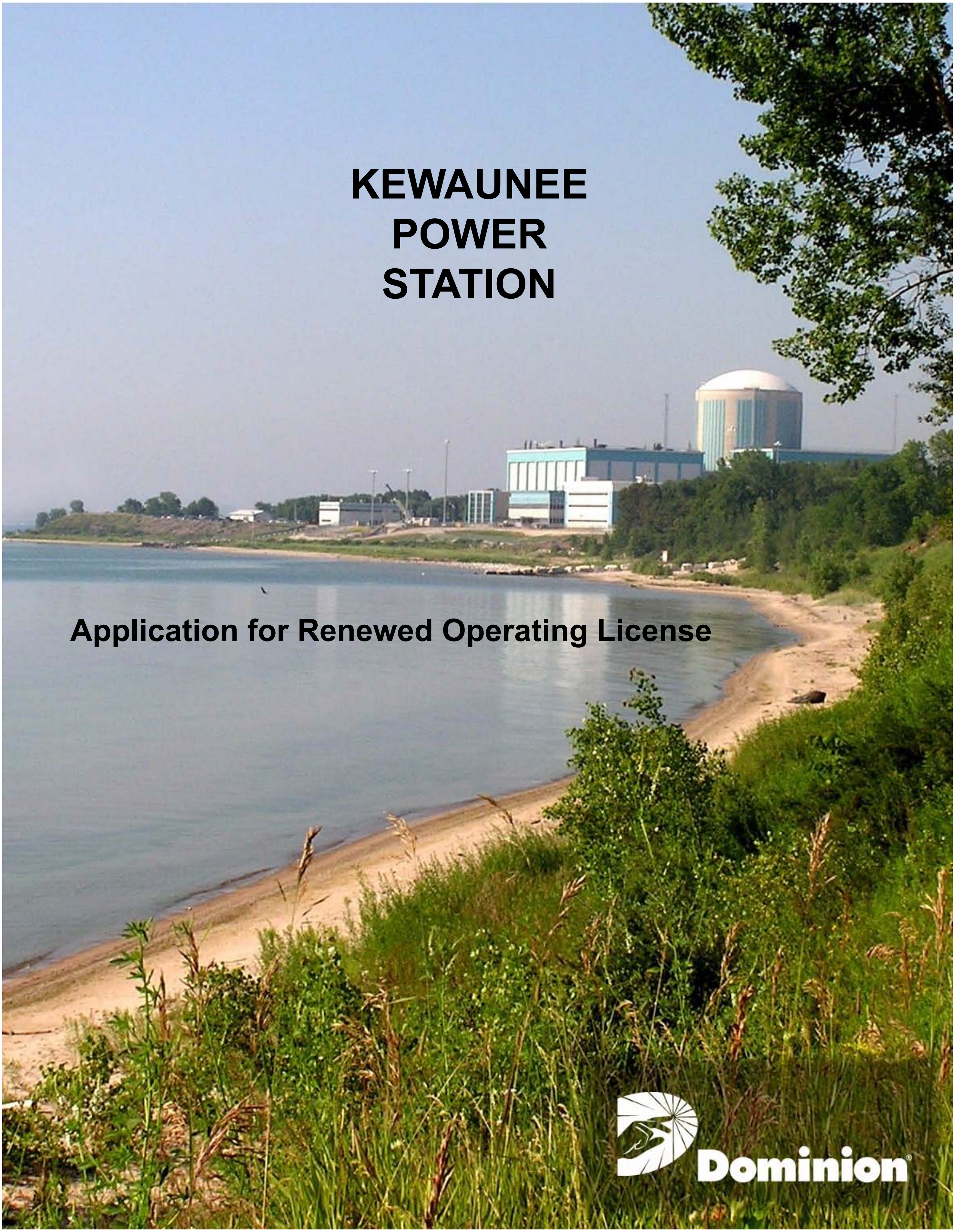
KEWAUNEE POWER STATION



Application for Renewed Operating License

Dominion

TABLE OF CONTENTS

Contents

Contents

Contents

Contents

Contents

Contents

TECHNICAL AND ADMINISTRATIVE INFORMATION
Tables

TECHNICAL AND ADMINISTRATIVE INFORMATION
Tables

TECHNICAL AND ADMINISTRATIVE INFORMATION
Tables

TECHNICAL AND ADMINISTRATIVE INFORMATION
Tables

TECHNICAL AND ADMINISTRATIVE INFORMATION
Tables

TECHNICAL AND ADMINISTRATIVE INFORMATION
Tables

TECHNICAL AND ADMINISTRATIVE INFORMATION
Figures

1.0 ADMINISTRATIVE INFORMATION

Dominion Energy Kewaunee, Inc. (hereinafter known as DEK) is filing this License Renewal Application for Kewaunee Power Station.

Pursuant to Parts 51 and 54 of Title 10 of the Code of Federal Regulations (10 CFR 51 (Reference 1.6-1) and 10 CFR 54 (Reference 1.6-2), respectively), this application seeks renewal for an additional 20-year term of the facility operating license for Kewaunee Power Station. The facility operating license (DPR-43) expires at midnight December 21, 2013. The application applies to renewal of the source, special nuclear material, and by-product licenses that are combined in the facility operating license.

The application is based on guidance provided by the U.S. Nuclear Regulatory Commission in NUREG-1800, *Standard Review Plan for the Review of License Renewal Applications for Nuclear Power Plants* (Reference 1.6-3), NUREG-1801, *Generic Aging Lessons Learned (GALL) Report* (Reference 1.6-4), and Regulatory Guide 1.188, *Standard Format and Content for Applications to Renew Nuclear Power Plant Operating Licenses* (Reference 1.6-5). The application is also based on guidance provided by NEI 95-10, *Industry Guideline for Implementing the Requirements of 10 CFR 54 - The License Renewal Rule* (Reference 1.6-6).

The License Renewal Application is contained on a CD-ROM. For the reviewer's convenience, the CD-ROM also contains copies of the Updated Safety Analysis Report and the license renewal drawings prepared in support of the license renewal effort. Hyperlinks to those documents are provided in the application where appropriate.

The USAR, LR drawings, and other references cited within the application are for information only, and are not incorporated by reference into the LRA.

This section of the application provides the following information:

1. Information on the organization of the application (Section 1.1),
2. A general plant description (Section 1.2),
3. Information required by regulations (Section 1.3),
4. Summary of abbreviations (Section 1.4), and
5. A distribution list for written communications related to the application (Section 1.5).

1.1 APPLICATION FORMAT AND CONTENT

The following discussion describes the content of the Kewaunee License Renewal Application. In general, the overall outline of the License Renewal Application is constructed as described in NEI 95-10, using the Standard License Renewal Application format.

Section 1.0, Administrative Information, provides the administrative information required by 10 CFR 54.17 and 10 CFR 54.19. The section has been expanded to provide (1) information on the format and content of the application, (2) a general plant description, (3) the required applicant information, (4) a summary of abbreviations used in the application, and (5) a distribution list for written communications related to the application.

Section 2.0, Scoping and Screening Methodology for Identifying Structures and Components Subject to Aging Management Review and Implementation Results, describes and justifies the methods used to determine the systems and structures within the scope of license renewal and the structural members, commodity groups, and components subject to aging management review. The results of the system and structure scoping are provided in Section 2.2. Section 2 also provides descriptions of in-scope systems and structures and their intended functions with tables identifying components, structural members, and commodity groups requiring aging management review and their associated intended functions. References are provided to the results of the aging management review in Section 3. The descriptions in Section 2 identify applicable license renewal drawings.

Section 3.0, Aging Management Review Results, describes the results of aging management reviews of mechanical, electrical and structural components requiring aging management review. Section 3 is divided into sections that address (1) the Reactor Coolant System, (2) Engineered Safety Features Systems, (3) Auxiliary Systems, (4) Steam and Power Conversion Systems, (5) Containment, Structures, and Component Supports, and (6) Electrical and Instrumentation and Controls. The tables in Section 3 provide a summary of information concerning aging effects requiring management and applicable aging management programs for the components, structural members, and commodity groups subject to aging management review. The information presented in the tables is based on the format and content of NUREG-1800. The tables include comparisons with the evaluations documented in NUREG-1801, *Generic Aging Lessons Learned (GALL) Report*.

Section 4.0, Time-Limited Aging Analyses, includes a list of time-limited aging analyses, as defined by 10 CFR 54.3. It includes the identification of the component or subject, and an explanation of the time dependent aspects of the calculation or analysis. Section 4 also identifies an exemption granted pursuant to 10 CFR 50.12, that is in effect and based on time-limited aging analyses as defined in 10 CFR 54.3, that is required during the period of extended operation. The information in Section 4 fulfills the requirements in 10 CFR 54.21(c).

Appendix A, USAR Supplement, contains a summary description of the programs for managing the effects of aging for the period of extended operation. A summary description of the evaluation of time-limited aging analyses for the period of extended operation is also included. The license renewal commitments are identified in Table A6.0-1, License Renewal Commitments. The information in Appendix A fulfills the requirements in 10 CFR 54.21(d).

Appendix B, Aging Management Programs, describes the aging management programs used for managing the aging effects on systems, structures, and components within the scope of license renewal and demonstrates that the aging effects will be managed such that the systems, structures, and components will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation. Where the Kewaunee programs are consistent with corresponding programs in NUREG-1801, the appropriate NUREG-1801 program is referenced. The information in Section 2, Section 3, and Appendix B fulfills the requirements of 10 CFR 54.21(a).

Appendix C, is an optional appendix and has not been used during the development of the Kewaunee License Renewal Application.

Appendix D, Technical Specification Changes, concludes that no technical specification changes are necessary to manage the effects of aging during the period of extended operation. The information in Appendix D fulfills the requirements in 10 CFR 54.22.

Appendix E, Environmental Report, contains an environmental report analyzing the potential environmental impacts of license renewal, as provided for in NRC regulations 10 CFR 51.53(c) and 10 CFR 54.23.

1.2 PLANT DESCRIPTION

Kewaunee Power Station is located on an approximately 908-acre site in the Town of Carlton in the southeast corner of Kewaunee County, Wisconsin, on the west shore of Lake Michigan. Kewaunee is a two steam generator, two-coolant-loop, pressurized water reactor nuclear steam supply system supplied by Westinghouse Electric Corporation. Westinghouse also furnished the turbine generator. Pioneer Service and Engineering Company was engaged as architect-engineer, and in this capacity performed plant construction and the design of balance-of-plant systems.

The reactor unit was initially operated at a licensed power output of 1650 MWt, with a gross electrical output of approximately 560 MWe.

The unit core power output has been uprated twice since initial operation. In 2003, the unit was uprated to a core power output of 1673 MWt. In 2004, using available design margin, a 6 percent stretch power uprate was performed that increased the licensed rated power to 1772 MWt. The gross electrical output of the unit following the 2004 uprate is approximately 590 MWe.

1.3 INFORMATION REQUIRED BY 10 CFR 54.17 AND 10 CFR 54.19

1.3.1 NAME OF APPLICANT

DEK, which is the operator and sole owner of Kewaunee Power Station, is the applicant.

