair criteria (B*) was approved for refueling outage 14 and the subsequent operating cycle. Tube sleeves are not approved for use at WCGS and have not been used.

NUREG-1801 Consistency

The Steam Generator Tube Integrity program is an existing program that is consistent, with exceptions, to NUREG-1801, Section XI.M19, “Steam Generator Tube Integrity.”

Exceptions to NUREG-1801

<u>Program Elements Affected</u>

Preventive Actions - Element 2

When in wet layup conditions WCGS is meeting the requirements for mixing of the steam generator bulk solution and ensuring adequate sample line flush times are employed. This ensures the chemistry of the bulk fluid is uniform and that samples are representative of the bulk steam generator secondary side water. The WCGS design incorporates pumps for periodic recirculation of the steam generator fluid. Operating experience has shown that a 33 hour recirculation period will provide adequate bulk mixing. If sample results after 33 hours of recirculation indicated a failure to meet the layup specifications, corrective action is taken to correct the layup mixture. After any chemical additions necessary to adjust chemistry, the steam generator is recirculated for another 33 hours prior to sampling. The intent of the EPRI Secondary Water Chemistry Guidelines for mixing is met after 33 hours of recirculation. Three samples per week are not necessary to demonstrate adequate mixing..

Detection of Aging Effects - Element 4

Section 6.2.5 and Appendix H of EPRI TR-107569 PWR Steam Generator Examination Guidelines requires full length examination of steam generator tubes with a technique qualified for each region. WCGS uses Rotating Pancake (RPC) probes to inspect the tube region +/- 3" from the top of tubesheet and relies on the bobbin probe as an alternative to RPC inspections of the entire engagement length of the hydraulically expanded tubesheet regions. The bobbin probe is not Appendix H qualified for inspection in this area and no special inspection of the tube ends is performed.

Section 6.2.5 and Appendix H of EPRI TR-107569 PWR, "Steam Generator Examination Guidelines" requires full-length examination of steam generator tubes with a technique qualified for each region. WCGS uses the bobbin probe to detect primary water stress corrosion cracking at tube dents in support plates and for detection of outer diameter stress corrosion cracking in free span regions. The bobbin probe is not qualified per Appendix H for detection of primary water stress corrosion cracking in dents at tube support plates with a dent amplitude exceeding 2 Volts. The bobbin probe is also not qualified per Appendix H to detect outside diameter stress corrosion cracking in freespan dings exceeding 5 Volts.

Monitoring and Trending - Element 5

Section 3.3.10 of EPRI TR-107569, "PWR Steam Generator Examination Guidelines" requires that if active damage mechanisms are identified then all steam generators shall be examined at the end of each fuel cycle. WCGS currently has one active degradation mechanism: wear at anti-vibration bars. The practice at WCGS is to examine two steam generators at each refueling outage on an alternating basis so that each steam generator is examined every other refueling outage.

Enhancements

None

Operating Experience

The Steam Generator Tube Integrity program has been developed to be consistent (with the minor exceptions noted above) with NEI 97-06, "Steam Generator Program Guidelines," and it benefits from the industry operating experience available when the initiative was issued as well as the EPRI guidelines it endorses. Procedures require that the Steam Generator Degradation Assessment for WCGS be updated every operating cycle to incorporate the latest industry and plant specific experience regarding steam generator degradation mechanisms.

Generic Letter 95-05 addresses issues related to Alternate Repair Criteria (ARC). A one-time license amendment request to use alternate repair criteria (B*) was approved for refueling outage 14 and the subsequent operating cycle. Tube sleeves are not approved for use at WCGS and have not been used.

NRC Information Notice 97-88 addressed the importance of recognizing the potential for degradation in areas that have not previously experienced tube degradation and the importance of licensees to assess the significance of indications with respect to the qualification of the inspection techniques and the manner in which the indications were detected. The WCGS Steam Generator Degradation Assessment evaluates industry experience as well as WCGS experience to identify active, relevant and potential tube damage mechanisms. The inspection sample size, location and method are developed to fully address active mechanisms and provide assurance that relevant and potential mechanisms will be identified if they become active at WCGS. The inspection expansion criteria take into account both increasing the area inspected when degradation is found and changing the technology used to accurately examine ambiguous or unexpected degradation.

WCGS is a four loop Westinghouse plant with four identical Model F steam generators. After the refueling outage 14 in the spring of 2005, a total of 181 tubes have been plugged in the plant representing less than 1% of the total tubes. These tubes have been plugged for manufacturing issues at the shop, anti-vibration bar wear, loose part wear, tube support wear (most likely due to a trapped loose part), flow distribution baffle wear (due to pressure pulse cleaning) and preventive measures (manufacturing anomalies discovered in the field). As of the end of the refueling outage 14, no corrosion degradation has been detected in any of the WCGS steam generator tubes. Wear due to anti-vibration bars and loose parts is the only active effect observed in the WCGS steam generators.

Conclusion

The continued implementation of the Steam Generator Tube Integrity 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.

B2.1.9 Open-Cycle Cooling Water System

Program Description

The Open-Cycle Cooling Water (OCCW) System program manages loss of material and reduction of heat transfer for components exposed to raw water. The program includes chemical treatment and control of biofouling; heat exchanger performance testing; and periodic inspections. The program is consistent with WCGS commitments as established in responses to Generic Letter 89-13, “Service Water System Problems Affecting Safety-Related Equipment.”

The WCGS OCCW System program provides the general requirements for implementation and maintenance of programs and activities which mitigate aging of the open-cycle cooling water SSCs. The various aspects of the WCGS program (control, monitoring, maintenance and inspections) are implemented in station procedures.

Chemical treatment of open-cycle cooling water systems is used to inhibit corrosion, deposition, and fouling. A dispersant/anti-scalant is fed to the open-cycle cooling water systems to prevent precipitation of scale-forming salts. A copper corrosion inhibitor is used to inhibit the corrosion of system components made of copper and/or copper alloys. A non-oxidizing biocide is used to control macro-invertebrate (i.e., Asiatic Clams) infestation. Physical cleaning of the open-cycle cooling water system components, including the intake bays, is also used as a macro-invertebrate control measure. Microbiological fouling is controlled by oxidizing and non-oxidizing biocide treatments.

Flushes are periodically performed on heat exchangers and piping in stagnant or low flow areas of raw water systems to remove silt and debris.

NDE examinations (UT or RT) are periodically performed at selected piping locations to quantitatively assess the integrity of the pipe at the testing location. NDE examinations (ECT) are also performed on all heat exchangers and room coolers within the scope of Generic Letter 89-13 with the exception of the containment coolers (ECT is not viable for these heat exchangers due to accessibility issues).

The heat exchangers managed by the Open-Cycle Cooling Water System program are performance tested to verify heat transfer capabilities. All of the open-cycle cooling water heat exchangers are tested for hydraulic performance using the pressure drop method. All of the open-cycle cooling water heat exchangers, except the diesel generator heat exchangers, the control room air conditioning units, and the Class 1E air conditioning units, are tested for thermal performance using the heat transfer method. The heat exchangers that are not thermal performance monitored were determined to be not well suited to heat transfer testing due to unique design elements. These heat exchangers are visually inspected and cleaned in lieu of thermal performance testing as stated in a WCGS response to GL 89-13.

Visual examinations are performed periodically on open-cycle cooling water components to detect conditions which initiate aging of open-cycle cooling water system components. Specific conditions to be documented include macro-invertebrate and microbiological fouling, scaling and deposition build-up, and the condition of component interior surfaces and coatings.

Mechanical and/or chemical cleaning methods are used based on the results of visual inspections to remove deposits and fouling from heat exchangers and other components in open cycle cooling water systems. Physical cleaning of the system components, including the intake bays, is also used to control macro-invertebrate infestation. Physical cleaning may be coordinated with chemical control treatment for optimum results.

NUREG-1801 Consistency

The Open-Cycle Cooling Water System program is an existing program that is consistent with NUREG-1801, Section XI, M20, “Open-Cycle Cooling Water System.”

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

WCGS has experienced macro-fouling (clam shells) of heat exchangers, room coolers, traveling screen spray nozzles, and low flow or stagnant portions of piping such as drain lines, dead legs, and standby trains. Macro-foul control methods include chemical treatment, system/component flushes, and inspection/cleaning. Transitioning of biocide treatments from the original gaseous chloride, through solid halogen donor in the 1993 to 1998 time frame, to the current use of sodium bromide supplemented with non-oxidizing biocide (in anticipation of the appearance of Zebra mussels) have resulted in minimal evidence of clams at this time. Zebra mussels have not yet been detected in the lake. Low flow areas are flushed to ensure biocide coverage and to remove silt and sedimentation build-up.

A previous problem area concerning Train B auxiliary feedwater (AFW) pump room cooler has been resolved by modification. The previous design of the Train B AFW Pump Room Cooler 4” supply line resulted in susceptibility to clogging of the room cooler during quarterly supply header flushing. A plant modification moved the room cooler supply line from the bottom of the header to the top thus preventing the clogging of the line.

In 2004, an increasing trend in tube leaks for open-cycle cooling water room coolers with copper-nickel tubes resulted in an evaluation of the impact of the leaks and a review of maintenance and inspection practices. It was determined that by revising the acceptance criteria to be more conservative, degraded tubes could be identified and removed from service prior to developing through wall leaks.

A report prepared in 2003 provided significant operating history regarding buried piping in many open-cycle cooling water systems. The report refers to a 1996 observation that stated the overall condition of the piping was good with no significant internal corrosion, and no systematic loss of wall thickness.

WCGS piping systems have experienced corrosion, pitting, and sedimentation build-up especially in low flow areas and stagnant dead legs off the main flow stream. Replacement of open-cycle cooling water piping has been infrequent. Some small piping has been replaced as a result of blockage due to corrosion product build-up. These aging effects are controlled by flushing, chemical treatment, and inspections/cleaning.

In 2005, two normally stagnant or low flow sections of essential service water system piping were found to have pitting corrosion that required repair or replacement. These sections of piping include the essential service water system "A" train warming line and the auxiliary feed pump suction piping from essential service water system "A" train.

The pitting corrosion of the essential service water system "A" train warming line resulted from multiple factors. The pitted section of piping is located upstream of a vent that was previously used as an injection point for a chlorine solution used as a biocide. It also appears the chlorine solution was introduced to the warming line when water flow was not present. When chlorine gas is absorbed into water it forms both hypochloric acid and hydrochloric acid. Both of these acids are corrosive to steel, with hydrochloric acid the stronger of the two.

Chlorine gas is also highly corrosive to steel. It appears that bubbles of chlorine gas rose to the top of the pipe sections after injection, directly corroding the steel, and also forming acids along the top of the pipe. Chlorine is no longer used at WCGS as a biocide. Another factor for pitting corrosion and wastage along the top quadrant of piping is the existence of a water/air interface. Waterline attack is driven by the large difference in oxygen concentrations at the air/metal and water/metal interfaces.

A section of auxiliary feed pump suction piping from essential service water system "A" train with through-wall leaks was cut out and visually examined. The aging mechanism for the through-wall leak was determined to be pitting due to under-deposit corrosion. This type of corrosion is typical for carbon steel piping exposed to raw water, where small regions under tubercles develop into self-sustaining pits.

With the above described aging it was determined that structural integrity of the piping was not compromised. The repair and replacements were performed to gain additional margin on the minimum wall thickness. Additional UT inspections of stagnant and low flow areas of open-cycle cooling water system piping are planned for the next refuel cycle. The stagnant and low flow piping lines currently have preventive maintenance activities to mitigate aging such as flushing and chemical treatment. However, due to the recent operating experience with pitting/under-deposit corrosion in these lines further study/review is on-going to improve the pressure boundary reliability of the OCCW systems. An overall project plan for OCCW piping remediation is under development.

Conclusion

The continued implementation of the Open-Cycle Cooling Water System 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 Closed-Cycle Cooling Water System

Program Description

The Closed-Cycle Cooling Water System program manages loss of material, cracking, and reduction of heat transfer for components in closed-cycle cooling water systems. The program includes maintenance of system corrosion inhibitor concentrations within specified limits of EPRI TR-107396 to minimize aging, and periodic testing and inspections to evaluate system and component performance. Inspection methods include visual, ultrasonic testing (UT) and eddy current testing (ECT).