1.3.2 ADDRESS OF APPLICANT

Dominion Energy Kewaunee, Inc.
N490 Highway 42
Kewaunee, WI 54216

1.3.3 DESCRIPTION OF BUSINESS OR OCCUPATION OF APPLICANT

DEK was incorporated in 2003 to own and operate Kewaunee Power Station. DEK is an Exempt Wholesale Generator that sells electricity at wholesale to rural electric cooperatives, power marketers, municipalities, and other utilities.

DEK is an indirect, wholly owned subsidiary of Dominion Resources, Inc. Dominion Resources, Inc. is an integrated supplier of energy and energy services.

1.3.4 ORGANIZATION AND MANAGEMENT OF APPLICANT

DEK is not owned, controlled or dominated by an alien, a foreign corporation, or a foreign government. All officers and directors are citizens of the United States of America. The names and addresses of the directors and principal officers are provided below:

DEK - Directors

Name	Address
Mark F. McGettrick	120 Tredegar Street - RS-3 Richmond, VA 23219

DEK - Principal Officers

Name	Address
Mark F. McGettrick Chief Executive Officer	120 Tredegar Street - RS-3 Richmond, VA 23219
David A. Christian President and Chief Nuclear Officer	Innsbrook Technical Center - 2SW 5000 Dominion Boulevard Glen Allen, VA 23060
G. Scott Hetzer Senior Vice President and Treasurer	120 Tredegar Street - PH-3 Richmond, VA 23219
James K. Martin Senior Vice President - Business Development & Generation Construction	Innsbrook Technical Center - 3N 5000 Dominion Boulevard Glen Allen, VA 23060
William R. Matthews Senior Vice President - Nuclear Operations	Innsbrook Technical Center - 2SE 5000 Dominion Boulevard Glen Allen, VA 23060
Fred G. Wood, III Senior Vice President - Financial Management - Generation	120 Tredegar Street - RS-3 Richmond, VA 23219

Gerald T. Bischof Vice President - Nuclear Engineering	Innsbrook Technical Center - 2SE 5000 Dominion Boulevard Glen Allen, VA 23060
James P. Carney Vice President and Assistant Treasurer	120 Tredegar Street - PH-2 Richmond, VA 23219
Pamela F. Faggert Vice President - Chief Environmental Officer	Innsbrook Technical Center - 2NW 5000 Dominion Boulevard Glen Allen, VA 23060
Leslie N. Hartz Vice President - Nuclear Support Services	Innsbrook Technical Center - 2SE 5000 Dominion Boulevard Glen Allen, VA 23060
Carter M. Reid Vice President and Secretary	120 Tredegar Street - PH-2 Richmond, VA 23219
Stephen E. Scace Site Vice President - Kewaunee	N490 Highway 42 Kewaunee, WI 54216
Lee D. Katz Controller	120 Tredegar Street - RS-3 Richmond, VA 23219
Earl J. Marks, III Assistant Secretary	120 Tredegar Street - PH-2 Richmond, VA 23219
Jerry G. Overman Assistant Treasurer	120 Tredegar Street - PH-3 Richmond, VA 23219

1.3.5 CLASS OF LICENSE, USE OF FACILITY, AND PERIOD OF TIME FOR WHICH THE LICENSE IS SOUGHT

DEK requests renewal of the operating license for a period of 20 years beyond the expiration date of the current operating license as shown below:

Unit	License No.	License Class	Expiration Date
1	DPR-43	104b	December 21, 2013

DEK also requests renewal of the source, special nuclear material, and by-product licenses that are included within the operating license and that were issued pursuant to 10 CFR Parts 30, 40, and 70.

1.3.6 EARLIEST AND LATEST DATES FOR ALTERATIONS, IF PROPOSED

DEK does not propose to alter the unit in connection with this application. The current licensing basis will be continued and maintained throughout the period of extended operation.

1.3.7 LISTING OF REGULATORY AGENCIES HAVING JURISDICTION AND NEWS PUBLICATIONS

The Federal Energy Regulatory Commission is the principal regulator of DEK's electric operations in Wisconsin.

Kimberly D. Bose
Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, DC 20426

Matthew J. Frank, Secretary
Wisconsin Department of Natural Resources
101 S. Webster Street
P.O. Box 7921
Madison, WI 53707-7921

The area news publications and their associated addresses are provided below:

Green Bay Press-Gazette
435 East Walnut Street
Green Bay, WI 54301

Manitowoc Herald Times Reporter
902 Franklin Street
Manitowoc, WI 54220

Kewaunee County News
602 Third Street
P.O. Box 68
Algoma, WI 54201-1215

The (Kewaunee) County Tribute
522 Fourth Street
P.O. Box 214
Algoma, WI 54201

Milwaukee Journal Sentinel
333 West State Street
Milwaukee, WI 53203

1.3.8 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 the unit does not contain a specific expiration term for the operating license. Therefore, conforming changes to account for the expiration term of the proposed renewed license are not necessary, unless the license number is changed upon issuance of the renewed license.

1.3.9 RESTRICTED DATA AGREEMENT

This application does not contain restricted data or other national defense information, nor is it expected that subsequent amendments to the license application will contain such information. However, pursuant to 10 CFR 54.17(g) and 10 CFR 50.37, DEK, as a part of the application for a renewed operating license, hereby agrees that it 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.

1.4 ABBREVIATIONS

This section contains the abbreviations that pertain to the administrative and technical information within the LRA. The abbreviations and descriptions of the intended functions used in the Section 2.0 Screening results tables and Section 3.0 AMR results summary tables are provided separately in Table 2.0-1. The abbreviations that pertain to the environmental information are included in the front of Appendix E (Environmental Report).

Abbreviation	Definition
ΔRT_{NDT}	Irradiation induced shift in the Reference Temperature for Nil Ductility Transition.
AC	Alternating Current
ACI	American Concrete Institute
ACSR	Aluminum Conductor Steel Reinforced
AEM	Aging Effect / Mechanism
AMP	Aging Management Program
AMR	Aging Management Review
ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
ATWS	Anticipated Transient Without Scram
B&PV	Boiler and Pressure Vessel
BMI	Bottom Mounted Instrumentation
BWR	Boiling Water Reactor

Abbreviation	Definition
CAP	Corrective Action Program
CASS	Cast Austenitic Stainless Steel
CEA	Control Element Assembly
CFR	Code of Federal Regulations
CFs	Chemistry Factors
CLB	Current Licensing Basis
CO_2	Carbon Dioxide
CRD	Control Rod Drive
CRDM	Control Rod Drive Mechanism
CREZ	Control Room Environmental Zone
CRPA	Control Room Post Accident
CUF	Cumulative Usage Factor
DBD	Design Basis Document
DC	Direct Current
DOR	Division of Operating Reactors
EAF	Environmentally-Assisted Fatigue
ECT	Eddy Current Testing
EDG	Emergency Diesel Generator
EFPY	Effective Full Power Years
EMPAC	Enterprise Maintenance Planning and Control
EOL	End of Life

Abbreviation	Definition
EOLR	End of License Renewal
EPRI	Electric Power Research Institute
EQ	Environmental Qualification
EQER	Environmental Qualification Evaluation and Review
ESF	Engineered Safety Features
FAC	Flow Accelerated Corrosion
Fen	Environmental Life Correction Factor
FERC	Federal Energy Regulatory Commission
FSSEL	Flooding Safe Shutdown Equipment List
GALL	NUREG-1801, “Generic Aging Lessons Learned Report”
GL	Generic Letter
GSI	Generic Safety Issue
HELB	High-Energy Line Break
IASCC	Irradiation Assisted Stress Corrosion Cracking
IEEE	Institute of Electrical and Electronics Engineers
IGSCC	Intergranular Stress Corrosion Cracking
ILRT	Integrated Leak Rate Test
IN	Information Notice
ISG	Interim Staff Guidance
ISI	Inservice Inspection
IWB	Subsection IWB of ASME Section XI Code

Abbreviation	Definition
IWE	Subsection IWE of ASME Section XI Code
IWF	Subsection IWF of ASME Section XI Code
IWL	Subsection IWL of ASME Section XI Code
kV	kilovolt
LBB	Leak Before Break
LLRT	Local Leak Rate Testing
LOCA	Loss-of-Coolant Accident
LR	License Renewal
LRA	License Renewal Application
LTOP	Low Temperature Overpressure Protection
MEAP	Material, Environment, Aging Effect and Program
MEB	Metal Enclosed Bus
MIC	Microbiologically Influenced Corrosion
MWe	Megawatts-Electrical
MWt	Megawatts-Thermal
NDE	Non-destructive Examination
NEI	Nuclear Energy Institute
NESC®	National Electrical Safety Code®
NFPA	National Fire Protection Association
NRC	Nuclear Regulatory Commission
NS	Non-Safety-Related

Abbreviation	Definition
NSSS	Nuclear Steam Supply System
NUREG	US Nuclear Regulatory Commission Publication
P&ID	Piping and Instrumentation Drawing
PM	Preventative Maintenance
ppm	Parts Per Million
PTS	Pressurized Thermal Shock
PWR	Pressurized Water Reactor
PWSCC	Primary Water Stress Corrosion Cracking
QA	Quality Assurance
RAT	Reserve Auxiliary Transformer
RCCA	Rod Cluster Control Assembly
RxCP	Reactor Coolant Pump
RG	Regulatory Guide
RHR	Residual Heat Removal
RPV	Reactor Pressure Vessel
RT_{NDT}	Reference temperature for nil ductility transition
RT_{PTS}	Reference temperature for pressurized thermal shock
RT_{To}	Reference temperature for nil ductility transition (Master Curve)
RVI	Reactor Vessel Internals
SAMA	Severe Accident Mitigation Alternative

Abbreviation	Definition
SBO	Station Blackout
SCBA	Self Contained Breathing Apparatus
SCC	Stress Corrosion Cracking
SE	Steam Exclusion
SER	Safety Evaluation Report
SFP	Spent Fuel Pool
SG	Steam Generator
SI	Safety Injection
SR	Safety-Related
SSC	System, Structure, and Component
SV	Special Ventilation
TAT	Tertiary Auxiliary Transformer
TLAA	Time-Limited Aging Analysis
TSC	Technical Support Center
U_{EAF}	EAF-corrected Fatigue Usage
ULSD	Ultra Low Sulfur Diesel
USAR	Updated Safety Analysis Report

Abbreviation	Definition
USE	Upper Shelf Energy
USI	Unresolved Safety Issue
UT	Ultrasonic Testing
VT	Visual Test
WCAP	Westinghouse Commercial Atomic Power
WOG	Westinghouse Owner’s Group
WPSC	Wisconsin Public Service Corporation

1.5 COMMUNICATIONS

Written communications regarding this application should be directed to:

Mr. David A. Christian
President and Chief Nuclear Officer
Innsbrook Technical Center - 2SW
5000 Dominion Boulevard
Glen Allen, VA 23060-6711
(David.Christian@dom.com)

with copies to:

Mr. William R. Matthews
Senior Vice President - Nuclear Operations
Innsbrook Technical Center - 2SE
5000 Dominion Boulevard
Glen Allen, VA 23060-6711
(William.R.Matthews@dom.com)

Mr. Stephen E. Scace
Site Vice President - Kewaunee
Administration Building
Kewaunee Power Station
N490 Highway 42
Kewaunee, WI 54216
(Stephen.E.Scace@dom.com)

Mr. Gerald T. Bischof
Vice President - Nuclear Engineering
Innsbrook Technical Center - 2SE
5000 Dominion Boulevard
Glen Allen, VA 23060-6711
(Jerry.Bischof@dom.com)

Mr. Michael J. Wilson
Director - Nuclear Station Safety & Licensing
Building ATF2
Kewaunee Power Station
N490 Highway 42
Kewaunee, WI 54216
(Michael.J.Wilson@dom.com)

Mr. William D. Corbin
Director - Nuclear Engineering
Innsbrook Technical Center - 3NE
5000 Dominion Boulevard
Glen Allen, VA 23060-6711
(Bill.Corbin@dom.com)

Mr. Paul C. Aitken
Supervisor - License Renewal Project
Innsbrook Technical Center - 3NE
5000 Dominion Boulevard
Glen Allen, VA 23060-6711
(Paul.Aitken@dom.com)

Mr. David A. Sommers
Supervisor - Nuclear Engineering
Innsbrook Technical Center - 2SE
5000 Dominion Boulevard
Glen Allen, VA 23060-6711
(David.Sommers@dom.com)

Mr. Thomas L. Breene
Manager - Nuclear Licensing
Building ATF2
Kewaunee Power Station
N490 Highway 42
Kewaunee, WI 54216
(Thomas.L.Breene@dom.com)

Ms. Lillian M. Cuoco
Senior Counsel
Dominion Resources Services, Inc.
120 Tredegar Street, RS-2
Richmond, VA 23219
(Lillian.Cuoco@dom.com)

Mr. David R. Lewis
Pillsbury Winthrop Shaw Pittman, LLP
2300 N Street, N.W.
Washington, D.C. 20037-1122
(David.Lewis@Pillsburylaw.com)

1.6 REFERENCES

1.6-1 10 CFR 51, *Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions*, U.S. Nuclear Regulatory Commission.

1.6-2 10 CFR 54, *Requirements for Renewal of Operating Licenses for Nuclear Power Plants*, U.S. Nuclear Regulatory Commission.

1.6-3 NUREG-1800, *Standard Review Plan for the Review of License Renewal Applications for Nuclear Power Plants*, Rev. 1, U.S. Nuclear Regulatory Commission, September 2005.

1.6-4 NUREG-1801, *Generic Aging Lessons Learned (GALL) Report,* Rev. 1, U.S. Nuclear Regulatory Commission, September 2005.

1.6-5 Regulatory Guide 1.188, *Standard Format and Content for Applications to Renew Nuclear Power Plant Operating Licenses*, Rev. 1, U.S. Nuclear Regulatory Commission, September 2005.

1.6-6 NEI 95-10, *Industry Guideline for Implementing the Requirements of 10 CFR Part 54 -The License Renewal Rule*, Rev. 6, Nuclear Energy Institute, June 2005.

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

This section describes the process for identifying the structures and components subject to aging management review and provides the scoping and screening results for those components, subcomponents, structural members, and commodity groups that are subject to AMR per Section 3.0 of this application.

A listing of the abbreviations used in Section 2.0 is provided in Section 1.4.

Intended Function Abbreviations and Descriptions

Table 2.0-1, Intended Functions: Abbreviations & Descriptions, contains the abbreviations and descriptions of the intended functions used in the Screening and AMR results tables for components, subcomponents, structural members, and commodity groups.

Table 2.0-1 Intended Functions: Abbreviations & Descriptions

Intended Function	Abbreviation	Description
Absorbs Neutrons	AN	Absorbs neutrons
Conducts Electricity	CE	Conducts electricity.
Enclosure Protection	EN	Provides enclosure, shelter, and/or protection for in-scope equipment (including radiation shielding and pipe whip restraint).
EQ Barrier	EQB	Provides EQ Barrier and/or HELB Barrier.
Fire Barrier	FB	Provides a rated fire barrier to confine or retard a fire from spreading to or from adjacent areas of the plant.

Table 2.0-1 Intended Functions: Abbreviations & Descriptions

Intended Function	Abbreviation	Description
Flood Barrier	FLB	Provides a protective barrier for internal/external flooding events.
Flow Distribution	FD	Provides for flow distribution.
Filtration	FLT	Provides filtration.
Heat Transfer	HT	Provides for heat transfer.
Insulate	IN	Insulates electrical conductors.
Jet Impingement Shield	JIS	Provides jet impingement shielding for high-energy line breaks.
Limit Thermal Cycling	LTC	Limits thermal cycling.
Missile Barrier	MB	Provides a missile (internal or external) barrier.
Pressure Boundary	PB	Provides a pressure boundary. This function includes maintaining structural integrity and preventing leakage or spray.
Restricts Flow	RF	Restricts flow.
Source of Cooling	SCW	Provides a source of cooling water for plant shutdown.
Spray Pattern	SP	Provides a spray pattern.
Structural Support	SS	Provides structural/functional support for in-scope equipment, and/or maintains structural integrity to prevent spatial interactions that could cause failure of SR SSCs.

2.1 SCOPING AND SCREENING METHODOLOGY

2.1.1 INTRODUCTION

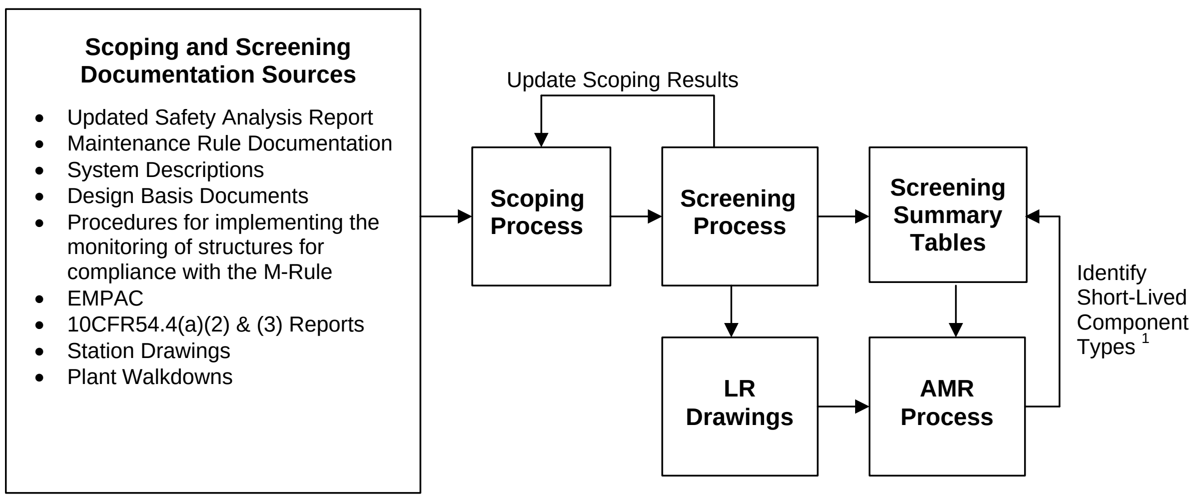
The first step in the Integrated Plant Assessment involved the identification of the plant SSCs that are within the scope of license renewal and that require an aging management review. This section provides the information that meets the requirements of 10 CFR 54.21(a)(1) and (a)(2).

Scoping and screening were performed consistent with the guidelines presented in NEI 95-10 (Reference 2.1-1) with the following clarifications:

- Scoping was performed at the system/structure level. Screening was performed on a component level basis and the scoping results (intended functions, applicable scoping criteria, etc.) were then reviewed and revised as required to be consistent with the screening results.
- The screening process identified in-scope passive components. The short-lived passive components, that could be excluded from an AMR on the basis of a qualified life or a specified replacement time period, were identified and removed from any further aging evaluation consideration (Section 2.1.5.7).

A simplified flow chart, showing the relationship between the scoping and screening processes for mechanical systems and components, is provided in Figure 2.1-1. Section 2.1.2 discusses the application of the 10 CFR 54.4(a) scoping criteria. Section 2.1.3 provides a discussion of the documentation that was used to perform scoping and screening. Section 2.1.4 and Section 2.1.5 describe the scoping and screening methodology, respectively.

Figure 2.1-1 Simplified Scoping and Screening Process Flow Chart



1. Short-lived passive components identified during the AMR process are reflected in the screening summary tables.

2.1.2 APPLICATION OF THE SCOPING CRITERIA IN 10 CFR 54.4(a)

10 CFR 54.4(a)(1), (a)(2) and (a)(3) contain criteria for including systems, structures, and components within the scope of license renewal. The application 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.

2.1.2.1 10 CFR 54.4(a)(1) - SAFETY-RELATED

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

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

(ii) The capability to 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 off-site exposures comparable to those referred to in 10 CFR 50.34(a)(1), 10 CFR 50.67(b)(2), or 10 CFR 100.11, as applicable.

Safety-related components at Kewaunee are designated QA Type 1. The mechanical and electrical components classified as QA Type 1 on the station drawings and/or in the Asset Management module of the EMPAC equipment database were included in the scope of license renewal under 10CFR54.4(a)(1). The structures (or portions of structures) identified as Nuclear Safety Design Class I in the USAR Appendix B, Table B2.1 were also included within the scope of license renewal under 10 CFR 54.4(a)(1). However, because of the vintage of the plant, it was recognized that non-safety-related SSCs had been credited for mitigating design basis events that were not required to be considered in the original plant design basis. Therefore, to ensure the scoping criteria of 10CFR54.4(a) were met, these non-safety-related components were included in scope under 10CFR54.4(a)(2) or (a)(3) as appropriate.

2.1.2.2 10 CFR 54.4(a)(2) - NON-SAFETY-RELATED AFFECTING SAFETY-RELATED

10 CFR 54.4(a)(2) requires that plant SSCs within the scope of license renewal include non-safety-related SSCs whose failure could prevent satisfactory accomplishment of any of the functions identified for 10 CFR 54.4(a)(1).

A review of the USAR, OE, and CLB documentation was performed to develop the guidelines and provide the sources of information to be used as input to scoping and screening. This information was augmented by plant walkdowns. The results, discussed in Section 2.1.3.6, 10 CFR 54.4(a)(2) Report, identified NS SSCs for inclusion within the scope of license renewal for 10 CFR 54.4(a)(2).

2.1.2.3 10 CFR 54.4(a)(3) - REGULATED EVENTS

10 CFR 54.4(a)(3) requires that plant SSCs within the scope of license renewal include SSCs 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).

For each of these regulated events, a report was prepared to provide input into the scoping and screening processes. These reports (1) identified the systems and structures that are relied on for each of the regulated events, and/or (2) either identified specific components, or provided a reference to the documentation to be used as input for screening. The regulated event reports are discussed in Section 2.1.3.7.