For the component cooling water system, the program maintains water chemistry within the parameters specified in plant procedures in order to minimize corrosion and microbiological growth through the addition of corrosion inhibitors and biocides. Diagnostic chemistry parameters are monitored to maintain the water within specified parameters and provide indication of abnormal conditions. Performance of selected heat exchangers is monitored by performing surveillance testing to verify the thermal or hydraulic performance function. The system pumps are also tested to verify performance. Nondestructive examinations are used to verify the pressure boundary intended function of system components is maintained. The program requires system pressure tests to locate and identify leaks so that corrective actions can be taken.

For the emergency diesel engine cooling water subsystem, plant heating system, and central chilled water system, the program relies on mitigative measures to minimize corrosion and microbiological growth through the use and maintenance of corrosion inhibitors and biocides. Chemistry parameters are also monitored to provide indication of abnormal conditions and preclude cracking in stainless steels in the plant heating system. Emergency diesel generator engine performance parameters are monitored through periodic surveillance tests. The plant heating and central chilled water systems are within the scope of license renewal for spatial interaction concerns only, therefore, the periodic sampling and maintenance of system chemistry in accordance with the specified limits is adequate to ensure component intended functions are maintained.

NUREG-1801 Consistency

The Closed-Cycle Cooling Water System program is an existing program that, following enhancement, will be consistent with exception to NUREG-1801, Section XI.M21, “Closed-Cycle Cooling Water.”

Exceptions to NUREG-1801

Program Elements Affected

Parameters Monitored or Inspected - Element 3

NUREG-1801, Section XI.M21 states this program should monitor heat exchanger parameters including flow, inlet and outlet temperatures, and differential pressure. The letdown heat exchangers, residual heat removal heat exchangers, safety injection pump coolers, and the PASS sample coolers, are not periodically tested for flow, inlet and outlet temperatures, and differential pressure. The CCW heat exchangers are periodically tested to measure heat transfer capability. Shell-side (closed-cycle cooling water) flow and temperature measurements are used to calculate heat exchanger performance in terms of a fouling factor. Tube side (raw water) flow and differential pressure are also measured and used as an indicator of tube fouling. The CCW heat exchangers are periodically NDE tested (ECT) to detect aging of the tube pressure boundary. The performance monitoring and NDE of the CCW heat exchangers will provide a leading indicator for aging of the other CCW supplied heat exchangers. An enhancement to the WCGS closed-cycle cooling water system program to specify inspection of the internal surfaces of the CCW pump return line check valves during operational readiness inspection activities will also provide additional indicators of the effective aging management of loss of material and fouling in the CCW system. A review of WCGS plant specific operating experience indicates there has been no evidence of significant fouling or loss of material observed in the closed cooling water systems. In lieu of performance testing of all CCW supplied heat exchangers, the CCW heat exchanger performance monitoring, system internal inspections activities, and CCW chemistry program are used to manage aging effects in the CCW system.

Enhancements

Prior to the period of extended operation, the following enhancements will be implemented in the following program element:

Monitoring and Trending - Element 5

A new periodic preventive maintenance activity will be developed to specify performing inspections of the internal surfaces of the valve bodies and accessible piping while the valves are disassembled for operational readiness inspections to detect loss of material and fouling.

Operating Experience

WCGS has identified biological activity and resulting deposit build-up in the closed-cycle cooling water systems. Corrective actions included implementation of periodic monitoring for biological activity and the addition of biocides when an increasing trend of biological activity is detected. There has been no evidence of significant fouling or corrosion product build-up observed in the closed-cycle cooling water systems.

In 1994, WCGS observed through-wall leakage at welds in the closed-cycle cooling water return line. Subsequent UT inspections revealed linear indications in multiple welds in this section of closed-cycle cooling water piping. It was determined the through wall leaks were caused by intergranular stress corrosion cracking (IGSCC). All welds identified to have cracking were replaced.

Detection of additional through-wall leaks on the letdown heat exchanger and discharge line from the heat exchangers occurred in 2000, which prompted an expanded scope of UT inspections of the heat exchanger and the discharge line, as well as several welds on the inlet line. Results of the UT inspections indicated additional linear indications at welds that were localized to the letdown heat exchanger discharge piping. Several welds on the return header were inspected with no recordable indications.

Based on the results of the UT examinations, repair plans were developed to replace all welds with rejectable indications. Piping was replaced as necessary to facilitate fieldwork and to limit radiation exposure. Welds inside the heat exchanger room were not inspected due to dose rates, however, all these welds/piping were replaced.

A selected number of welds in the letdown heat exchanger discharge piping exhibiting rejectable linear indications were preserved and sent for independent hardware failure and root cause analysis. During the subsequent refueling outage, additional piping was inspected using UT examinations to identify any existing indications in the reactor coolant pumps thermal barrier, motor air cooler, and upper bearing cooler closed-cycle cooling water system return lines. The UT examinations resulted in what appeared to be severe, rejectable indications. Based on the previous root cause investigation of the letdown heat exchanger discharge line indications, and the similarity to the indications identified in refueling outage 11, it was believed that these indications were also the result of stress corrosion cracking. A replacement plan was developed to repair/replace welds and piping during refueling outage 12.

Following the identification of the rejectable indications in the reactor coolant pump closed-cycle cooling water return piping in refueling outage 12, two indications that extended the full circumference of the pipe were partially sized by UT for depth. The depth sizing indicated that the indications extended to 90 percent through wall over large fractions of their length. The NRC contracted the Naval Surface Warfare Center (NSWC) to perform a hardware failure analysis. WCGS also contracted a hardware failure analysis (with the hardware examination performed by Atomic Energy of Canada Limited (AECL)) and a root cause analysis. WCGS provided weld and pipe samples that were removed from the system piping with the most severe noted indications to the NRC and AECL for examination. The NSWC and AECL independently performed destructive and non-destructive examinations of the provided piping specimens. The final reports from both organizations were provided to the NRC and WCGS for review. The investigations performed by AECL revealed no significant stress corrosion cracking in the circumferential direction; however, small amounts of stress corrosion cracking in the longitudinal direction were found. The deterioration was limited to a few very small areas and was characterized as intergranular attack. No cracking was observed in the analyses performed by the NSWC.

Since the AECL and NSWC reports concluded no significant stress corrosion cracking was identified in the subject piping and welds, WCGS contracted EPRI to investigate the discrepancy between the hardware failure analyses and the UT results. The EPRI report concluded the NDE procedure was not strictly followed with respect to the removal of external weld reinforcement, acquisition of internal and external surface contours, recording of indication location, or plotting of indications on a cross-sectional drawing of the component. EPRI felt that procedural enhancements could be made by the inclusion of flaw discrimination techniques.

Based on the conclusions and recommendations of the various reports and analyses performed regarding cracking of WCGS closed-cycle cooling water system piping, corrective actions have included:

- Adjusting of the pH and molybdate to the higher levels recommended in the EPRI Closed Cooling Water Chemistry Guidelines (TR-107396).
- Implementation of monitoring for biological activity and the addition of biocides to the closed-cycle cooling systems.
- Susceptible welds in the CCW return line from the letdown heat exchanger (including the heat exchanger) have been replaced and stress relieved.
- Plant specific UT inspection procedures were revised to incorporate EPRI recommendations.

Periodic UT examinations have been established over the course of the next several refueling outages, of welds in the discharge line from the letdown heat exchanger to verify the effectiveness of the corrective actions. The UT inspections of the piping will be an adequate representation of the affects of corrective actions on the heat exchanger.

In a letter providing an evaluation of cracking in closed-cycle cooling water system piping at WCGS, the NRC has concluded that, based on the information provided by WCGS and the work of the NRC contractor, WCGS has taken sufficient corrective action and no additional action is required.

Conclusion

The continued implementation of the Closed-Cycle Cooling Water 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.

B2.1.11 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 the loss of material and the effects of rail wear for all cranes, trolley structural components and applicable rails within the scope of license renewal. The program is implemented through periodic visual inspections of components.

Crane inspection activities verify structural integrity of the crane components required to maintain the crane intended function. Visual inspections assess conditions such as loss of material of structural members, misalignment, flaking, side wear of rails, loose tie down bolts and excessive wear or deformation of monorails.

The inspection requirements are consistent with:

- The guidance provided by NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants" for load handling systems that handle heavy loads which can directly or indirectly cause a release of radioactive material.
- Applicable industry standards (such as CMAA Spec 70 and ANSI B30.11) for other cranes within the scope of license renewal.
- Applicable OSHA regulations (such as 29 CFR Volume XVII, Part 1910 and Section 1910.179).

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:

Detection of Aging Effects – Element 4

Procedures will be enhanced to specifically inspect for loss of material due to corrosion or rail wear.

Acceptance Criteria – Element 6

Procedures will be enhanced to identify industry standards or WCGS Specifications that are applicable to the component.

Operating Experience

Corrosion has been identified on the reactor vessel internals lifting device. The corrosion from the lifting device flaked off and into the reactor vessel when the upper and lower internals were in the process of being removed and reinstalled. The intended function of the lifting device was not compromised. The lifting device was repainted. Additionally, since WCGS cranes, hoists and fuel handling equipment have not been operated outside their design limits (without appropriate evaluations, See Section 4.7.1), nor beyond their design lifetime, no fatigue related structural failures have occurred.

Conclusion

The continued implementation of the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems 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.

B2.1.12 Fire Protection

Program Description

The Fire Protection program manages loss of material for fire rated doors, fire dampers, diesel-driven fire pump, and the halon fire suppression system, cracking, spalling, and loss of material for fire barrier walls, ceilings, and floors, and hardness and shrinkage due to weathering of fire barrier penetration seals. Periodic visual inspections of fire barrier penetration seals, fire dampers, fire barrier walls, ceilings and floors, and periodic visual inspections and functional tests of fire-rated doors are performed. Periodic testing of the diesel-driven fire pump ensures that there is no loss of function due to aging of diesel fuel supply lines.

The Fire Protection program performs a visual inspection, at least once every 18 months, of the fire barrier walls, ceilings, and floors, including coating and wraps (structural steel fireproofing, raceway fire wrap and hatch covers), examining for any signs of aging such as cracking, spalling, and loss of material.

Approximately 10 percent of each type (electrical and mechanical as practical) of penetration seal is visually inspected at least once every 18 months.

The Fire Protection program performs drop tests on approximately 10 percent of accessible horizontal and vertical fire dampers on an 18 month basis. Fire dampers that are inaccessible for drop testing are visually inspected to assess integrity/availability. The fire damper inspection and drop test procedure also performs a visual inspection on fire dampers which have transfer grilles, with no or limited ductwork, on both sides of safety significant fire barriers.

The Fire Protection program performs a visual inspection, at least once per year, on fire-rated doors to verify the integrity of door surfaces and for clearances to detect aging of the fire doors. The diesel-driven fire pump is under observation during performance tests to detect any aging of the fuel supply line. A visual inspection and function test of the halon fire suppression system is performed every 18 months.

NUREG-1801 Consistency

The Fire Protection program is an existing program that, following enhancement, will be consistent with exception to NUREG-1801, Section XI.M26, “Fire Protection.”

Exceptions to NUREG-1801

Program Elements Affected

Parameters Monitored or Inspected - Element 3 and Detection of Aging Effects – Element 4

WCGS performs visual inspections and function tests of the halon system every 18 months, not every 6 months as suggested by NUREG-1801, Section XI.M26. The 18 month inspection frequency is specified in the WCGS fire protection program, which is referenced in the USAR, and was part of the original licensing basis until the fire protection requirements were removed from the Technical Specifications and placed in plant procedures.

Enhancements

Prior to the period of extended operation, the following enhancements will be implemented in the following program elements:

Scope of Program – Element 1, Parameters Monitored or Inspected – Element 3, Detection of Aging Effects – Element 4, Monitoring and Trending –Element 5, and Acceptance Criteria – Element 6

Fire damper inspection and drop test procedures will be enhanced to inspect damper housing for signs of corrosion.