2.1.3 DOCUMENTATION SOURCES USED FOR SCOPING AND SCREENING

2.1.3.1 UPDATED SAFETY ANALYSIS REPORT

The USAR was used as a source of system functions for the Maintenance Rule and the System Descriptions, both of which were used as sources of intended functions for system scoping.

The USAR was also reviewed during scoping as a source for the following:

- Interactions involving NSR equipment failures affecting SR equipment as documented in the 10 CFR 54.4(a)(2) Report.
- System functions not included in other documents.
- Structural members, structural areas, structure descriptions, structural functions and the safety classifications of structures.

2.1.3.2 MAINTENANCE RULE PROGRAM DOCUMENTATION

The Maintenance Rule program includes a baseline for scoping, ranking risk, and developing performance criteria to comply with the requirements established in 10

CFR 50.65, *"Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants"*. The resulting Maintenance Rule scoping documentation was used as a source of system functions for license renewal scoping.

The Maintenance Rule Inspection Guideline for Buildings and Structures (Reference 2.1-2) was used as a reference in identifying the list of structures for license renewal consideration.

2.1.3.3 EMPAC EQUIPMENT DATABASE

The EMPAC system contains an equipment database within the Asset Management module. For components in the Asset Management module, EMPAC typically provides information such as the equipment number, equipment description, Asset (component) type, equipment location, QA classification, and both EQ and RG 1.97 indicator fields. Data from the Asset Management module was used to support both scoping and screening activities.

2.1.3.4 SYSTEM DESCRIPTIONS

System descriptions have been developed and maintained for most plant systems. The system descriptions were used as a source of system intended functions for License Renewal scoping evaluations.

2.1.3.5 DESIGN BASIS DOCUMENTS

DBDs are an informational source of applicable design basis information in the planning of unit modifications, technical reviews, safety evaluations, and other design related activities. DBDs have been developed for topics such as Flooding, SBO, HELB and some of the critical plant systems.

2.1.3.6 10 CFR 54.4(a)(2) REPORT

A review of the USAR, operating experience, and documents indicated in Section 2.1.3.1 through Section 2.1.3.5, was performed to identify the non-safety-related SSCs whose failure could prevent satisfactory accomplishment of the SR functions identified in 10 CFR 54.4(a)(1). The review encompassed the design basis events and hypothetical failures considered within these documents, and included the non-safety-related SSCs that have been credited for mitigating design basis events as defined in 10 CFR 50.49(b)(1). The NS SSCs already included within the scope of license renewal for 10 CFR 54.4(a)(3) were not identified for inclusion under 10 CFR

54.4(a)(2). The results of the review were incorporated into a 10 CFR 54.4(a)(2) Report, which was used as input to scoping and screening. The report identified the following general categories of NS SSCs for inclusion within the scope of license renewal for 10 CFR 54.4(a)(2):

1. NS components containing liquids or steam that are spatially oriented such that their failure could prevent the satisfactory accomplishment of a safety-related function of a safety-related SSC. (Spatially Oriented NS SSCs Not Directly Attached to SR SSCs, Section 2.1.3.6.1).
2. NS piping that is attached to SR piping and that is seismically designed and supported up to the first equivalent anchor point beyond the SR/NS boundary. (NS Piping Attached to SR Piping, Section 2.1.3.6.2).
3. Supports for NS SSCs that are in close proximity to SR SSCs such that support system failure during a seismic event could result in adverse interaction with SR SSCs. (Seismic (II/I), Section 2.1.3.6.3)
4. Other Evaluated Design Basis Events (Section 2.1.3.6.4)

The criteria for including each of these categories in scope is discussed in the indicated section.

2.1.3.6.1 Spatially Oriented NS SSCs Not Directly Attached to SR SSCs

There are two options for scoping spatially oriented components in NEI 95-10: a mitigative option or a preventative option. The components for both options have been included in scope for 10 CFR 54.4(a)(2). Non-safety related mitigative features consist of jet impingement shields, spray shields, pipe whip restraints, seismic supports and flood barriers. They are evaluated as commodities in Section 3.5, Aging Management of Containment, Structures and Component Supports. NS SSCs are included in scope if they were spatially oriented such that their failure could prevent the satisfactory accomplishment of a SR function of SR SSC, even if a mitigative feature did exist.

Non-safety-related fluid-containing components (e.g., piping, valves, heat exchangers, relief valves discharge piping, etc.) contain or have the potential to contain liquid or steam. These fluid-containing components may spray, leak or physically impact safety-related components. Additionally, fluid-containing components may contain contaminants, which could result in internal age-related degradation, or reach temperatures below the dew point of the air surrounding the component, which may produce intermittent wetting conditions on the external surfaces and cause age related degradation. Therefore, NS fluid-containing components spatially oriented near SR components were evaluated to determine if they met the criteria defined in 10 CFR 54.4(a)(2). When determining the scoping boundary for NS components, the following criteria were applied within the buildings that house SR components:

1. NS components containing or potentially containing high-energy fluid (i.e., >200°F and >275 psig) were included within the scope of license renewal regardless of their location within the building.
2. NS components containing or potentially containing moderate or low energy fluids (i.e., ≤ 200°F or ≤ 275 psig) were also included in license renewal scope unless both 2(a) and 2(b) below applied:
   (a) The NS component could not directly leak or spray on SR components in the immediate area because one of the following conditions existed:
      - The NS component was located in a room, cubicle, enclosure, tunnel, or enclosed corridor, which did not contain any SR mechanical or electrical components.
      - The NS component was located in an open space, but was separated from SR mechanical or electrical components by solid physical barriers such as walls, floors, ceilings and/or major plant equipment (e.g., the main condenser).
      - The NS component was located in an open space, was maintained at or near atmospheric pressure, and there were no SR mechanical or electrical components located within the collapse envelope of the NS component.

   (b) The fluid contents of the NS components could not flow from the area through doorways, grating, or floor penetrations, and then drain or drip on or flood SR mechanical or electrical components in adjacent areas, unless an analysis demonstrated that the SR components would not be adversely impacted.

For components included in-scope for spatial orientation, the license renewal boundary would normally extend to:

- A wall or floor of the SR area. If the wall or floor was not shown on the system P&ID, then a note was used to denote the boundary on the license renewal drawing.
- A NS component that was located within the SR area and that was excluded from scope under item 2 above.
- A convenient location (preferably the first valve, tank, etc.) outside the SR area.

2.1.3.6.2 NS Piping Attached to SR Piping

Section B.7.2 of the USAR states, "All Class I piping was isolated from piping for which Class I analysis was not required by structural anchors. Non-Class I pipe which was connected to Class I pipe was analyzed as Class I pipe up to a structural anchor which provided a means for isolating the Class I piping from the non-Class I piping, or up to an equipment connection when isolation by structural anchor was not practical." A structural anchor is a device that ensures forces and moments are restrained in each of the three orthogonal directions. At Kewaunee, the piping systems were designed and constructed such that structural anchors were primarily used to provide the restraints.

The NS piping up to and including the structural anchors were included in scope per 10 CFR 54.4(a)(2). In the event an equipment connection is credited for providing restraint in one or more of the orthogonal directions, the credited component and its associated supports were included in the scope of license renewal per 10 CFR 54.4(a)(2). The supports were evaluated as a commodity in Section 2.4.3 and the mechanical components were evaluated with their respective system in Section 2.3

The extent of NS piping included in the scope of license renewal was generally determined from controlled drawings. In the event that a structural anchor used in a seismic analysis for a SR piping system was not identified on those drawings, the bounding scoping methodology described in Appendix F, Section 4, paragraphs (a) through (f) of NEI 95-10 was applied.

In some cases the bounding approach was overly conservative and it was deemed appropriate to limit the additional scope for a piping system by specifically identifying structural anchors via a review of isometric drawings. In a limited number of cases, where isometric drawings were not available, plant walkdowns were performed by experienced personnel to determine the location of the structural anchors.

Mechanical components that are included in scope per this criteria are evaluated with their respective systems and supports that are included in scope per this criteria are evaluated as a commodity. Additionally, NS structures in which these NS piping segments and associated pipe supports are located were also included within the scope of license renewal in that they provide structural support and shelter for these components.

2.1.3.6.3 Seismic (II/I)

Seismic II/I is a term used to describe the potential for NS equipment to adversely interact with SR equipment during a seismic event via catastrophic failure or other seismic interactions such as impacts on adjacent equipment and structures. Consistent with NEI 95-10, Appendix F, Section 5.2.2.3, piping supports for Seismic II/I components need to be intact in order to prevent physical impacts on SR equipment during a seismic event. Therefore, the piping supports were included within the scope of license renewal per 10 CFR 54.4(a)(2).

The NS seismic supports that could potentially have a Seismic II/I interaction were not uniquely identified during screening. Instead, seismic supports are evaluated as a commodity using an "area-based approach" rather than being evaluated in their separate systems.

Seismic II/I also includes any NS buildings and structures that are seismically designed to prevent them from adversely impacting SR safe shutdown equipment during a seismic event. These structures are designated Nuclear Safety Design Class I* or III* in USAR Section B.2.1, Definition of Nuclear Safety Design Classifications, Table B.2-1, and the aging management review results are provided in Section 3.5, Aging Management of Containment, Structures and Component Supports.

The passive structural members for seismically designed load handling cranes and devices are included in this Seismic II/I category. If the structural members are Nuclear Safety Design Class I* or III*, they were included in scope for 10 CFR 54.4(a)(2) and evaluated during the structural screening process to determine if an aging management review is required. The aging management review results for load handling cranes are provided in Section 3.3, Aging Management of Auxiliary Systems.

2.1.3.6.4 Other Evaluated Design Basis Events

The USAR specifically addresses the following design basis events that rely on NS SSCs for mitigation of the event consequences:

High Energy Line Break

USAR Appendix 10A provides the list of equipment credited in the analysis for a HELB outside of Containment. Mitigative features (i.e., encapsulation sleeves, whip restraints and jet impingement shields), installed to protect equipment outside of the Reactor Containment Vessel, that are credited in the HELB analysis were included within the scope of license renewal per 10 CFR 54.4(a)(2). The jet impingement shields and pipe whip restraints were evaluated for the effects of aging with Structures and Component Supports. The NS steel encapsulation sleeves on main feedwater and main steam lines were evaluated for the effects of aging with the Steam and Power Conversion Systems.

NS SSCs credited for maintaining steam exclusion zones (i.e., ducting, doors, hatches, seals for electrical/mechanical penetration of walls, etc.) were included within the scope of license renewal per 10 CFR 54.4(a)(3), since they act as an EQ barrier by protecting SR electrical equipment from a harsh steam environment. With the exception of ducting, these SSCs were addressed as a part of the structural screening review and the aging management review results are presented in Section 3.5, Aging Management of Containment, Structures and Component Supports. The ducting credited for steam exclusion was included in scope and the aging management review results are presented in Section 3.3, Aging Management of Auxiliary Systems.