Fire barrier and fire door inspection procedures will be enhanced to specify fire barriers and doors described in USAR Appendix 9.5A, "WCGS Fire Protection Comparison to APCSB 9.5-1 Appendix A," and WCGS Fire Hazards Analysis.

Training for technicians performing the fire door and fire damper visual inspections will be enhanced to include fire protection inspection requirements and training documentation.

Operating Experience

WCGS fire barrier penetration seals have been found with degradation during inspections. It was determined that the identified condition had existed since original construction. It was determined that the version of the procedure used for the inspection did not provide a detailed location of seismic gap. The procedure was revised to provide adequate guidance regarding seismic gap seal locations and correct wording to indicate that seismic gap seals are a portion of the fire area boundary required for operability. Seismic gap seals were inspected using the revised procedure and additional degraded seal segments repaired or captured in a corrective action document. The current revision of the fire barrier penetration seals inspection procedure has demonstrated degradation of fire barrier penetration seals will be detected prior to loss of the intended function.

Cracking due to water damage on Thermo-Lag of an electrical race way and on a containment buttress hatch cover was found and was identified by the fire barrier inspection before the loss of intended function. The Thermo-Lag observed to have cracking on the electrical race way did not have a credited fire-rating, it only provides IEEE-384 electrical separation.

The WCGS fire door inspections have identified wear of hinges and handles prior to the doors' loss of intended function and initiated appropriate corrective actions.

Through the course of reviewing fire barrier penetration seal parameters and documenting qualification consistent with NRC Information Notice 88-04, several penetration seals required field action to ensure that a fire barrier configuration was maintained. An action plan has been developed to track field work to completion and ensure that documents affected by this change package are released prior to change package closeout.

WCGS performed a Fire Protection Program Self Assessment examining penetration seals for installation compliance regarding approved installation details and bounding test parameters. As a result of this self assessment, unbounded penetration seal conditions were identified and have been reviewed and evaluated for acceptance and/or functionality. The initial evaluation was formulated to demonstrate that the function of the penetration seals identified to be unbounded provide a level of protection that is commensurate with the combustible loading within the fire areas where these seals are located. All penetrations that were identified to have unbounded seal conditions have been repaired or evaluated in accordance with Generic Letter 86-10 guidance and no further action is required.

Conclusion

The continued implementation of the Fire Protection 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.

B2.1.13 Fire Water System

Program Description

The Fire Water System program manages loss of material for water-based fire protection systems. Periodic hydrant inspections, fire main flushing, sprinkler inspections, and flow tests are performed in accordance with applicable National Fire Protection Association (NFPA) codes and standards. Nuclear Electric Insurance Limited (NEIL) performance based guidance is utilized for fire protection system inspection, testing, and maintenance intervals. The fire water system discharge pressure is continuously monitored such that loss of system pressure is immediately detected and corrective actions are initiated. The Fire Water System program conducts an air or water flow test through each open head spray/sprinkler head to verify that each open head spray/sprinkler nozzle is unobstructed. The Fire Water System program tests a representative sample of fire protection sprinkler heads or replaces those that have been in service for 50 years, using the guidance of NFPA 25, 2002 Edition, and tests at 10 year intervals thereafter during the period of extended operation to ensure that signs of aging are detected in a timely manner. Visual inspections of the fire protection system exposed to water, evaluating wall thickness to identify evidence of loss of material due to corrosion, is covered by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program (B2.1.22).

NUREG-1801 Consistency

The Fire Water System program is an existing program that is consistent, with exceptions to NUREG-1801, Section XI.27, “Fire Water System.”

Exceptions to NUREG-1801

<u>Program Elements Affected</u>

Detection of Aging Effects – Element 4

NUREG-1801 specifies annual hydrant hose hydrostatic tests. WCGS performs a hydrostatic test of its power block fire hoses every three years. WCGS may replace an existing fire hose with a new fire hose every five years in lieu of performing a hydrostatic test.

NUREG-1801 specifies annual gasket inspections. WCGS performs gasket inspections at least once every 18 months. Since aging effects are typically manifested over several years, differences in inspection and testing frequencies are insignificant.

Enhancements

None

Operating Experience

WCGS fire hydrants have been found in conditions where the valve could not be opened, with excessive leakage, and foreign material was flushed out of the hydrant. In these instances a work request was created and repair or replacement activities were initiated.

In 1987, corrosion was found on carbon steel piping that was directly connected to ductile iron piping. Since that time, an additional leak was discovered in fire protection system outside the diesel generator building. Subsequent excavation discovered loss of material due to pitting corrosion. The fire protection system corrosion resulted from a break in the protective coating.

Three localized areas of through wall corrosion have been identified on the fire protection piping for the unit aux transformer. Engineering evaluated this condition and determined that the system was still able to perform its intended function, but had this portion of the pipe replaced.

The fire protection sprinkler headers surrounding transformers were discovered to be corroded at the unions and threaded connections. Repair or replacement activities were initiated and the threaded surfaces of the sprinkler heads were cleaned and painted before the loss of intended function.

Asiatic clams were discovered in the fire protection system in 1996. The fire protection system was flushed to capture any evidence of additional clams and to force any existing clams out of the system. As a corrective action to the discovery to the Asiatic clams a chemical injection system was installed near the jockey pump for biocide treatment of the fire protection water. Since the installation of this chemical injection system there have been no indications of clams in the fire protection system.

WCGS completed its first C-factor test in 2004, resulting in system pressure differentials meeting the acceptance criteria. These test results determined that the C-factor for the underground and above ground fire protection piping has not degraded below the bases values used in the fire protection hydraulic calculation; thereby providing objective evidence that the fire protection water supply is capable of meeting the demand of each water-based fire suppression system in the power block structures.

Conclusion

The continued implementation of the Fire Water System 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.

B2.1.14 Fuel Oil Chemistry

Program Description

The Fuel Oil Chemistry program manages loss of material on the internal surface of components in the emergency diesel fuel oil storage and transfer system and diesel fire pump fuel oil system. The program includes (a) surveillance and monitoring procedures for maintaining fuel oil quality by controlling contaminants in accordance with applicable ASTM Standards, (b) periodic draining of water from fuel oil tanks, (c) visual inspection of internal surfaces during periodic draining and cleaning, (d) ultrasonic wall thickness measurements of the emergency fuel oil storage tanks if there are indications of reduced cross sectional thickness found during the visual inspection, (e) inspection of new fuel oil before it is introduced into the storage tanks, and (f) one-time inspections of a representative sample of components in systems that contain fuel oil by the One-Time Inspection program (B2.1.16).

Fuel oil quality is maintained by monitoring and controlling fuel oil contaminants in accordance with applicable ASTM Standards. This is accomplished by periodic sampling and chemical analysis of the fuel oil inventory at the plant and sampling, testing, and analysis of new fuel oil prior to delivery at the plant. If a sample appears to be unsatisfactory, delivery is discontinued or not allowed.

All samples are taken in accordance with ASTM D4057 and are shipped to a laboratory approved in accordance with the WCGS QA program for analysis.

Any accumulated water is removed monthly from the emergency fuel oil storage and emergency fuel oil day tanks, and quarterly from the diesel fire pump fuel tank.

The internal surfaces of the emergency fuel oil storage tanks are periodically drained, cleaned, and visually inspected to detect potential aging. The emergency fuel oil day tanks will also be drained, cleaned, and visually inspected at the same time as the emergency fuel oil storage tanks. The diesel fire pump fuel tank does not have interior accessibility for cleaning.

Due to the fuel oil day tanks and diesel fire pump fuel tanks periodic sampling and testing for water and sediment, and having no history in the last ten years of having more than trace amounts of water found during sampling, no ultrasonic thickness measurements will be performed on these tanks.

A representative sample of components in systems that contain fuel oil will be inspected for evidence of aging effects in accordance with One-Time Inspection program (B2.1.16).

NUREG-1801 Consistency

The Fuel Oil Chemistry program is an existing program that, following enhancement, will be consistent with exceptions to NUREG-1801, Section XI.M30, “Fuel Oil Chemistry.”

Exceptions to NUREG-1801

Program Elements Affected

Preventive Actions (Element 2)

WCGS does not add fuel oil stabilizers, corrosion inhibitors, or routinely add biocides. It relies on the periodic sampling and analysis for particulates and corrosion products. Any accumulated water is removed monthly from the emergency fuel oil storage and emergency fuel oil day tanks and quarterly from the diesel fire pump fuel tank.

Parameters Monitored or Inspected (Element 3) and Acceptance Criteria (Element 6)

WCGS uses only ASTM Standard D1796-83, not D1796 and D2709. WCGS Technical Specifications commit to using only D1796-83. The testing conducted using ASTM D1796 gives quantitative results, whereas D2709 testing gives only pass-fail results; therefore, the D1796 method gives more descriptive information about the fuel oil condition than the D2709 method.

Acceptance Criteria (Element 6)

WCGS uses the guidance of ASTM Standard D 2276 Method A for determination of particulates, as opposed to the combination of D 2276 and D 6217. ASTM D6217 states that it is the first ASTM standard test method for assessing the mass quantity of particulates in middle distillate fuels. Test Method D5452 and its predecessor Test Method D2276 were developed for aviation fuels and used 1 gal or 5 L of fuel sample. Using greater than or equal to one gallon of middle distillate fuel often requires significant time to complete the filtration. The D6217 test method uses about a quarter of the volume in the D2276 aviation fuel method. There is no indication that ASTM D6217 is either technically superior to D2276 as far as managing the effects of aging (it merely allows for faster filtration), or that the combination of the two standards adds any value beyond using just D2276 itself.

Enhancements

Prior to the period of extended operation, the following enhancements will be implemented in the following program elements:

Preventive Actions - Element 2 and Detection of Aging Effects – Element 4

Procedures will be enhanced to provide for supplemental ultrasonic thickness measurements if there are indications of reduced cross sectional thickness found during the visual inspection of the emergency fuel oil storage tanks. The emergency fuel oil day tanks will be added to the 10 year drain, clean, and internal inspection program.

Operating Experience

A review of plant-specific operating experience indicates that both emergency fuel oil storage tanks have experienced high particulate counts. The fuel oil tanks are checked regularly for the presence of water and sediment and the emergency fuel oil storage tanks are regularly checked for particulates; any instances are corrected in a timely manner. Neither the fuel oil day tanks nor the diesel fire pump fuel tanks have any history of water and sediment levels exceeding the normal chemistry level.

The internals of the emergency fuel oil storage tanks were visually inspected in 2002. This inspection revealed that the interior coating of one of the emergency fuel oil storage tanks was deteriorated and some rust had developed on the interior walls. An engineering evaluation determined that the failure of the interior coating should not result in failure of the diesel system to perform its intended functions. It was also determined that the rust identified during this inspection was an acceptable condition because it is not at a stage that could result in the component's failure to perform its intended function and any deteriorated conditions in future inspections will be documented in a corrective action. Upon the discovery of the condition of the emergency fuel oil storage tank interior coating, biocide was added to that tank and all of the diesel fuel oil in the emergency fuel oil storage tanks was subsequently replaced with new fuel oil. Since the discovery of the condition of the emergency fuel oil storage tank interior coating, one of the emergency fuel oil day tanks has been visually inspected, and no coating degradation was found. The other fuel oil day tank is scheduled to be visually inspected by the end of 2006.

Conclusion

The continued implementation of the Fuel Oil Chemistry program, supplemented by the One-Time Inspection program (B2.1.16), 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 Reactor Vessel Surveillance

Program Description

The Reactor Vessel Surveillance program is consistent with ASTM E 185. Actual reactor vessel coupons are used, but an exemption in the original license permits use of other than beltline weld material for the weld coupons. 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."

The schedule has been revised by removal of the last two coupon sets to the spent fuel pool, at exposures greater than those expected at the beltline wall at 60 years. This withdrawal therefore 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. Vessel fluence is now determined by ex-vessel dosimetry.

This schedule change has been approved by the NRC, as required by 10 CFR 50 Appendix H.