Internal Flooding

NS flood level instrumentation and alarms identified in the Kewaunee Internal Flooding Topical Design Basis Document are utilized to warn the operators of flood conditions or stop component operation to mitigate the effects of a flood. These NS flood level instrumentation and alarms were included within the scope of license renewal per 10 CFR 54.4 (a)(2).

Floor drains, collection sumps, connecting piping and backflow preventers necessary to mitigate the effects of a flood were included within the scope of license renewal per 10 CFR 54.4(a)(2).

Installed structural members that provide flood barriers to SR SSCs were also included within the scope of license renewal per 10 CFR 54.4(a)(2) and addressed as a part of the structural screening review. This includes the flood barriers located at doors credited in the flooding design basis. These flood barriers were evaluated for aging management with Miscellaneous Structural Commodities.

The Fire Protection Program Plan, which complies with NRC Branch Technical Position BTP SPLB 9.5.1, Appendix A, credits floor drainage to prevent the flooding of safety-related equipment due to postulated pipe ruptures and inadvertent operation of pressurized fire protection water suppression systems outside of the Reactor Containment Vessel. The floor drainage outside of the Reactor Containment Vessel that is credited for protecting safety-related equipment has been included within scope of license renewal for 10 CFR 54.4(a)(2) and evaluated for aging management with Miscellaneous Drains and Sumps System.

External Flooding

Kewaunee USAR, Section 2.6.3, indicates that external flooding is considered as an insignificant contributor to risk. The circulating water screenhouse-forebay structure, which is at a lower elevation than the rest of the site, may be affected by wave run up. Per USAR Table B.2-1, the screenhouse is a Nuclear Safety Design Class I structure. However, some features credited for external flooding due to wave run up are non-Class I components (e.g., gasketed traveling water screen covers) and are included in scope for 10 CFR 54.4(a)(2).

Precipitation is also an insignificant contributor because of the expected maximum precipitation intensities, location of the plant, the design elevation of safety equipment and the plant's drainage channels. A review and re-evaluation of external flooding, performed in response to Generic Letter GL 88-20 (Reference 2.1-3), concluded the plant had adequate design capability to handle the 100-year hourly intensity. Therefore, the only non-safety-related SSCs included within the scope of license renewal for external flooding are related to the screenhouse to address the potential for wave run up.

Missiles

Missiles can be generated from external events (e.g., tornado) and internal events (i.e., rotating equipment and component failure). Typically, inherent structural features (such as concrete walls or steel covers) or engineered structures are credited to protect safety-related equipment from missiles and are classified safety-related. For the purposes of license renewal, missile barriers that protect SR equipment from damage due to missiles are considered as part of a Class I or Class I* structure. These protection features (missile barriers) are included as part of the building structure and are evaluated as a part of the Structural screening review. These SSCs are evaluated in Section 3.5, Aging Management of Containment, Structures and Component Supports.

Missiles from selected equipment failures have been evaluated. Based on the trajectory of a potential missile, the location of safety-related components, and the layout of the plant, the majority of equipment was determined to be protected.

The spent fuel pool and new fuel storage pit are not completely protected from the postulated turbine missile. However, due to the small target area combined with the low probability of the generation of a potentially damaging turbine missile, it is concluded in USAR Appendix B.9.4 that fuel damage resulting from a turbine missile is extremely unlikely.

Therefore, no components are included within the scope of license renewal based on their potential for generation of missiles.

2.1.3.7 10 CFR 54.4(a)(3) REPORTS

A report was prepared for each of the five regulated events covered in 10 CFR 54.4(a)(3) to provide input to the scoping and screening processes. This section provides a discussion of each of those reports.

2.1.3.7.1 Fire Protection

The Fire Protection Program Plan was developed to maintain compliance with 10 CFR 50.48 and Appendix R to 10 CFR 50 by meeting the following objectives in fire areas important to safety:

- Reduce the likelihood of fires.
- Promptly detect and extinguish fires that do occur.
- Maintain safe-shutdown capability if a fire does occur.
- Prevent release of a significant amount of radioactive material if a fire does occur.

A review was performed to identify the specific SSCs that fall within the scope of license renewal for fire protection, including the SSCs relied upon in the Fire

Protection Program Plan. As a result of that review, the following features and equipment were included within the scope of license renewal for fire protection:

- Fire detection and suppression equipment,
- Passive fire protection features such as reactor coolant pump lube oil collection components, dikes, curbs, and drains,
- Fire-rated assemblies such as walls, floors, ceilings, cable tray enclosures, and other fire barriers,
- Fire-rated penetrations assemblies (including fire doors, fire dampers, cable, piping, and ventilation duct penetration seals),
- Manual fire fighting equipment (hydrants, hose stations, extinguishers, etc.),
- Ventilation equipment (smoke removal),
- Emergency lighting (fire safe shutdown and life safety lighting),
- Communications equipment (fire brigade and fire safe shutdown), and
- Safe shutdown equipment

The screening methodology was applied to the post-fire repair equipment that is maintained in storage and is discussed in Section 2.1.5.6, Screening of Stored Equipment.

2.1.3.7.2 Environmental Qualification

The EQ program was developed to maintain compliance with 10 CFR 50.49. The program applies to the following electrical equipment that is important to safety and is located in a harsh environment:

- Safety-related electrical equipment that is relied on to remain functional during and following a design basis accident.
- Non-safety-related electrical equipment whose failure, under postulated environmental conditions, could prevent accomplishment of safety functions of the safety-related electrical equipment identified above.
- Category 1 and 2 post-accident monitoring equipment described in response to Regulatory Guide 1.97.

DOR Guidelines delineated in Enclosure 4 of IE Bulletin 79-01B (Reference 2.1-4) and IEEE 323-1974 (Reference 2.1-5) are the qualification basis.

The electrical components that fall within the scope of the EQ program are identified in the Asset Management module of EMPAC system equipment database (Section 2.1.3.3). Components that provide a barrier between mild and harsh areas of the plant, such as doors, penetrations, seals, dampers, walls, and floors, while not in the EQ program, were also included within the scope of license renewal.

2.1.3.7.3 Pressurized Thermal Shock

10 CFR 50.61 requires that each licensee project a value for the reference temperature for PTS for the limiting reactor vessel materials for end-of-life neutron fluence. The licensee is also required to implement those flux reduction programs, plant modifications and/or operational changes that are reasonable to avoid exceeding the pressurized thermal shock screening criteria set forth in 10 CFR 50.61.

The evaluation of reactor pressure vessel material RT_{PTS} is provided in Section 4.2, Reactor Vessel Neutron Embrittlement.

2.1.3.7.4 Anticipated Transient Without Scram

Plant modifications were implemented in response to 10 CFR 50.62 which require each pressurized water reactor to have equipment, from sensor to final actuation device, that is diverse from the reactor trip system. The ATWS Mitigating System Actuating Circuitry design and the Diverse Scram system, described in USAR Section 14.1.12, fulfills the NRC requirements addressed in 10 CFR 50.62 that provides the following initiations:

1. Initiation of auxiliary feedwater flow
2. Initiation of a turbine trip, and
3. Interruption of power to the control rods.

The equipment is required to reduce the likelihood of failure to shut down the reactor following anticipated transients and to mitigate the consequences of an ATWS event.

All ATWS equipment/components were included within the scope of license renewal.

2.1.3.7.5 Station Blackout

Plant modifications and procedure changes were implemented in response to 10 CFR 50.63 to enable the station to withstand and recover from a station blackout (SBO) of a specified duration (4 hours based on the Kewaunee parameters).

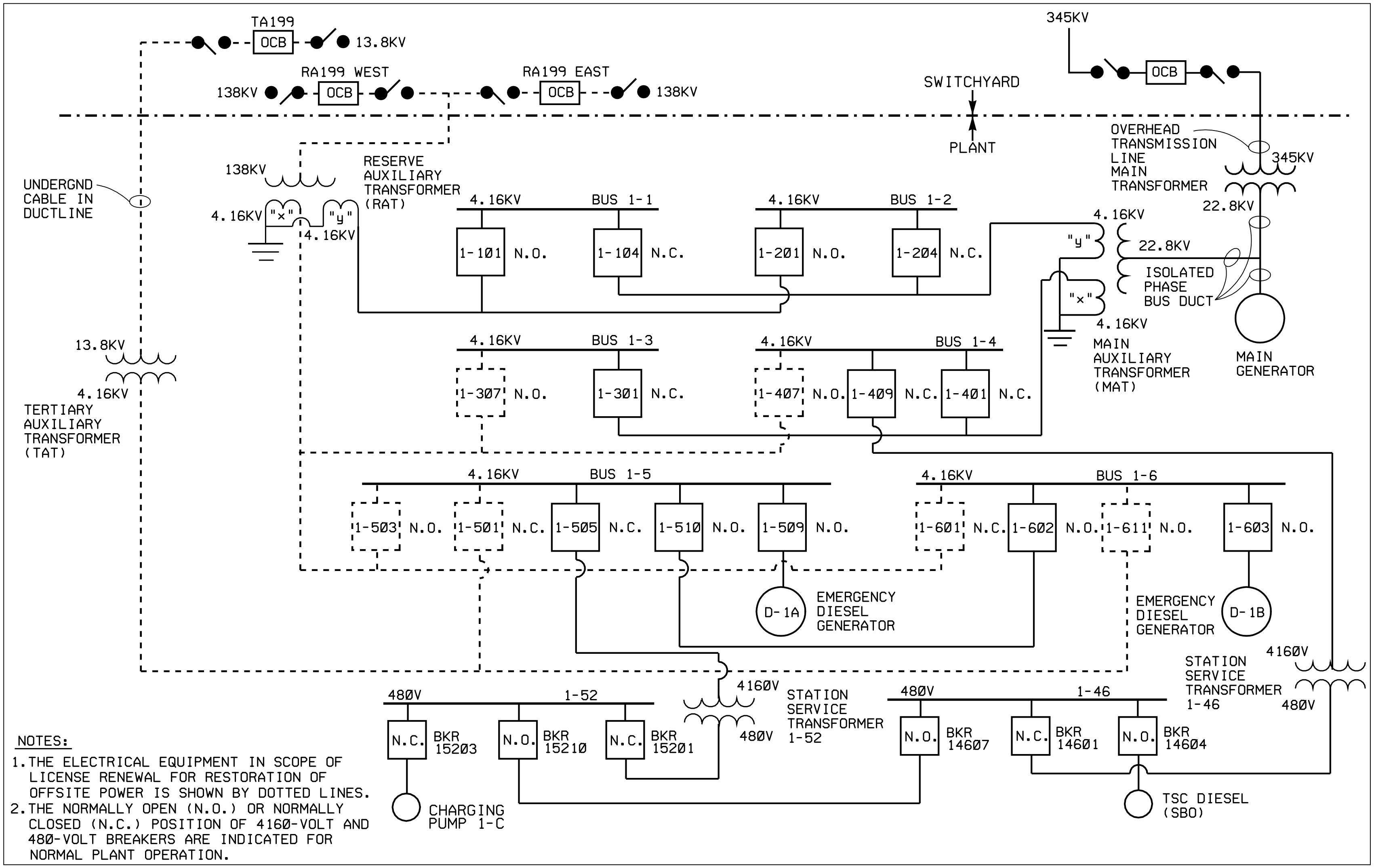
The Kewaunee required functions to cope with an SBO event are described in USAR Section 8.2.4. Recovery includes the ability to achieve and maintain hot shutdown.

The SSCs required for compliance with 10 CFR 50.63 were identified in a regulated event report which was used as input to the scoping and screening processes. The in-scope SSCs include the TSC diesel generator, its support systems, the TSC Diesel Generator Room, and other equipment relied upon to mitigate an SBO event.

The CLB for Kewaunee considers the recovery of a safety-related EDG as the method of recovery from an SBO. Based solely on the CLB, the offsite power system would not be included within the scope of license renewal. The NRC position on SBO recovery as it relates to the requirements of 10 CFR 54 (Reference 2.1-6) requires the inclusion of structures and components that support the recovery of offsite power after an SBO event within the scope of license renewal. Using this guidance, the supply path required to energize the safety-related 4160 V buses from offsite power after an SBO was included within the scope of license renewal. For Kewaunee, this required the inclusion of the off-site power feeds for both the Reserve Auxiliary Transformer (RAT) that normally supplies Emergency 4,160-Volt Bus 1-6 and the Tertiary Auxiliary Transformer (TAT) that normally supplies Emergency 4,160-Volt Bus 1-5. The scope includes the first point of isolation upstream of the supply for the primary side of the specific transformer and also from the secondary side of the transformer to the safety-related buses. The Kewaunee switchyard provides two possible paths for the 138kV source supplying the overhead conductors to the RAT. Since any of the two incoming transmission lines could be restored first, both circuit breakers and their associated set of disconnect switches were included within the scope of license renewal. The TAT is supplied via an underground cable connected to a circuit breaker and associated set of disconnect switches supplied at 13.8 kV from the tertiary winding of transformer T-10. The support structures associated with these in-scope components were also included within the scope of license renewal. Figure 2.1-2 provides a schematic of the electrical components that support the recovery of offsite power after an SBO event.

The proposed ISG, LR-ISG-2008-01, “Staff Guidance Regarding the Station BLackout Rule (10 CFR 50.63) Associated with License Renewal Applications,” has been reviewed and the Kewaunee scoping boundary is consistent with the guidance of this document.

Figure 2.1-2 Offsite Power for SBO



2.1.3.8 DRAWINGS

Mechanical flow (P&ID) drawings were marked-up to show the in-scope mechanical components that support one or more system intended functions. The marked-up drawings were subsequently used to create a set of license renewal drawings identifying the in-scope passive mechanical components. A unique style of highlighting was used to distinguish the in-scope mechanical components for each system. For each unique style of highlighting, the color blue was used to identify components included in scope for 10 CFR 54.4(a)(1) and (a)(3) and the color orange was used to identify components included within the scope of license renewal for 10 CFR 54.4(a)(2). In addition, seismic anchors were indicated on the drawings when the anchor established the LR boundary. As shown on the drawings, a seismic anchor may represent an actual structural anchor or a component (e.g., heat exchanger) that functions as a seismic anchor for in-scope piping or components. Other symbols shown on the license renewal drawings are defined on station drawings M-201 and XK-100-45.

Structural drawings were used to screen structures and to help determine materials of construction for input into the AMR process. A license renewal Site Plan Drawing was produced (LR-A-202-1) that shows the in-scope structures.

2.1.3.9 PROJECT DESIGN MANUAL

The Project Design Manual was developed by Pioneer Service & Engineering Company to provide a functional description of the Kewaunee Plant and the design criteria for its component systems and buildings. It is a historical document, which was used to help develop descriptions for in-scope structures and to assist in identifying the materials of construction for input into the integrated plant assessment process. All materials of construction were verified by drawings or specifications.

2.1.3.10 OTHER DOCUMENTATION

Additional documents, such as design change documentation, technical reports, and engineering correspondence, were reviewed during screening, when needed, to obtain clarification of components to be included within the scope of license renewal and/or the functions performed by SSCs.

2.1.4 SCOPING METHODOLOGY

Scoping was performed to identify the plant systems and structures within the scope of the license renewal rule. The scoping for systems and structures was performed as two separate efforts as discussed in the following sections.

2.1.4.1 SYSTEM SCOPING METHODOLOGY

Mechanical and electrical system scoping was performed by applying the criteria described below. If any of the criteria were met, indicating that a system performed one or more intended functions, the system was listed as potentially within the scope of license renewal.

1. EMPAC contains data that indicates that the system contains one or more components that have been determined to meet the scoping criteria in 10 CFR 54.4.
2. The USAR, Maintenance Rule documentation, system descriptions, and/or DBDs list one or more system functions that were determined to meet the scoping criteria in 10 CFR 54.4.
3. The 10 CFR 54.4(a)(2) Report, and/or one of the 10 CFR 54.4(a)(3) regulated event reports indicate that the system performs an intended function.
4. Controlled station drawings and/or EMPAC data indicate that the system contains one or more NS fluid-containing components located in a Class I (SR) structure or in the non-Class I portion of the Turbine Building. In these instances, spatial interactions between NS and SR components is a potential concern.
5. Controlled station drawings indicates that the system contains NS piping that is attached to SR piping and is required to be seismically supported.

The preliminary scoping results were used as input to the screening process. The results of the completed screening process were used as input for reviewing and updating the system scoping results (intended functions, applicable scoping criteria, etc.). The lists of systems within the scope of license renewal and the systems not within the scope of license renewal are presented in Section 2.2.

2.1.4.2 STRUCTURE SCOPING METHODOLOGY

Structure scoping was performed by applying the criteria described below. If any of the criteria were met, indicating that a structure performed one or more intended functions, the structure was listed as potentially within the scope of license renewal.

1. The Maintenance Rule documentation indicates that the structure performs one or more intended functions that were determined to meet the scoping criteria in 10 CFR 54.4.
2. The USAR identifies the structure as Class I, I* or III*.
3. The 10 CFR 54.4(a)(2) Report, and/or one of the 10 CFR 54.4(a)(3) regulated event reports indicate that the structure performs an intended function.
4. A plant walkdown identifies that the failure of the structure could adversely impact SR SSCs.

After the screening process for systems and electrical components was completed, the list of in-scope structures was reviewed to (1) ensure that all structures housing in-scope mechanical and/or electrical components were included within the scope of license renewal, and to (2) validate the intended functions for the in-scope structures. The final lists of structures within the scope of license renewal and the structures not within the scope of license renewal are presented in Section 2.2.

2.1.5 SCREENING METHODOLOGY

The initial scoping effort (Section 2.1.4) identified the plant systems and structures that were candidates for inclusion within the scope of license renewal. For each of those systems and structures, screening was performed to identify the passive components, structural members, and commodities that support an intended function. The components that are short-lived (and therefore did not require an AMR) were identified and removed from any further aging evaluation consideration as discussed in Section 2.1.5.7.

Screening was divided by engineering discipline into three primary areas: (1) system (mechanical), (2) structural, and (3) electrical/instrumentation and controls (I&C). The screening processes for these areas are described in Section 2.1.5.2, Section 2.1.5.4, and Section 2.1.5.5, respectively.

Selected major components were also screened to identify the passive long-lived subcomponents that require an AMR. That screening is discussed in Section 2.1.5.3, Major Components Screening. Section 2.1.5.6 summarizes the screening review performed for stored equipment.

2.1.5.1 IDENTIFICATION OF IN-SCOPE PASSIVE COMPONENTS

Several terms are used to refer to plant equipment when addressing their form and function. For mechanical system equipment, the term "component type" was applied to system components. For buildings and structures, the term "structural member" was applied to the parts of a building or structure. For major components, the term “subcomponents” was applied to the pieces that constitute the major component.

For structural and electrical screening efforts, license renewal drawings are not available that identify in-scope structural members and electrical component types/commodity groups using specific nomenclature. Therefore, to the extent practical, NUREG-1801 (Reference 2.1-7) terminology was applied to identify in-scope structural members, and electrical component types/commodity groups as long as it was not in conflict with other station documentation. Additional terminology (beyond that delineated in NUREG-1801) was used where needed to adequately ensure in-scope structural members and electrical component types/commodity groups were clearly identified.

For mechanical (system) and major component screening, the primary focus was to identify the component type for a component shown on the license renewal drawings (systems) or subcomponents referenced on USAR figures (major components) with their unique name if they were identified as such on the referenced drawing. If a unique name was identified for a specific component (e.g., a tank) on the license renewal drawing, the component type corresponds to the title of that component (e.g., Refueling Water Storage Tank).

Some component types represent the consolidation of similar or inherently related elements of the component type for the purpose of aging management review. They are generally of the same material as the host component and are subject to the same environmental conditions. These component types include pipe, tanks (either specific or generic), tubing, and valves as described below:

- “Pipe” includes piping and all of the associated fittings, flanges (including blind and spectacle), elbows, reducers, welds, drain lines, vent lines, end caps, threaded plugs, fill connections, funnels, and access ports such as manholes.

- “Tanks” includes, but not necessarily limited to, subcomponents of the tank such as nozzles, vent, drain, fill, and sample connections, manways, manway covers, caps and plugs, and other appurtenances.
- “Tubing” includes fittings, connections, end caps.
- “Valves” includes the valve bodies for all types of valves such as manual valves, air operated valves, motor operated valves, level control valves, solenoid operated valves, safety valves, pressure control valves, check valves, backflow preventers and vacuum breakers. Valve operators are specifically excluded.

In a few cases, component types were defined to document components not shown on the license renewal drawings or referenced USAR figures. In these instances, a note has been added to the component type in the Section 2 Screening Results Table indicating that the component is not shown on the associated system license renewal drawings. (A note was not added for the component type ‘Bolting’, which was used for every system that contains in-scope passive mechanical components that require and aging management review.)

2.1.5.2 SYSTEM (MECHANICAL) SCREENING

Each system identified during scoping as being within the scope of license renewal was screened to identify the mechanical components (pumps, valves, piping, etc.) that support the system intended functions. The electrical/I&C components (such as heaters) that are in-scope only because they perform a system pressure boundary function, were treated as mechanical components and were also identified during system screening.

The intended functions for a system were used as input to the screening process. Those functions were developed during scoping utilizing the following reference material:

- Updated Safety Analysis Report (Section 2.1.3.1),
- Maintenance Rule Program Documentation (Section 2.1.3.2),
- Component data in the EMPAC Equipment Database (Section 2.1.3.3),
- System Descriptions (Section 2.1.3.4),
- Design Basis Documents (Section 2.1.3.5),
- 10 CFR 54.4(a)(2) Report (Section 2.1.3.6),
- Five 10 CFR 54.4(a)(3) Reports (Section 2.1.3.7), and

- Station drawings (Section 2.1.3.8).