NUREG-1801 Consistency

The Reactor Vessel Surveillance program is an existing program that is consistent with NUREG-1801, Section XI.M31 "Reactor Vessel Surveillance."

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

The last-tested capsule specimens were exposed to fluences equivalent to approximately 54 effective full-power years, and demonstrated generous margins to the upper-shelf energy (USE) criterion and to pressurized thermal shock temperature (RT_{PTS}) screening criteria; and low end-of-life adjusted reference temperatures (EOL ART), thereby demonstrating generous operating margins to pressure-temperature limits; in the limiting materials.

Conclusion

The continued implementation of the Reactor Vessel Surveillance 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.

B2.1.16 One-Time Inspection

Program Description

The One-Time Inspection program conducts one-time inspections of plant system piping and components to verify the effectiveness of the Water Chemistry program (B2.1.2), Fuel Oil Chemistry program (B2.1.14), and Lubricating Oil Analysis program (B2.1.23). The aging effects to be evaluated by the One-Time Inspection program are loss of material, cracking, and reduction of heat transfer.

The One-Time Inspection program specifies corrective actions and increased sampling of components if aging effects are found during an inspection that leads to loss of component intended function. The inspections required by this program will be implemented and completed within the ten year period prior to the period of extended operation. Conducting the One-Time Inspection program in this time period will assure that potential aging effects will be manifested based on at least 30 years of WCGS operation.

Major elements of the One-Time Inspection program includes identification of component populations subject to one-time inspection based on common materials and environments; determination of sample size using the method described in EPRI Report TR-107514 based on the population size of the material-environment groups; selection of components within the material-environment groups for inspection based on specified criteria such as service period, operating conditions, and design margins; conducting ASME Code Section XI NDE inspections of the selected components within the sample; and, evaluation of inspection results and initiation of corrective action for unacceptable results to maintain component intended function.

The One-Time Inspection program is a new program and will be implemented within the ten year period prior to the period of extended operation. NDE examinations of piping and components for One-time inspections will be conducted in accordance with ASME Section XI Code requirements. NDE acceptance criteria will be consistent with the specific ASME Section XI examination procedure used for each inspection.

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

There is no programmatic operating experience applicable to the new One-Time Inspection 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 this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B2.1.17 Selective Leaching of Materials

Program Description

The Selective Leaching of Materials program manages loss of material due to selective leaching for brass (>15% zinc) and gray cast iron components exposed to raw water or closed-cycle cooling water within the scope of license renewal. Components susceptible to selective leaching are in the fire protection system, the auxiliary building HVAC system, the containment purge HVAC system, the control building HVAC system, the fuel building HVAC system, the miscellaneous buildings HVAC system, the standby diesel engine system and the oily waste system. WCGS has no components made of bronze alloys that are susceptible to selective leaching.

The program includes a one-time inspection of a selected sample of component internal surfaces. Visual and mechanical methods determine whether loss of material due to selective leaching is occurring. If these inspections detect dezincification or graphitization, which are indications of selective leaching, then a follow up examination/evaluation will be performed. The examination/evaluation may require confirmation of selective leaching with a metallurgical evaluation (which may include a microstructure examination.) The sample size for the system, 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/evaluations will be performed.

The initial visual inspections/evaluations required by this program will be completed prior to the period of extended operation. If indications of selective leaching are confirmed, follow up examinations/evaluations are performed.

The Selective Leaching of Materials program is a new program and will be implemented prior to the period of extended operation.

NUREG-1801 Consistency

The Selective Leaching of Materials program is a new program that when implemented will be consistent with exceptions to NUREG-1801, Section XI.M33, “Selective Leaching of Materials.”

Exceptions to NUREG-1801

<u>Program Elements Affected</u>

Scope of Program – Element 1, Preventive Actions – Element 2, Parameters Monitored or Inspected – Element 3, and Detection of Aging Effects – Element 4

A qualitative determination of selective leaching will be used in lieu of Brinell hardness testing for components within the scope of the Selective Leaching of Materials aging management program. The exception involves the use of examinations, other than Brinell hardness testing identified in NUREG-1801, Section XI.M33, to identify the presence of selective leaching of material. The exception is justified, because hardness testing may not be feasible for most components due to form and configuration (i.e., heat exchanger tubes) and other mechanical means, i.e., scraping, or chipping, provide an equally valid means of identification.

Enhancements

None

Operating Experience

The Selective Leaching of Materials program is a new program that is a one-time inspection with no operational history at WCGS.

During eddy current testing of the emergency diesel generator heat exchanger tubing at WCGS in 2001, several tubes were found to have defect indications originating on the tubing inside diameter. To support the root cause investigation of these indications, selected tubes were removed from the EDG heat exchangers and destructively examined. The laboratory examinations did not reveal any evidence of selective leaching, such as dezincification, in any of the tube sections.

Conclusion

The implementation of the Selective Leaching of Materials 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.

B2.1.18 Buried Piping and Tanks Inspection

Program Description

The Buried Piping and Tanks Inspection program manages loss of material of buried components in the essential service water system, emergency diesel engine fuel oil storage and transfer system, auxiliary feedwater system, high pressure coolant injection system (borated refueling water storage system), and the fire protection system. Opportunistic visual inspections monitor the condition of protective coatings and wrappings found on carbon steel, gray cast iron or ductile iron components and assess the condition of stainless steel components with no protective coatings or wraps. Evidence of damaged wrapping or coating defects is an indicator of possible corrosion damage to the external surface of the components. In addition, selective leaching, which is an applicable aging effect for buried gray cast iron components, will be managed by the Selective Leaching of Materials program (B2.1.17).

The Buried Piping and Tanks Inspection program is a new program that will be implemented prior to the period of extended operation. Within the ten year period prior to entering the period of extended operation, an opportunistic or planned inspection will be performed. Upon entering the period of extended operation the WCGS Buried Piping and Tanks Inspection program will require a planned inspection within ten years unless an opportunistic inspection has occurred within this ten year period.

NUREG-1801 Consistency

The Buried Piping and Tanks Inspection program is a new program that, when implemented, will be consistent with NUREG-1801, Section XI.M34, “Buried Piping and Tanks Inspection.”

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

The Buried Piping and Tanks Inspection program is a new program. However, there is operating experience with buried piping at WCGS. In 1987, corrosion was discovered on multiple runs of buried piping that are in the scope of license renewal in the fire protection system and the auxiliary feedwater system. The corrosion discovered in the fire protection system piping was found on carbon steel piping that was directly connected to ductile iron piping. The study postulated that the corrosion in the auxiliary feedwater system was either corrosion due to stray current from the fuel oil system or galvanic corrosion due to the carbon steel piping becoming a sacrificial anode.

Since the completion of the 1987 study, there have been four occurrences of leakage due to corrosion of the external surface of buried components. Three of these leaks occurred in buried portions of the service water system, which are not within the scope of license renewal. An additional leak was discovered in the fire protection system in 1997. Subsequent excavation discovered loss of material due to pitting corrosion. The fire protection system corrosion resulted from a break in the protective coating.

Conclusion

The implementation of the Buried Piping and Tanks Inspection 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.

B2.1.19 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 stainless steel ASME Code Class 1 piping less than or equal to 4 inches. This program is a part of the WCGS Risk-Informed Inservice Inspection (RI-ISI) program.

For ASME Code Class 1 small-bore piping, the RI-ISI program requires volumetric examinations (by ultrasonic testing) on selected weld locations to detect cracking. Weld locations are selected based on the guidelines provided in EPRI TR-112657. Ultrasonic examinations are conducted in accordance with ASME Section XI with acceptance criteria from Paragraph IWB-3131 and IWB-2430. The fourth interval of the ISI program at WCGS will provide the results for the one time inspection of ASME Code Class 1 small-bore piping.

In conformance with 10 CFR 50.55a(g)(4)(ii), the WCGS ISI Program is updated 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.

NUREG-1801 Consistency

The One-Time Inspection of ASME Code Class 1 Small-Bore Piping program is an existing program that is consistent with exception to NUREG-1801, Section XI.M35, “One-Time Inspection of ASME Code Class 1 Small-Bore Piping.”

Exceptions to NUREG-1801

<u>Program Elements Affected</u>

Acceptance Criteria – Element 6

The WCGS ISI Program uses ASME Section XI 1998 Edition through 2000 addenda as modified by 10 CFR 50.55a, and approved code cases. NUREG-1801, Section XI.M35 specifies the use of ASME Section XI, 2001 edition with 2002 and 2003 addenda. There are no differences in the two code versions for Paragraphs IWB-3131 and IWB-2430.

Enhancements

None

Operating Experience

WCGS has not experienced cracking of stainless steel ASME Code Class 1 piping less than or equal to NPS 4 and greater than or equal to NPS 1.

Conclusion

The continued implementation of the One-Time Inspection of ASME Code Class 1 Small-Bore Piping 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.

B2.1.20 External Surfaces Monitoring Program

Program Description

The External Surfaces Monitoring Program manages loss of material for external surfaces of steel components and hardening and loss of strength for elastomers in ventilation and mechanical systems. Visual inspections conducted during system engineer walkdowns are used to identify aging effects. Loss of material for external surfaces is managed by the Boric Acid Corrosion program (B2.1.4) for components in a system with treated borated water or reactor coolant environment on which boric acid corrosion may occur, Buried Piping and Tanks Inspection program (B2.1.18) for buried components, and Structures Monitoring Program (B2.1.32) for supports, structural items, and electrical components

The External Surfaces Monitoring Program consists of periodic visual inspections for aging management of loss of material, leakage, elastomer hardening and loss of strength. The scope of the program includes those systems and components that require external surface monitoring.

Walkdowns for systems inside containment are performed at least every re-fueling outage, or as determined necessary based on system safety significance, accessibility, production significance, trending of inspection results, and operating experience. Components that are inaccessible during both plant operations and refueling outages are evaluated to ensure that they have been/will be inspected at frequencies that provide reasonable assurance that the effects of aging will be managed such that the applicable intended functions will be maintained during the period of extended operation

NUREG-1801 Consistency

The External Surfaces Monitoring Program is an existing program that is consistent with NUREG-1801, Section XI.M36, "External Surfaces Monitoring Program."

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

External surfaces inspections via system inspections and walkdowns have been in effect at WCGS in support of 10 CFR 50.65 and have proven effective in maintaining the material condition of plant systems. The elements that comprise these inspections (e.g., the scope of the inspections and inspection techniques) are consistent with industry practice.

Conclusion

The continued implementation of the External Surfaces Monitoring 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.

B2.1.21 Flux Thimble Tube Inspection

Program Description

The Flux Thimble Tube Inspection program performs 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 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 program implements the recommendations of NRC Bulletin 88-09, "Thimble Tube Thinning in Westinghouse Reactors."

All flux thimble tubes are inspected during each outage. Wall thickness measurements are trended and wear rates are calculated. 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 outage, corrective actions are taken to reposition, cap or replace the tube. Program documentation maintains details regarding the core location, wear location and the number of times a tube has been previously repositioned or replaced.

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

WCGS has inspected flux thimble tubes in accordance with NRC IE Bulletin 88-09, "Thimble Tube Wearing in Westinghouse Reactors." Details regarding the core location, wear location and the number of times a tube has been previously repositioned, capped or replaced are maintained. Prior to 2002, no thimble tubes were replaced. Since that time, eleven flux thimble tubes have been replaced. Ten of them were due to wear and were replaced with chrome plated tubes in identified wear areas which are more wear resistant. There have been no through-wall failures of flux thimble tubes resulting in a loss of reactor coolant pressure boundary.

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.

B2.1.22 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 and hardening - loss of strength. Visual inspections of the internal surfaces of piping, piping components, ducting and other components that are not covered by other aging management programs are included in this program.

The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program uses the work control process to conduct and document inspections. The program performs visual inspections during periodic maintenance, predictive maintenance, surveillance testing and corrective maintenance to detect aging effects that could result in a loss of component intended function.

A review will be conducted to determine the number of inspection opportunities afforded by the work control process for all systems in the scope of license renewal. In the vast majority of cases, it is expected that the number of work opportunities existing will be sufficient to detect aging and provide reasonable assurance that intended functions are maintained. For those systems or components where inspections of opportunity are insufficient, an inspection will be conducted prior to the period of extended operation to provide reasonable assurance that the intended functions are maintained.

The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program is a new program that will be implemented prior to 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 NUREG-1801, Section XI.M38, “Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components.”

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program is a new program. Therefore no programmatic operating experience has been gained. The program will be reviewed to account for industry and station operating experience.

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.

B2.1.23 Lubricating Oil Analysis

Program Description

The Lubricating Oil Analysis program manages loss of material and reduction of heat transfer for components within the scope of license renewal. The program maintains lubricating oil contaminants within acceptable limits, thereby preserving an environment that is not conducive to aging effects and includes acceptance criteria based on OEM or industry guidelines for oil chemical and physical properties, wear metals, contaminants, additives, and water. Increased impurities and degradation of oil properties provide an indication of aging of materials exposed to lubricating oil. Additionally, ferrography is performed on oil samples for trending of wear particle concentrations for the reactor coolant pumps upper and lower bearing oil and other components. Monitoring and trending of lubricating oil analysis results identifies component aging prior to loss of component intended function. Corrective actions, when alert/action levels or limits have been reached, include increased sampling frequency, additional oil filtration, oil change out, visual inspections, and corrective maintenance.

NUREG-1801 Consistency

The Lubricating Oil Analysis program is an existing program that is consistent with exception to NUREG-1801, Section XI.M39, “Lubricating Oil Analysis.”

Exceptions to NUREG-1801

<u>Program Elements Affected</u>

Parameters Monitored or Inspected – Element 3

WCGS does not specify flash point testing as part of the lubricating oil analysis program as indicated in NUREG-1801, Section XI.M39. The WCGS lubricating oil analysis program instead specifies a fire point analysis to determine fuel contamination. The fire point analysis is a test method for determining the lowest temperature a test specimen can sustain combustion for 5 seconds following the introduction of an ignition source. Flash point and fire point are determined using the same standard ASTM test method (ASTM D92) and are equally effective measures for determining the suitability of lubricating oils for continued use with regards to fuel contamination.

Enhancements

None

Operating Experience

No instances of component failures attributed to lubricating oil contamination or degradation have been identified at WCGS. Reviews of analysis results indicate water pooling in lubricating oil is not occurring at WCGS.

Conclusion

The continued implementation of the Lubricating Oil Analysis program, supplemented by the One-Time Inspection program (B2.1.16), 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.

B2.1.24 Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements

Program Description

The Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program manages the aging effects of embrittlement, melting, cracking, swelling, surface contamination, or discoloration to ensure that electrical cables and 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.

Technical information contained within SAND96-0344 and EPRI TR-1003057 was used to determine the service limitations of the cable and connection insulating materials. SAND96-0344 and EPRI TR-109619 provided guidance on techniques for visually inspecting cables and connections for aging.

Non-EQ cables and connections within the scope of license renewal in accessible areas with an adverse localized environment are inspected. The inspections of Non-EQ cables and connectors in accessible areas are representative, with reasonable assurance, of cables and connections in inaccessible areas with an adverse localized environment. At least once every ten years, the Non-EQ cables and connections within the scope of license renewal in accessible areas are visually inspected for embrittlement, melting, cracking, swelling, surface contamination, or discoloration.

The acceptance criterion for visual inspection of accessible Non-EQ cable jacket and connection insulating material is the absence of anomalous indications that are signs of degradation. Corrective actions for conditions that are adverse to quality are performed in accordance with the corrective action program as part of the QA program. The corrective action process provides reasonable assurance that deficiencies adverse to quality are either promptly corrected or are evaluated to be acceptable.

The Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program is a new program that will be implemented prior to the period of extended operation.

NUREG-1801 Consistency

The Electrical Cables and 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.E1, "Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements."

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

The Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program is a new program and as such, no programmatic operating experience is available.

A review of the plant operating history determined that in 2001 a steam leak had allowed water to drip onto a cable tray. The steam leak was repaired and the cables were inspected. No cable degradation was observed.

Conclusion

The implementation of the Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program will provide reasonable assurance that adverse localized environments are identified and 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 Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits

Program Description

The scope of this program includes the cables and connections used in sensitive instrumentation circuits with sensitive, high voltage low-level signals within the Ex-core neutron monitoring system. This includes the source range, intermediate range, and power range monitors.

This program provides reasonable assurance that the intended function of cables and connections used in instrumentation circuits with sensitive, low-level signals that are not subject to the environmental qualification requirements of 10 CFR 50.49 and are exposed to adverse localized environments caused by heat, 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 surveillance tests are used to manage the aging of the cable insulation and connections so that 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 calibration results will be completed before the period of extended operation and every 10 years thereafter.

NUREG-1801 Consistency

The Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits program is an existing program that is consistent with NUREG-1801, Section XI.E2, “Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits.”

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

A case was identified where a change in temperature across a high range radiation monitor cable in containment resulted in substantial change in the reading of the monitor. Changes in instrument calibration can be caused by degradation of the circuit cable and are a possible indication of electrical cable degradation.

The vast majority of site specific and industry wide operating experience regarding neutron flux instrumentation circuits is related to cable/connector issues inside of containment near the reactor vessel.

Conclusion

The continued implementation of the Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits 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.

B2.1.26 Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements

Program Description

The Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 EQ Requirements program manages the aging effects of inaccessible medium voltage cables exposed to adverse localized environments caused by significant moisture simultaneously with significant voltage to ensure that inaccessible medium voltage cables 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.

All cable manholes that contain in-scope Non-EQ inaccessible medium voltage cables will be inspected for water collection. Collected water will be removed as required. This inspection and water removal will be performed based on actual plant experience with the inspection frequency being at least once every two years.

All in-scope Non-EQ inaccessible medium voltage cables will be tested to provide an indication of the conductor insulation condition. A polarization index test as described in EPRI TR-103834-P1-2 or other testing that is state-of-the-art at the time of the testing will be performed at least once every ten years.

The acceptance criteria for each test will be defined for the specific type of test performed and the specific cable tested. Periodic inspections of cable manholes, for the accumulation of water will minimize cable exposure to water. Corrective actions for conditions that are adverse to quality are performed in accordance with the corrective action program as part of the QA program. The corrective action process provides reasonable assurance that deficiencies adverse to quality are either promptly corrected or are evaluated to be acceptable.

The Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 EQ Requirements program is a new program that will be implemented prior to the period of extended operation.

NUREG-1801 Consistency

The Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 EQ Requirements program is a new program that, when implemented, will be consistent with NUREG-1801, Section XI.E3, "Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements."

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

The in-scope Non-EQ inaccessible medium voltage cables exposed to significant moisture simultaneously with significant voltage at the WCGS are 5 KV and 15 KV Kerite cables with High-Temperature Kerite insulation. According to Sandia report SAND96-0344 section 4.1.2.5 industry operating experience has shown that water treeing is much less prevalent with this insulation type than in cable with cross linked polyethylene (XLPE) insulation.

A review of the plant operating history determined that water has accumulated in cable manholes. In 2004, the cable manholes for these in-scope medium voltage cables exposed to significant moisture simultaneously with significant voltage were inspected for degradation of the cable support members due to water. All cable support members were found to be satisfactory. WCGS has had no failure of inaccessible medium voltage cables.

Conclusion

The implementation of Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 EQ Requirements program will provide reasonable assurance that aging effects will be managed so that the intended functions of the inaccessible medium voltage cables within the scope of license renewal are maintained during the period of extended operation.

B2.1.27 ASME Section XI, Subsection IWE

Program Description

The ASME Section XI, Subsection IWE program provides aging management of the steel liner of the concrete containment building, including the containment liner plate, piping and electrical penetrations, access hatches, moisture barrier, and the fuel transfer tube. Inspections are performed in accordance with ASME Section XI, Subsection IWE, 1998 Edition with no Addenda, 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 exam requirements are specified in Article IWE-3000.

The ASME Section XI, Subsection IWE program is consistent with the 2001 edition of ASME Section XI, Subsection IWE, including the 2002 and 2003 Addenda, for each of the elements addressed in NUREG 1801, Section XI.S1, ASME Section XI, Subsection IWE.

In conformance with 10 CFR 50.55a(g)(4)(ii), the WCGS 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 twelve months before the start of the inspection interval.

NUREG-1801 Consistency

The ASME Section XI, Subsection IWE program is an existing program that is consistent with exceptions to NUREG-1801, Section XI.S1, ASME Section XI, Subsection IWE.

Exceptions to NUREG-1801

<u>Program Elements Affected</u>

Scope of Program – Element 1

Pressure retaining containment seals and gaskets are not addressed by the 1998 edition of ASME Section XI, Subsection IWE. These components are evaluated per 10 CFR Part 50, Appendix J.

The WCGS CISI program is in accordance with the 1998 Edition of ASME Section XI (with no addenda), Subsection IWE. The WCGS IWE CISI program, which adheres to these code requirements, is consistent with the 2001 edition of ASME Section XI, Subsection IWE, including the 2002 and 2003 Addenda, for defining the scope of the WCGS IWE CISI program.

Parameters Monitored or Inspected - Element 3

Table IWE-2500-1 does not specify seven categories for examination in the 1998 or later editions of ASME Section XI, Subsection IWE. The ASME Section XI, Subsection IWE program is in accordance with the 1998 Edition of ASME Section XI (with no addenda), Subsection IWE, supplemented with the applicable requirements of 10 CFR 50.55a(b)(2)(ix). The WCGS IWE CISI program, which adheres to these code requirements, is consistent with the 2001 edition of ASME Section XI, Subsection IWE, including the 2002 and 2003 Addenda, for the parameters monitored by this program.

Monitoring and Trending - Element 5

WCGS manages containment liner aging in accordance with procedures which require when flaws or areas of degradation are accepted by engineering evaluation, the area containing the flaw or degradation shall be reexamined in accordance with IWE-2420(b) and (c). This ASME Code requirement specifies that flaws or areas of degradation no longer require augmented examination if they remain essentially unchanged for the next inspection period. This is not consistent with NUREG 1801, Section XI.S1, Element 5, which requires that they remain essentially unchanged for three consecutive inspection periods.

IWE 2430 was deleted from the 1998 Edition of ASME Section XI. It is also absent from the 2001 Edition of ASME Section XI, with 2002 and 2003 Addenda. The changes to Table IWE 2500-1 eliminate several examination categories. The categories that remain all require 100% examination. Therefore no items are available for additional examinations.

Enhancements

None

Operating Experience

At WCGS an inspection of the containment liner plate was performed during the 1996 refueling outage. Both an internal containment liner surface inspection and an external containment concrete surface inspection were performed during the outage. No corrosion, pitting, or other degraded conditions were identified with the liner plate. This is also documented in WCGS response to NRC Information Notice 97-10, Liner Plate Corrosion in Concrete Containments.

With the exception of pitting identified on the incore instrument tunnel sump, the degradation that has occurred in the containment liner at WCGS has been minor. All of the degradation was discovered during normal inspections performed in accordance with existing plant procedures.

In 2002, a general visual examination of the incore instrument tunnel sump was performed as part of the Inservice Inspection Program and it was noted that there were areas of apparent liner plate degradation as indicated by rust and degraded coatings. The coatings were removed, and a detailed visual examination was performed. An engineering evaluation was required to approve continued operation of this section of the liner plate in this condition.

In 2003, two additional recordable indications were noted during the inspections. A detailed visual inspection was performed, and in one case, the area was prepped and recoated and the second was dispositioned by engineering for use-as-is.