The system intended functions, in conjunction with component information in EMPAC, the 10 CFR 54.4(a)(2) Report (Section 2.1.3.6), the 10 CFR 54.4(a)(3) regulated event reports (Section 2.1.3.7), and the applicable system drawings, were used to identify the mechanical components within the scope of license renewal that require an aging management review. The following guidelines were applied to this effort:

- Passive component determinations were made in accordance with 10 CFR 54.21(a)(1)(i) and the guidance in NEI 95-10 (Reference 2.1-1).
- Cascading was addressed and compliance with 10 CFR 54.4(a)(2) was demonstrated by identifying support systems (such as supplying instrument air, cooling water or heating and ventilation) down to a level necessary to provide for the satisfactory accomplishment of the SR functions identified in 10 CFR 54.4(a)(1).
- Housings for active components (e.g., pump casings, valve bodies, fan and blower housings, etc.) that support the component intended function in a passive manner were subject to aging management review.
- Passive components (piping, valves, etc.) of complex assemblies (such as the emergency diesel generators and air-conditioning units) are shown on the system flow drawings and were screened separately from the complex assembly.

Therefore, the passive components that supported a system intended function were subject to aging management review.

The license renewal boundaries for a mechanical system includes the safety-related mechanical components. In order to meet the scoping criteria in 10 CFR 54.4(a)(2) and (3), the license renewal boundaries were typically extended beyond the SR/NS interfaces as follows:

- For NS components required for Appendix R, station blackout, HELB, and flooding events, that perform an accident analysis function, or that were required for a SR component to perform its intended function (cascading issue), the license renewal boundaries were typically defined consistent with the boundaries established in the CLB evaluations. These boundaries did not always coincide with an isolation device. In those instances, the boundary was extended to, and included the first normally closed manual valve, check valve, or automatic valve that received a signal to close, and that formed the flow path pressure boundary. A normally-open manual valve or a remotely operated valve was used as a boundary in those instances where the valve was relied upon in the plant procedures for the event, or where a failure down stream of the valve could be quickly detected and the valve could be easily closed by operators to establish the pressure boundary.

- For NS fluid-containing components in-scope based on spatial orientation to SR SSCs, the license renewal boundary normally extended to:
  - A wall or floor of the area containing SR SSCs. The wall or floor is depicted on the license renewal drawing.
  - A NS component that is located within the area, but whose failure will not affect SR SSCs.
  - A convenient location (preferably the first valve, tank, etc.) outside the area containing SR SSCs.
- For the NS piping that is attached to SR piping and that is required to be seismically designed and supported, the license renewal boundary was extended and established as indicated in Section 2.1.3.6, 10 CFR 54.4(a)(2) Report.

Following the completion of the screening review for a system, the annotated drawings were used to generate a set of license renewal drawings which identified the in-scope mechanical components. A unique style of highlighting was used to distinguish the in-scope mechanical components for each system. The color orange was used to identify components included within the scope of license renewal for 10 CFR 54.4(a)(2) and the color green was used to identify components included in scope for 10 CFR 54.4(a)(1) and (a)(3). The color highlighting included the components that were subsequently determined to be short-lived, and removed from any further aging evaluation consideration, as discussed in Section 2.1.5.7, Identification of Short-Lived Components and Consumables.

Certain items, such as pipe supports, panels, and cabinets, associated with a system are not typically shown on the system drawings and, therefore, were not identified on the license renewal drawings for each system. Instead, they were screened as structural components as explained in Section 2.1.5.4, Structural Screening.

The results of the system screening are presented in Section 2.3, Scoping and Screening Results: Mechanical Systems. This section addresses each system that was identified as containing in-scope mechanical components.

The following information is provided in Section 2.3 for each in-scope mechanical system that contains components subject to aging management review:

System Description - Contains a brief description of the system, identifies the 10 CFR 54.4 criteria along with the intended functions that provide the basis for including the system in scope for license renewal, and defines the evaluation boundary for the mechanical components subject to aging management review that are required to perform all the system's intended functions.

USAR References - Identifies the USAR sections that describe the system.

License Renewal Drawings - Lists the license renewal drawings that were developed for the system.

Components Subject to AMR - Identifies the screening summary table that lists the component types that require an AMR, along with the associated intended functions. This section also identifies the aging management review results table for the system.

2.1.5.3 MAJOR COMPONENTS SCREENING

The major components within the Reactor Coolant System, i.e., the reactor vessel, the reactor vessel internals, and the steam generators, were screened separately from the remainder of the Reactor Coolant System components. Detailed screening was performed to identify subcomponents that perform or support intended functions. The results of the major components screening are presented in Section 2.3.1.1, Reactor Vessel, Section 2.3.1.2, Reactor Vessel Internals, and Section 2.3.1.4, Steam Generator. The following information is provided for each of the major components:

Component Description - Contains a brief description of the major component, identifies the 10 CFR 54.4 criteria along with the intended functions that provide the basis for including the major component in scope for license renewal, and defines the evaluation boundary for the subcomponents subject to aging management review that are required to perform all the component's intended functions.

USAR References - Identifies the USAR sections that describe the major component.

License Renewal Drawings - Lists the license renewal drawings that indicate the major component.

Subcomponents Subject to AMR - Identifies the screening summary table that lists the subcomponents that require an AMR along with the associated intended functions. This section also identifies the aging management review results table for the major component.

2.1.5.4 STRUCTURAL SCREENING

Screening was performed for each in-scope structure identified during the scoping process. The following categories of structural equipment were not included with the associated structures during screening and were screened separately:

- Load Handling and Fuel Handling Cranes - Includes cranes that are either safety related or seismically designed to ensure they will not adversely impact safety related components during or after a seismic event.
- Component and NSSS Supports - Includes structural supports for mechanical and electrical components, which are an integral part of all plant systems including the NSSS. Supports for electrical components (including items such as racks, cabinets, panels, enclosures, etc.) also includes cable trays, conduits, and battery racks. Supports have been evaluated as commodities within in-scope structures.
- Miscellaneous Structural Commodities - Includes items such as metal enclosed bus - enclosure assemblies, cable tray covers, fire barrier penetration seals, doors, insulation, panels, cabinets, and junction, terminal, and pull boxes, etc. These items have been evaluated as commodities within in-scope structures.
- Fuel Storage - Includes the new and spent fuel storage racks.

Structure screening identified the passive structural members and components (e.g., walls, beams, grating, foundations, barriers, duct banks, equipment pads, sumps, etc.) that support the structure's intended function(s) and, therefore, require an AMR. The structural members that require an AMR were identified based upon a review of the structural detail drawings, the USAR, and any information available in EMPAC.

Structural bolting, used in applications such as bolted joints, threaded connections for structural steel and steel components in the construction of building structures, and mechanical and electrical supports, have been evaluated as part of the structural component and not identified as a unique component during the screening process. Structural bolting includes bolts, studs, nuts, screws, and anchorage to concrete.

The results of the structural screening are presented in Section 2.4, Scoping and Screening Results: Structures, except for Fuel Storage and Load Handling and Fuel Handling Cranes, which are presented in Section 2.3.3. The following information is provided for each structure and category of structural equipment:

Description - Contains a brief description of the structure, or category of structural equipment, and identifies the 10 CFR 54.4 criteria along with the intended functions that provide the basis for including the structure in scope for license renewal, and defines the evaluation boundary for the structural members subject to aging management review that are required to perform all the structure's intended functions.

USAR References - Identifies the USAR sections that describe the structure, or category of structural equipment.

License Renewal Drawings - Lists the license renewal site plan drawing and license renewal drawings that indicate the structure or its structural members.

Components Subject to AMR - Identifies the screening summary table that lists the structural members or commodity groups that require an AMR and the associated intended functions. This section also identifies the aging management review results table for the structure or category of structural equipment.

2.1.5.5 ELECTRICAL/I&C SCREENING

Electrical/I&C components were screened and evaluated as commodities as explained below.

The majority of electrical/I&C components (such as transmitters, switches, breakers, relays, actuators, radiation monitors, recorders, isolators, signal conditioners, meters, batteries, analyzers, chargers, motors, regulators, transformers, and fuses) are active components, in accordance with 10 CFR 54.21(a)(1)(i) and the supplemental guidelines in NEI 95-10, and therefore do not require an AMR.

The electrical/I&C components that are in scope only because they perform a passive pressure boundary function were treated as mechanical components and identified during the mechanical system screening process.

The following electrical/I&C commodity groups/component types perform a passive function:

- Cables and connections (including splices, terminal blocks, insulation portion of fuse holders, and transmission conductors)
- Fuse Holder (Metallic portion)
- Metal Enclosed Bus (includes switchyard buses)
- Reactor Containment Vessel electrical penetrations

Screening was performed for each of above items and the results are presented in Section 2.5.

Additionally, screening of cables and connections was performed on the following four levels:

1. Non-EQ Cables and connections (including splices, terminal blocks and fuse holder insulation materials) were screened on a commodity basis using a spaces approach.
2. The in-scope non-EQ cables used in sensitive, high voltage, instrumentation circuits with low-level signals for instruments such as radiation detectors and neutron detectors were individually identified and screened for license renewal applicability.
3. The in-scope non-EQ inaccessible medium voltage cables that are exposed to significant moisture simultaneously with significant voltage were individually identified and screened for license renewal applicability.
4. The in-scope fuse holders that are not considered a piece/part of a larger active assembly were individually identified and screened for license renewal applicability.

The results of the electrical screening are presented in Section 2.5, Scoping and Screening Results: Electrical and Instrumentation and Controls Systems. The following information is provided for each of the electrical/I&C commodity groups/component types identified above.

Description - Contains a brief description of the electrical/I&C commodity group, identifies the 10 CFR 54.4 criteria along with the intended functions that provide the basis for including the electrical/I&C commodity groups/component types in scope for license renewal, and defines the evaluation boundary for the electrical/I&C commodity groups/component types.

USAR Reference - Identifies the USAR section that describes the electrical/I&C commodity groups/component types.

Components Subject to AMR - Identifies the electrical/I&C commodity group/component types that are subject to an AMR and the intended functions. This section also identifies the aging management review results table for the electrical/I&C commodity groups/component types.

2.1.5.6 SCREENING OF STORED EQUIPMENT

In response to the NRC letter of February 11, 1999 (Reference 2.1-8), a review was performed to identify equipment that: 1) is maintained in storage, 2) is reserved for installation in the plant in response to a design basis accident or regulated event, and 3) requires an AMR.

The equipment in storage that performs an intended function and is subject to aging management review includes hardware dedicated to mitigate the effects of a fire as identified in the Kewaunee Fire Protection Plans and Appendix R/Fire Safe Shutdown Compliance Reports.

In addition to passive components, the review has also considered stored active components that are not routinely inspected, tested, and maintained.

Cables and connections are stored equipment identified as requiring an AMR and have been evaluated with Cables and Connections.

Tools and supplies used to place the stored equipment in service are not required for the installed equipment to remain operable (once placed in service) and are outside the scope of license renewal.

Fuses and communication equipment retained in storage were treated as active components since they are tested and maintained in accordance with station procedures on a quarterly frequency.

2.1.5.7 IDENTIFICATION OF SHORT-LIVED COMPONENTS AND CONSUMABLES

Components subject to periodic replacement, or components found to have an established qualified life (e.g., for EQ purposes), were included within the scope of license renewal, but later screened out as short-lived and did not require an aging management review.