Conclusion

The continued implementation of the ASME Section XI, Subsection IWE 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 IWL

Program Description

The ASME Section XI, Subsection IWL containment inservice inspection program provides aging management of the concrete containment structure (including the tendon gallery ceiling), the concrete dome, and the post-tensioning system. For the inspection interval from 1998 to 2008, WCGS performs concrete inspections in accordance with the 1998 Edition of ASME Section XI (with no addenda), Subsection IWL, supplemented with the applicable requirements of 10 CFR 50.55a(b)(2)(xiii). Additional commitments define the visual examinations to be performed as part of the WCGS program and the qualification requirements for personnel performing the inspections. Acceptance criteria for components subject to IWL examination requirements are specified in Article IWL-3000. With enhancements, the WCGS IWL CISI program is consistent with the 2001 edition of ASME Section XI, Subsection IWL, including the 2002 and 2003 Addenda, for each of the elements addressed in NUREG 1801, Section XI.S2, ASME Section XI, Subsection IWL.

In conformance with 10 CFR 50.55a(g)(4)(ii), the WCGS CISI 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 twelve months before the start of the inspection interval.

NUREG-1801 Consistency

The ASME Section XI, Subsection IWL program is an existing program that, following enhancement, will be consistent with NUREG-1801, Section XI.S2, ASME Section XI, Subsection IWL.

Exceptions to NUREG-1801

None

Enhancements

Prior to the period of extended operation, the following enhancement will be implemented in the following program element:

Detection of Aging Effects - Element 4

The 2003 edition of ASME Section XI, Subsection IWL, Article IWL-2000, includes two provisions regarding inspection of repair/replacement activities that are not required by the 1998 edition. IWL-2410(d) specifies additional inspections for concrete surface areas affected by a repair/replacement activity, and IWL-2521.2 specifies additional inspections for tendons affected by a repair/replacement activity. In accordance with 10 CFR 50.55a, WCGS will revise their ASME Section XI, Subsection IWL containment inservice inspection program prior to the next inspection interval to incorporate the ASME Code edition and addenda incorporated into 10 CFR 50.55a at that time.

Operating Experience

The results of the twentieth year surveillance report of the post-tensioning system (2005), which includes the inspection of the unbonded post-tensioning system (Examination Category L-B), and the visual examination of the WCGS containment concrete surfaces (Examination Category L-A), showed no abnormal degradation of the Post Tensioning System.

The results of the 2000 Physical In-Service Tendon Inspection of the containment building post tensioning system, included both the concrete surfaces (Examination Category L-A) and the unbonded post-tensioning system (Examination Category L-B) and concluded that the containment structure has experienced no abnormal degradation of the post-tensioning system.

A review of WCGS operating experience has shown no cases of unacceptable degradation of the concrete containment building or the post-tensioning system.

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.

B2.1.29 ASME Section XI, Subsection IWF

Program Description

The WCGS ASME Section XI, Subsection IWF program provides aging management for Class 1, 2 and 3 component supports. There are no Class MC supports at WCGS. For the inspection interval from September 3, 2005 to September 3, 2015, WCGS performs inservice inspections of Class 1, 2, and 3 component supports in accordance with ASME Section XI, Subsection IWF 1998 edition through 2000 addenda. The WCGS IWF program is consistent with the 2001 edition of ASME Section XI, Subsection IWF, including the 2002 and 2003 Addenda, for the each of the elements addressed in NUREG 1801, Section XI.S3, ASME Section XI, Subsection IWF.

Class 1, 2 and 3 component supports are selected for examination per the requirements of ASME Section XI, subsection IWF. Scope of the inspection for supports is based on Class and total population as defined in Table IWF-2500-1. Discovery of deficiencies during regularly scheduled inspections require that the support be reexamined during the next inspection period. For supports requiring corrective measures, component supports immediately adjacent to the supports requiring corrective action, shall also be examined. The primary inspection method is visual examination.

In conformance with 10 CFR 50.55a(g)(4)(ii), the WCGS 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 twelve months before the start of the inspection interval.

NUREG-1801 Consistency

The ASME Section XI, Subsection IWF program is an existing program that is consistent with exception to NUREG-1801, Section XI.S3 ASME Section XI, Subsection IWF.

Exceptions to NUREG-1801

<u>Program Elements Affected</u>

Scope of Program – Element 1 and Parameters Monitored and Inspected – Element 3

WCGS uses the 1998 edition through the 2000 addenda of the ASME Section XI code instead of the 2001 edition with 2002 and 2003 addenda which is referenced in NUREG-1801, Section XI.S3.

Enhancements

None

Operating Experience

Review of the Owner Activity Reports for Interval 2 indicates there were 282 required examinations for ASME Class 1, 2 and 3 component supports in the interval (100% of the required examinations were completed). One replacement was noted. WCGS replaced a sway strut on an ASME Class 1 support for CVCS letdown piping. The sway strut had a bent paddle that appeared to have been damaged during refueling operations, not as a result of normal service or aging.

The ASME Section XI, Subsection IWF program at WCGS is updated to account for industry operating experience. ASME Section XI is also revised every three years and addenda issued in the interim, which allows the code to be updated to reflect operating experience.

The requirement to update the ASME Section XI, Subsection IWF program to reference more recent editions of ASME Section XI at the end of each inspection interval ensures the program reflects enhancements due to operating experience that have been incorporated into ASME Section XI.

Conclusion

The continued implementation of the ASME Section XI, Subsection IWF 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 10 CFR 50, Appendix J

Program Description

The 10 CFR Part 50, Appendix J program monitors leakage rates through the containment pressure boundary, including the penetrations and access openings, in order to detect degradation of containment pressure boundary. Seals, gaskets, and bolted connections are also monitored under the program.

The 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; Regulatory Guide 1.163, Revision 0, "Performance-Based Containment Leak-Testing 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 Technical Specifications. Corrective actions are taken if leakage rates exceed established administrative limits for individual penetrations or the overall containment pressure boundary.

Type A tests are conducted to measure the containment overall integrated leakage rate. Procedures require a general visual inspection of the accessible interior and exterior surfaces of the primary containment and components prior to each integrated leak rate test pressurization. In addition, visual examinations of containment, as described by Regulatory Guide 1.163, were performed during two other refueling outages between 10-year interval Type A tests.

Type B local leak rate tests are performed on containment pressure boundary access penetrations at frequencies that comply with the requirements of 10 CFR 50 Appendix J Option B. The Type B Test is a test intended to detect or measure leakage across pressure-retaining or leakage-limiting boundaries other than valves.

Type C local leak rate tests are performed on containment isolation valves at frequencies that comply with the requirements of 10 CFR 50 Appendix J, Option B.

NUREG-1801 Consistency

The 10 CFR 50, Appendix J program is an existing program that is consistent with NUREG-1801, Section XI.S4, 10 CFR 50, Appendix J.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

The most recent Type A test was conducted at WCGS in October 2000. The 95 percent confidence limit was 0.59 La. Type A tests performed in the third refueling outage (1988) and fifth refueling outage (1991) showed resultant leakages of 0.56 La and 0.35 La respectively. The Integrated Leakage Rate Test acceptance criterion is 1.0 La (as-found).

Type B and C tests are conducted at various intervals for the many different penetrations tested. The results of the individual Type B and Type C tests are combined and the total combined leakage is updated after each test. The Type B and C combined leakage rate acceptance criteria is 0.6 La (250,000 sccm). The combined Type B and Type C maximum path leakage rate is used during refueling periods and was 49,710 sccm as of November 2005. The combined Type B and Type C minimum path leakage rate is used when the plant is in Modes 1 through 4 was 21,641 sccm as of November 2005.

Type B and C test failures have been noted in the past due to debris, corrosion products and general degradation of valve seating surfaces. Most of these were corrected by replacing the seat, flushing the valve or lapping the valve seat. One gasket degradation has been noted. The gasket was installed in 1989, exhibited an increasing leakage trend since 1993 and was replaced in 1997. In addition, there was a failure of the T-ring seal on the purge supply damper. The T-Ring seal was originally installed in 1985, failure was identified in 1997 and the seal was replaced. In both of these cases, the Appendix J program identified the condition and initiated corrective actions.

Conclusion

The continued implementation of the 10 CFR 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.

B2.1.31 Masonry Wall Program

Program Description

The Masonry Wall Program is part of the WCGS Structures Monitoring Program that implements structures monitoring requirements as specified by 10 CFR 50.65. The Masonry Wall Program manages aging of masonry walls, and structural steel restraint systems of the masonry walls, within scope of license renewal based on guidance provided in IE 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.

NUREG-1801 Consistency

The Masonry Wall Program is an existing program that, following enhancement, will be consistent with NUREG-1801, Section XI.S.5, “Masonry Wall Program.”

Exceptions to NUREG-1801

None

Enhancements

Prior to the period of extended operation, the following enhancement will be implemented in the following program element:

Scope of Program – Element 1

Procedures will be enhanced to identify unreinforced masonry in the radwaste building within the scope of license renewal that requires aging management.

Operating Experience

The baseline Evaluation of Maintenance Rule Observations was completed in 1998. Aging effects were observed on masonry walls in the auxiliary building, communication corridor, control building, and turbine building. Cracking was the most frequently observed aging effect to masonry walls. Other types of deterioration that could lead to increased aging effects to masonry walls were support angles missing bolts, pop outs due to installation of steel components, and the presence of water.

Based upon the baseline Evaluation of Maintenance Rule Observations, completed in 1998, structures that have masonry walls within scope of license renewal that had aging effects classified as "Acceptable with Degradation" were in the control building and turbine building. Subsequent inspections took place between 2002 and 2003. The control building had observed cracks. The cracks were repaired with grout, but the joint was moving enough to re-crack the repair. The wall is located in an area not subject to weather or a threat to water exposure. The wall will continue to be monitored until a history is developed demonstrating that the wall is stable. The masonry will retain an "Acceptable with Degradation" status.

The turbine building was observed to have several masonry walls categorized as "Acceptable with Degradation." In most cases during the 5-year re-inspection, the conditions had stabilized from the baseline observation resulting in a downgraded category. The latest inspection reveals that the length and size of one crack continues to increase. Engineering evaluated this wall and determined that it will still perform its intended functions. WCGS will continue to monitor this condition.

Conclusion

The continued implementation of the Masonry Wall 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.

B2.1.32 Structures Monitoring Program

Program Description

The Structures Monitoring Program manages the cracking, loss of material, and change in material properties by monitoring the condition of structures and structural supports that are within the scope of license renewal. The Structures Monitoring Program implements the requirements of 10 CFR 50.65 and is consistent with the guidance of NUMARC 93-01, Revision 2 and Regulatory Guide 1.160, Revision 2, "Monitoring the Effectiveness of Maintenance at Nuclear Power Plants." The Structures Monitoring Program provides inspection guidelines and walkdown checklists for concrete elements, structural steel, masonry walls, treated wood, structural features (e.g., caulking, sealants, roofs, etc.), structural supports, and miscellaneous components such as doors.

The Structures Monitoring Program includes all masonry walls within the scope of license renewal. The Structures Monitoring Program also inspects supports for equipment, piping, conduit, cable tray, HVAC, and instrument components.

Though coatings may have been applied to the external surfaces of structural members, no credit was taken for these coatings in the determination of aging effects for the underlying materials. The Structures Monitoring Program evaluates the condition of the coatings as an indication of the condition of the underlying materials.

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 Program."

Exceptions to NUREG-1801

None

Enhancements

Prior to the period of extended operation, the following enhancement will be implemented in the following program element:

Parameters Monitored or Inspected - Element 3

Procedures will be enhanced to add inspection parameters for treated wood.

Operating Experience

The baseline walkdown inspection for the Structures Monitoring Program occurred in 1998. The results of this inspection were primarily categorized as Acceptable with Minor Degradation. All items found to have more severe aging effects were categorized as

Acceptable with Degradation and have been reexamined and evaluated for further action. There were no items identified that required a categorization of Major Degradation.

During the five year reinspection in 2002/2003, four items were identified to have increased degradation. Two of those items previously categorized as Acceptable with Degradation are not within the scope of license renewal. Two items that were previously categorized as Acceptable with Minor Degradation were noted to have increased degradation and reclassified to Acceptable with Degradation. One was corrosion on an essential service water hanger in the communications corridor, and the other was corrosion on a steel column in the turbine building. Corrective action has been initiated. Five new items categorized as Acceptable with Degradation were reported during the 2002/2003 inspection. None of these items required immediate action to maintain their intended functions and all will be monitored for future changes.

Conclusion

The continued implementation of the Structures Monitoring 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 RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants

Program Description

The Regulatory Guide 1.127, Inspection of Water Control Structures Associated with Nuclear Power Plants program manages aging due to extreme environmental conditions and the effects of natural phenomena that may affect water-control structures. WCGS is committed to Regulatory Guide 1.127, Revision 1. The program implements the requirements of 10 CFR 50.65, The Maintenance Rule program that incorporates the guidance of RG 1.160, Revision 2, “Monitoring the Effectiveness of Maintenance at Nuclear Power Plants,” and NUMARC 93-01, Revision 2.

This program includes inspection and surveillance activities for dams, slopes, canals, and other water-control structures associated with emergency cooling water systems or flood protection.

The aging management program includes:

- Periodic visual inspections of in-scope concrete structures using techniques identified in industry standards and codes such as ACI 201.1R.
- Periodic monitoring of the hydraulic and structural condition of the Ultimate Heat Sink as prescribed in USAR section 2.5.6.8.4, as well as associated structures, main dam service spillway, and auxiliary spillway.
- Periodic dredging of the UHS Reservoir (every fifteen years) and channel connecting the reservoir to the ESW Pumphouse (every five years).
- Survey of the UHS dam for vertical movement every five years and a complete profile when warranted by unusual events.

NUREG-1801 Consistency

The Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants program is an existing program that, following enhancement, will be consistent with NUREG-1801, Section XI.S7, “Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants.”

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 – Element 1

Procedures will be enhanced so that the main dam service spillway and the auxiliary spillway will be inspected in accordance with the same specification that governs the other water-control structures that are in scope for license renewal.

Parameters Monitored or Inspected – Element 3

Procedures will be enhanced to clarify the scope of inspections for the main dam service and auxiliary spillways, and to add cavitation to the list of concrete aging effects for surfaces other than spillways.

Detection of Aging Effects – Element 4

Procedures will be enhanced to add the 5 year frequency for inspecting the main dam service spillway.

Operating Experience

The latest inspection report for the ultimate heat sink and associated safety-related structures was performed in 2002 and concluded that there were no signs of unacceptable conditions or deterioration of the safety-related water control structures.

An elevation survey of the settlement monuments on the ultimate heat sink dam revealed no abnormal changes, trends or unsafe movements of the dam structure. The estimated sedimentation volume is within the acceptable volume. The sediment in the channel is minimal due to the recent dredging.

The inspection of the main dam, service and auxiliary spillways was performed in 2004 and found the concrete surfaces at the service spillway and discharge chute in generally good condition. Previous repairs are performing satisfactorily. No trees or deep-rooted vegetation were observed growing adjacent to the chute. The concrete surfaces at the auxiliary spillway are generally in good condition. The approach area leading up to the spillway and discharge channel were clear of obstructions.

Conclusion

The continued implementation of the Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants 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 Nickel Alloy Aging Management Program

Program Description

The plant specific Nickel Alloy Aging Management Program manages cracking due to primary water stress corrosion cracking in all plant locations that contain Alloy 600, with the exception of steam generator tubing (aging management of steam generator tubing is performed by the Steam Generator Tubing Integrity aging management program (B2.1.8)). This includes reactor coolant system (RCS) pressure boundary, RCS non-pressure boundary, and ESF locations. Aging management requirements for nickel alloy penetration nozzles welded to the upper reactor vessel closure head noted in the Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactors program (B2.1.5) are included here for review convenience. The term Alloy 600 is used throughout this program to represent Nickel Alloy 600 material and Nickel Alloy 82/182 weld metal. Non-Alloy 600 nickel components (e.g., steam generator bowl drain welds made of Alloy 52/152) are not included in this program but are subject to the ASME Section XI Inservice Inspection program (B2.1.1) requirements.

The Nickel Alloy Aging Management Program uses inspections, mitigation techniques, repair/replace activities and monitoring of operating experience to manage the aging of Alloy 600 at WCGS. Detection of indications is accomplished through a variety of examinations consistent with NRC Order EA-03-009, ASME Section XI Subsections IWB and IWC, EPRI Report 1010087 (MRP-139) issued under NEI 03-08 protocol, and NRC Bulletin 2004-01. Mitigation techniques are implemented when appropriate to preemptively remove conditions that contribute to primary water stress corrosion cracking (PWSCC). Repair/replacement activities are performed to proactively remove or overlay Alloy 600 material, or as a corrective measure in response to an unacceptable flaw in the material. Mitigation and repair/replace activities are consistent with those detailed in MRP-139. Operating experience was reviewed to determine the risk rankings of each Alloy 600 location. Operating experience is continually monitored to provide improvements and modifications to the Nickel Alloy Aging Management Program as needed.

Aging Management Program Elements

The results of an evaluation of each element against the 10 elements described in Appendix A of the SRP-LR, NUREG-1800, are provided below.

Scope of Program – Element 1

With the exception of steam generator tubing, which is managed by the Steam Generator Tubing Integrity program (B2.1.8), all Alloy 600 locations in plant systems are included in the scope of this program. This includes reactor coolant system (RCS) pressure boundary, RCS non-pressure boundary, and ESF locations.

Preventive Actions – Element 2

The Nickel Alloy Aging Management Program has many potential mitigation strategies that remove one or more of the three conditions that control primary water stress corrosion cracking (susceptible material, tensile stress field, supporting environment). Mitigation activities that have been successfully performed for at least one US PWR plant include weld overlays, replacement of Alloy 600 (as a pre-planned activity), and mechanical stress improvement process (MSIP). Full structural weld overlays may be used either as a mitigation strategy or as a repair method. This method provides structural reinforcement at the (potentially) flawed location, such that adequate load-carrying capability is provided by the overlay. MSIP is a mechanical process that places the component surface in contact with the primary water in a compressive state, thereby removing the tensile stresses needed for initiation of PWSCC.

The considerations used by the Nickel Alloy Aging Management Program in selecting a mitigation strategy, include availability of method, industry experience, plant location, risk evaluation, and pre-implementation activities.

The program lists the recommended mitigation strategies for all of the Alloy 600 components. Mitigation strategies for several components are still to be determined. Specific mitigation strategies will be determined by plant-specific and industry operating experience. The Water Chemistry program (B2.1.2) provides preventive actions for monitoring and control of the supporting environment for PWSCC.

Parameters Monitored/Inspected – Element 3

The Nickel Alloy Aging Management Program utilizes various inspection and examination techniques for early detection of PWSCC in Alloy 600 components. Visual exams are used to detect evidence of leakage from pressure retaining components due to cracking and/or discontinuities and imperfections on the surface of the component. Surface examinations indicate the presence of surface discontinuities. Volumetric examination indicates the presence of cracking/discontinuities throughout the volume of material.

Detection of Aging Effects – Element 4

The Nickel Alloy Aging Management Program utilizes various visual, surface and volumetric inspection and examination techniques for early detection of PWSCC in Alloy 600 components. Three types of visual exams are used: 1) VT-2 Exams which are conducted to detect evidence of leakage from pressure retaining components, 2) Bare Metal Visual Exams which are similar to VT-2 exams but require removal of insulation to allow direct access to the metal surface, and 3) Visual Exams which are conducted to assess the general condition of non-pressure boundary components. Surface Exams are used to indicate the presence of surface discontinuities and are conducted by liquid penetrant or eddy current methods. Volumetric Exams indicate the presence of discontinuities throughout the volume of material and are conducted by radiographic, ultrasonic, or eddy current methods, or a combination.

Monitoring and Trending – Element 5

Relative risk rankings for Alloy 600 locations are included as part of the Nickel Alloy Aging Management Program. The rankings were provided in a study conducted by Westinghouse for WCGS and reflect conclusions based on WCGS data. As additional information from the industry and WCGS is collected and analyzed, the risk rankings may be modified.

The Nickel Alloy Aging Management Program provides the requirements for examination frequencies. The examination frequencies are required by regulation, industry guidelines, and WCGS good practices.

Acceptance Criteria – Element 6

Acceptance criteria are specified in implementing procedures. The implementing procedure or work order will specify examination requirements and acceptance criteria in accordance with the applicable regulatory (NRC Order EA-03-009 or ASME Section XI) or industry guideline. For components included in MRP-139, it requires that all indications found during inspections must be evaluated per ASME Section XI requirements and indications that do not satisfy IWB-3500 acceptance criteria must be dispositioned by analysis (such as IWB-3600), repaired or replaced.

Corrective Actions – Element 7

Relevant indications failing to meet applicable acceptance criteria are repaired or evaluated in accordance with plant corrective action processes.

Corrective actions may be used as tracking and documentation records for changes in plant thought processes and to identify potential improvements in programs from benchmarking activities.

WCGS site QA procedures, review and approval processes, and administrative controls are implemented in accordance with the requirements of 10CFR50, Appendix B that are acceptable in addressing corrective actions.

Confirmation Process – Element 8

WCGS site QA procedures, review and approval processes, and administrative controls are implemented in accordance with the requirements of 10CFR50, Appendix B that are acceptable in addressing the confirmation process.

Administrative Controls – Element 9

WCGS site QA procedures, review and approval processes, and administrative controls are implemented in accordance with the requirements of 10CFR50, Appendix B that are acceptable in addressing administrative controls.

Operating Experience — Element 10

A summary of the Alloy 600 locations and whether or not they have experienced in-service cracking throughout the industry is provided in the Nickel Alloy Aging Management Program. Risk rankings were provided in a study conducted by Westinghouse for WCGS and reflect conclusions based on WCGS data. As additional information from the industry and WCGS (including implemented mitigation activities) is collected and analyzed, the risk rankings may be modified.

WCGS has not experienced any Alloy 600 indications or cracking with the exception of the steam generator bowl drains. During the refueling in 2005, through-wall cracking in the Alloy 82/182 weld metal of the steam generator bowl drains was found. The weld metal was removed and replaced with Alloy 52 weld metal. This mitigation was performed on all four steam generators, even though cracking was found on only two of the steam generators.

Enhancements

None

Conclusion

The continued implementation of the Nickel Alloy Aging Management 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.

B2.1.35 Reactor Coolant System Supplement

Section 3.1 of NUREG-1800, “Standard Review Plan for the Review of License Renewal Applications for Nuclear Power Plants,” supplements the aging management programs for the reactor coolant system components with the following additional requirements.

WCNOC will:

A. Reactor Coolant System Nickel Alloy Pressure Boundary Components

Implement applicable (1) NRC Orders, Bulletins and Generic Letters associated with nickel alloys and (2) staff-accepted industry guidelines, and

B. Rector Vessel Internals

(1) Participate in the industry programs for investigating and managing aging effects on reactor internals; (2) evaluate and implement the results of the industry programs as applicable to the reactor internals; and (3) upon completion of these programs, but not less than 24 months before entering the period of extended operation, WCNOC will submit an inspection plan for reactor internals to the NRC for review and approval.

B2.1.36 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 EQ Requirements program manages the aging effects of loosening of bolted connections due to thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion, and 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 WCGS predictive maintenance program, infrared thermography testing is being performed on a representative sample of Non-EQ electrical cable connections, associated with active or passive components within the scope of license renewal. The infrared thermography testing is being performed to identify loosening of bolted connections due to thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion, and oxidation. The selected sample is based upon application (medium and low voltage), circuit loading (energized, non-energized during normal plant operations), and environment (plant indoor air). The testing of a sample of Non-EQ electrical cable connectors is representative, with reasonable assurance, of Non-EQ electrical cable connections within similar applications, circuit loading conditions, and environments. The infrared thermography testing is being performed on a 6 month monitoring interval which meets the requirement of at least once every ten years. The sample of Non-EQ electrical cable connections within the scope of license renewal are tested to identify loosening of bolted connections.

The acceptance criteria for thermography testing are 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. Corrective actions for conditions that are adverse to quality are performed in accordance with the corrective action program as part of the QA program. The corrective action process provides reasonable assurance that deficiencies adverse to quality are either promptly corrected or are evaluated to be acceptable.

NUREG-1801 Consistency

The Electrical Cable 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.E6, "Electrical Cable 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 enhancement will be implemented in the following program element:

Corrective Actions - Element 7

The current infrared thermography testing will be enhanced to include performing an engineering evaluation when the acceptance criteria are not met. This engineering evaluation will include identifying the extent of condition to determine if the situation is applicable to other in-scope Non-EQ electrical cable connections that are not part of the testing sample, the potential root cause for not meeting the test acceptance criteria, and the likelihood of recurrence.

Operating Experience

WCGS has routinely performed infrared thermography since 1989 on 189 electrical components. A review of the plant operating experience identified a small number of scans where electrical connections showed thermal anomaly. The connections associated with these thermal anomalies were cleaned and re-tighten. No loss of component intended function has occurred.

Conclusion

The continued implementation of the Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program provides reasonable assurance that adverse localized environments are identified and 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 METAL FATIGUE OF REACTOR COOLANT PRESSURE BOUNDARY

Program Description

In accordance with WCGS Technical Specifications, the present fatigue aging management program uses cycle counting and usage factor tracking to ensure that actual plant experience remains bounded by design assumptions and calculations reflected in the USAR. It was customized, verified, and validated under a 10 CFR 50 Appendix B quality assurance program for plant-specific implementation at WCGS.

The WCGS Metal Fatigue of Reactor Coolant Pressure Boundary program manages cumulative fatigue damage in metal components of the reactor coolant pressure boundary and analyzed Class 2 portions of the steam generators. The program software counts operating transient cycles and applies analytical methods to determine stress cycles and contributions of them to fatigue usage factors; and tracks the resulting fatigue cumulative usage factors (CUFs). The software maintains a record of CUFs at bounding locations in Class 1 piping and vessels and in the parts of the Class 2 steam generators that have a Class 1 analysis.

The scope of the Metal Fatigue of Reactor Coolant Pressure Boundary program includes the NUREG/CR-6260 monitoring locations applicable to WCGS (with one exception, for which the original fatigue analysis plus effects of the reactor coolant environment have been validated for the period of extended operation).

The program will include action limits applicable to the NUREG/CR-6260 locations, including allowances for environmental effects of the reactor coolant as determined by NUREG/CR-6583 and NUREG/CR-5704 or appropriate alternative methods; and will include action limits to ensure that the bases of the leak-before-break (LBB) analysis and of the high energy line break (HELB) locations remain valid, or that appropriate corrective measures are taken..

NUREG-1801 Consistency

The Metal Fatigue of Reactor Coolant Pressure Boundary program is an existing program that, following enhancement, will be consistent with NUREG 1801, Section X.M1, "Metal Fatigue of Reactor Coolant Pressure Boundary."

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, and Corrective Actions – Element 7

Action levels of the Metal Fatigue of Reactor Coolant Pressure Boundary program will be enhanced to ensure that if the fatigue usage factor calculated by the code analysis is reached at any monitored location, appropriate evaluations and actions will be invoked to maintain the analytical basis of the leak-before-break (LBB) analysis and of the high-energy line break (HELB) locations, or to revise them as required.

Action levels of the Metal Fatigue of Reactor Coolant Pressure Boundary program will be enhanced to ensure that appropriate evaluations and actions will be invoked to maintain the bases of safety determinations that depend upon fatigue analyses, if the fatigue usage factor at any of the monitored NUREG/CR-6260 locations approaches 1.0 when multiplied by the environmental effect factor F_{EN}.

Action levels of the Metal Fatigue of Reactor Coolant Pressure Boundary program will be enhanced to ensure that appropriate evaluations and actions will be invoked to maintain the bases of safety determinations that depend upon fatigue analyses, if the fatigue usage factor at any monitored location approaches 1.0.

Corrective actions of Metal Fatigue of Reactor Coolant Pressure Boundary program will be enhanced to ensure that on approach to an action limit, an evaluation will determine whether the scope of the monitoring program must be enlarged to include additional affected reactor coolant pressure boundary locations; to ensure that other locations do not approach the code limit without an appropriate action and that the bases of the LBB and HELB analyses are maintained.

Confirmation Process – Element 8

The WCGS Metal Fatigue of Reactor Coolant Pressure Boundary program will be enhanced to invoke Appendix B procedural and record requirements.

Operating Experience

The methods of the existing fatigue monitoring program were developed by EPRI, for the industry, in response to NRC concerns that early-life operating cycles at some units had caused fatigue usage factors to accumulate faster than anticipated in the design analyses. This fatigue monitoring program was therefore designed to ensure that the code limit will not be exceeded in the remainder of the licensed life. The operating experience program reviews industry experience, including experience that may affect fatigue monitoring to ensure that applicable experience is evaluated and incorporated in plant analyses and procedures. Any necessary evaluations are conducted under the plant corrective action program.

The program has remained responsive to emerging issues and concerns, particularly:

Pressurizer surge and spray nozzle, hot leg surge nozzle, and surge line transients: This concern prompted operation with continuous spray during startup and shutdown transients, and inclusion of these locations in the fatigue monitoring program.

Axisymmetric thermal shock and thermal striping in the steam generator feedwater nozzles: Evaluation of low-flow transients in the feedwater nozzles raised concerns for thermal-instability-driven transients under these conditions, with possible thermal shock, thermal stratification bending, and skin-effect thermal striping. WCGS installed additional monitoring points to permit the fatigue monitoring system to collect data during operation; and developed unique correlations (“transfer functions”) to calculate these effects.

Reduction and equalization of fatigue usage factor accumulation rate in charging nozzles: Westinghouse and WCGS found that operating practices were cycling flow through the active primary loop charging nozzle more often than necessary and were also failing to use the two nozzles equally, resulting in accumulation of fatigue usage at a higher rate than indicated by the code analysis. Operations modified procedures and practices to reduce cycling and to equalize cycling between the two charging nozzles. The fatigue monitoring program evaluated the nozzle CUF to date, and fatigue in these nozzles is now tracked by the program.

Results of fatigue monitoring to date indicate that the number of design transient events assumed by the original design analysis will be sufficient for a 60-year operating period, and that the design basis fatigue cumulative usage factor limit of 1.0 will not be exceeded at the monitored locations for a 60-year licensed operating period.

Conclusion

The continued implementation of the Metal Fatigue of Reactor Coolant Pressure Boundary 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.

B3.2 ENVIRONMENTAL QUALIFICATION (EQ) OF ELECTRICAL COMPONENTS

Program Description

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. Aging evaluations for EQ components that specify a qualification of at least 40 years are considered time-limited aging analyses (TLAAs). The Environmental Qualification (EQ) of Electrical Components program is consistent with the requirements of 10 CFR 50.49, and the guidance of NUREG-0588, “Interim Staff Position on Environmental Qualification of Safety-Related Electrical Equipment” and Regulatory Guide 1.89, “Environmental Qualification of Certain Electric Equipment Important to Safety for Nuclear Power Plants”, Revision 1 for maintaining qualification of equipment.

Qualified components and their service requirements and environments are identified in controlled documents containing a master list of affected equipment, a replacement and maintenance information, and local environment descriptions.

Analytical Methods:

Reanalysis may refine previously-conservative methods or conservative environmental condition assumptions; may invoke local environmental data collected for that purpose; and may change underlying assumptions, acceptance criteria, and corrective actions (if acceptance criteria are not met). Thermal effects are estimated by Arrhenius methods. Normal operating radiation and cyclic effects are assumed linear with time unless adjustments are possible or necessary because of operating, configuration, shielding, power, or measured dose changes.

Data Collection and Reduction Methods:

The EQ Program does not maintain condition or performance monitoring programs for purposes of confirming qualified life. Reanalysis may, however, invoke local environmental data collected for that purpose, and the EQ Program employs surveillance or maintenance activities when required by the qualification evaluation for an individual component. Any changes to material activation energy values as part of a reanalysis will be justified.

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. The reanalysis of an aging evaluation is documented according to the station's quality assurance program, which requires the verification of assumptions and conclusions.

Acceptance Criteria and Corrective Actions:

If the qualification cannot be extended by reanalysis, the component will be refurbished, replaced, or requalified to maintain qualification for the period of extended operation. A reanalysis is to be performed in a timely manner (that is, sufficient time is available to refurbish, replace, or requalify the component if reanalysis is unsuccessful).

NUREG-1801 Consistency

The Environmental Qualification (EQ) of Electrical Components program is an existing program that, following enhancement, will be consistent with NUREG-1801, Section X.E1, "Environmental Qualification (EQ) of Electrical Components."

Exceptions to NUREG-1801

None

Enhancements

Prior to the period of extended operation, the following enhancements will be implemented in the following program elements:

Acceptance Criteria – Element 6

The program documents will be enhanced to describe methods that may be used for qualified life evaluations for the period of extended operation.

Operating Experience

The Environmental Qualification (EQ) of Electrical Components program is consistent with the guidance of 10 CFR 50.49, NUREG-0599, and Regulatory Guide 1.89, and includes consideration of operating experience for determining qualification bases and conclusions, including qualified life.

Operating experiences, system, equipment or component related information, as reported through NRC Bulletins, Information Notices, Generic Letters and Part 21 Notifications are evaluated for applicability. When an emerging industry aging issue is identified that affects the qualification of an EQ component, the affected component is evaluated and appropriate corrective actions are taken. Any change to the qualification evaluations are documented in the affected EQ work packages, and any applicable corrective actions are identified. Issues addressing equipment aging are reconciled in sections that specifically document thermal, radiation and cyclic qualified lives.

Conclusion

The continued implementation of the Environmental Qualification (EQ) of Electrical Components program provides reasonable assurance that aging 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, within the WCGS Creek ASME Section XI Subsection IWL Program, manages the loss of tendon prestress in the post-tensioning system.

The WCGS post-tensioning system consists of inverted-U-shaped tendons, extending up through the basemat, through the full height of the cylindrical walls and over the dome; and horizontal circumferential (hoop) tendons, at intervals from the basemat to about the 45-degree elevation of the dome. The basemat is conventionally reinforced. The tendons are ungrouted, in grease-filled glands.

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 enhancement will be implemented in the following program element:

Scope of Program - Element 1

Procedures which list surveillance tendons will be extended to include random samples for the 40, 45, 50, and 55 year surveillances

Monitoring and Trending - Element 5 and Acceptance Criteria – Element 6

Procedures will be enhanced to explicitly require a regression analysis for each tendon group after every surveillance; and to invoke and describe regression analysis methods used to construct the lift-off trend lines, including the use of individual tendon data in accordance with Information Notice (IN) 99 10, "Degradation of Prestressing Tendon Systems in Prestressed Concrete Containments."

Monitoring and Trending - Element 5

Surveillance program predicted force lines for the vertical and hoop tendon groups will be extended to 60 years.

Corrective Actions – Element 7

Procedure descriptions of acceptance criteria action levels will be revised to conform to the ASME Code, Subsection IWL 3221 descriptions.

Operating Experience

Tendon inspections have shown no evidence of significant corrosion or other effects that might damage wires, no wire breakage (after initial installation), and no accelerated loss of prestress due to high temperatures.

The most recent 20 year surveillance results of the Concrete Containment Tendon Prestress program include an examination and regression analysis of all tendon prestress surveillance data through the most recent inspection, consistent with IN 99-10 Attachment 3 (i.e., using individual-tendon data rather than averages), and which therefore incorporates the entire history of tendon prestress surveillance at this unit.

The report found that loss of prestress in all tested tendons was less than that originally predicted. The regression analysis was extended to 60 years, and demonstrated that prestress in both the vertical and horizontal ("hoop") tendon groups should remain above the applicable minimum required values for at least 60 years of operation; and that all tendons should therefore maintain their design basis function for the extended licensed operating period 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. The material condition of other components (concrete, bearing surfaces, grease, buttonheads, etc.) showed only minor degradation in a few areas, none indicating a need for significant corrective action.

Conclusion

The continued implementation of the Concrete Containment Tendon Prestress program provides reasonable assurance that loss of prestress 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)

APPENDIX E

ENVIRONMENTAL INFORMATION

(PROVIDED UNDER SEPARATE COVER)