Consumables are a special class of short-lived items that can include packing, gaskets, component seals, O-rings, oil, grease, component filters, system filters, fire extinguishers, fire hoses, and air packs. Many types of consumables are part of a component such as a valve or a pump and, therefore, were identified during screening. Items potentially treatable as consumables were evaluated consistent with the information presented in NEI 95-10 (Reference 2.1-1). The results of that evaluation are presented below.

Packing, Gaskets, Component Seals, and O-Rings

Packing, gaskets, component seals, and O-rings are typically used to ensure leak-proof seals when components are mechanically joined together. These items are commonly found in components such as valves, pumps, heat exchangers, ventilation units, ducts, and piping segments. These items are considered subcomponents of the identified components. Unless they are replaced on a fixed frequency, have an established qualified life (e.g., for EQ purposes), or are replaced based on performance or condition monitoring, it is not appropriate to classify them as short-lived.

Based on ANSI B31.1 and the ASME B&PV Code Section III, these items are not pressure-retaining parts. Thus, these types of sealing devices do not perform an intended function per 10 CFR 54.4(a) and are not in the scope of license renewal.

Oil, Grease, and Component Filters

Oil, grease, and component filters are required to support the intended functions of the systems or components in which they are installed. Per the NEI guidance (Reference 2.1-1), these consumables are considered short-lived and periodically replaced and, therefore, do not require aging management review.

System Filters, Fire Extinguishers, Fire Hoses, and Air Packs

These consumable items are in the scope of license renewal because they are either safety-related or because they are relied on for fire protection (i.e., fire extinguishers, fire hoses, and air packs). As identified in NEI guidance (Reference 2.1-1), there are specific standards that provide effective guidance for monitoring these components; that is, the onset of degradation can be detected and replacement requirements can be imposed before there is a loss of intended function.

Components such as fire hoses, fire extinguishers, SCBA, and SCBA cylinders are considered to be consumables that are routinely tested or inspected in accordance with the Fire Protection Program. Therefore, while these consumables are in the scope of license renewal, they do not require aging management review.

Structural Sealants

Structural sealants are associated with structural members such as fire barriers, flood barriers, etc. These types of sealants historically are not replaced on a fixed interval and do not have established qualified lives. Therefore, they were treated as long-lived items and subject to aging management review.

2.1.6 DISCUSSION OF INTERIM STAFF GUIDANCE

The NRC staff has identified the following issues for which Interim Staff Guidance has been issued or is planned:

LR-ISG-19B	Cracking Of Nickel-Alloy Components In The Reactor Coolant Pressure Boundary
LR-ISG-23	Replacement Parts Necessary to Meet 10 CFR 50.48 (Fire Protection) To Provide Guidance On How To Handle Replacement Parts For 10 CFR 50.48
LR-ISG-2006-01	Corrosion of the Mark I Steel Containment Drywell Shell
LR-ISG-2006-02	Staff Guidance on Acceptance Review for Environmental Requirements
LR-ISG-2006-03	Staff Guidance for Preparing Severe Accident Mitigation Alternatives (SAMA) Analyses
LR-ISG-2007-01	Updating the LR-ISG Process to Include References to the Environmental Review Guidance Documents, References for the Recent Publication of Revision 1 of the License Renewal Guidance Documents, and Minor Revisions to Be Consistent with Current Staff Practices

LR-ISG-2007-02	Changes to Generic Aging Lesson Learned (GALL) Report Aging Management Program (AMP) XI.E6, "Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements"
LR-ISG-2008-01	Staff Guidance Regarding the Station Blackout Rule (10 CFR 50.63) Associated with License Renewal Applications

The following is a discussion of each of these issues. The ISGs that have been formalized 75 days prior to submittal of this application are addressed.

2.1.6.1 LR-ISG-19B

Cracking Of Nickel-Alloy Components In The Reactor Coolant Pressure Boundary

This LR-ISG is under development.

2.1.6.2 LR-ISG-23

Replacement Parts Necessary to Meet 10 CFR 50.48 (Fire Protection) To Provide Guidance On How To Handle Replacement Parts For 10 CFR 50.48

The staff has determined that this ISG is not needed.

2.1.6.3 LR-ISG-2006-01

Corrosion of the Mark I Steel Containment Drywell Shell

This ISG is applicable only to BWRs and is therefore not applicable to Kewaunee Power Station.

2.1.6.4 LR-ISG-2006-02

Staff Guidance on Acceptance Review for Environmental Requirements

This ISG has been issued for comment.

2.1.6.5 LR-ISG-2006-03

Staff Guidance for Preparing Severe Accident Mitigation Alternatives (SAMA) Analyses

The severe accident mitigation alternatives analysis provided as a part of Appendix E to this application is consistent with the guidance of NEI 05-01, Severe Accident Mitigation Alternatives (SAMA) Analysis Guidance Document, as discussed in this Interim Staff Guidance.

2.1.6.6 LR-ISG-2007-01

Updating the LR-ISG Process to Include References to the Environmental Review Guidance Documents, References for the Recent Publication of Revision 1 of the License Renewal Guidance Documents, and Minor Revisions to Be Consistent with Current Staff Practices

This LR-ISG is under development.

2.1.6.7 LR-ISG-2007-02

Changes to Generic Aging Lesson Learned (GALL) Report Aging Management Program (AMP) XI.E6, "Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements"

This ISG has been issued for comment.

2.1.6.8 LR-ISG-2008-01

Staff Guidance Regarding the Station Blackout Rule (10 CFR 50.63) Associated with License Renewal Applications

This ISG has been reviewed and the Kewaunee components included for offsite power restoration are consistent with the guidance for establishment of the scoping boundary in this document.

2.1.7 REVIEW OF NUREG-0933

NUREG-0933 (Reference 2.1-9) has been reviewed in accordance with the guidance provided in NEI 95-10 (Reference 2.1-1) and Appendix A.3 of the Standard Review Plan (Reference 2.1-10). As a result of this review, no USIs or HIGH- or MEDIUM-priority issues described in NUREG-0933, Appendix B (unresolved GSIs), involving aging effects of structures and components subject to aging management review or time-limited aging analysis were identified. However, the following open GSIs were evaluated for license renewal and are addressed:

2.1.7.1 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. This GSI is only indirectly related to aging of piping systems because the probability of failure of a piping system is affected by degradation, including metal fatigue, that occurs over time.The effects of age-related degradation are addressed in the aging management review tables associated with mechanical systems in Section 3.0 and metal fatigue that is addressed in the TLAA evaluations of piping components documented in Section 4.0.

2.1.7.2 GSI-163, *Multiple Steam Generator Tube Leakage*

This GSI involves the potential for multiple steam generator 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 a time-limited aging analysis. The aging management review results for the steam generator tubes are provided in Table 3.1.2-4: Reactor Vessel, Internals, and Reactor Coolant System - Steam Generator - Aging Management Evaluation and the TLAA evaluation for the steam generator metal fatigue is documented in Section 4.0. The issue of age-related degradation of steam generator tubes is addressed in the current licensing basis of the plant and will continue to be addressed for the period of extended operation by the Steam Generator Tube Integrity program.

2.1.8 REFERENCES

2.1-1 NEI 95-10, Industry Guideline for Implementing the Requirements of 10 CFR Part 54 - The License Renewal Rule, Rev. 6, Nuclear Energy Institute, June 2005.

2.1-2 Procedure NEP No. 8.4, Maintenance Rule Inspection Guideline for Buildings and Structures.

2.1-3 Generic Letter GL 88-20, *Individual Plant External Events Evaluation (IPEEE) for Severe Accident Vulnerabilities and resolution of generic issue GI-103, Design for Probable Maximum Precipitation (PMP)*.

2.1-4 NRC Information and Enforcement Bulletin (IEB) 79-01B, Environmental Qualification of Class 1E Equipment.

2.1-5 IEEE 323-1974, IEEE Standard for Qualifying Class 1E Equipment for Nuclear Power Generating Stations.

2.1-6 Letter of April 1, 2002 from David B. Matthews of the NRC to Alan Nelson of NEI Subject: “Staff Guidance on Scoping of Equipment Relied on to Meet the Requirements of the Station Blackout (SBO) Rule (10 CFR 50.63) for License Renewal (10 CFR 54.4(a)(3))”.

2.1-7 NUREG-1801, Revision 1, *Generic Aging Lessons Learned (GALL) Report*, September 2005.

2.1-8 Letter of February 11, 1999 from Christopher I. Grimes of the NRC to Doug Walters of NEI, Subject: *Request for Additional Information Regarding Generic License Renewal Issue No. 98-0102, "Screening of Equipment that is Kept in Storage"*.

2.1-9 NUREG-0933, *A Prioritization of Generic Safety Issues*, U.S. Nuclear Regulatory Commission, June 2007.

2.1-10 *NUREG-1800, Standard Review Plan for the Review of License Renewal Applications for Nuclear Power Plants*, U.S. Nuclear Regulatory Commission.

2.2 PLANT LEVEL SCOPING RESULTS

Table 2.2-1 and Table 2.2-3 list the systems and the structures, respectively, that are within the scope of license renewal. A reference to the section of the application that contains the screening results is provided for each item on the list. The referenced screening results provide information regarding the specific portions of the system or structure that require an AMR. The in-scope structures are shown on the following license renewal drawing:

LR-A-202-1

Table 2.2-2 and Table 2.2-4 list the systems and the structures, respectively, that did not meet the criteria specified in 10 CFR 54.4(a) and, therefore, were excluded from the scope of license renewal. For each item, the tables provide a reference (if applicable) to the section of the Updated Safety Analysis Report that describes the system or structure.

Structures, systems, and components classifications are defined in USAR Section B.2.1, Definition of Nuclear Safety Design Classifications.

A listing of the abbreviations used in this section is provided in Section 1.4.

Table 2.2-1 Systems Within the Scope of License Renewal

System Name	Screening Results Section
4160 Volt	See Footnote No. 1
480 Volt	See Footnote No. 1
Air Removal	Section 2.3.4.8, Air Removal System
Auxiliary Building Air Conditioning	Section 2.3.3.11, Auxiliary Building Air Conditioning System
Auxiliary Building Special Ventilation and Steam Exclusion	Section 2.3.3.12, Auxiliary Building Special Ventilation and Steam Exclusion System
Auxiliary Building Ventilation	Section 2.3.3.13, Auxiliary Building Ventilation System
Auxiliary Feedwater	Section 2.3.4.7, Auxiliary Feedwater System
Bleed Steam	Section 2.3.4.3, Bleed Steam System
Chemical and Volume Control	Section 2.3.3.9, Chemical and Volume Control System
Chemical Injection	Section 2.3.2.1, Containment Vessel Internal Spray System Section 2.3.4.5, Condensate System Section 2.3.3.6, Service Water System Section 2.3.3.9, Chemical and Volume Control System Section 2.3.4.4, Feedwater System Section 2.3.4.7, Auxiliary Feedwater System
Circulating Water	Section 2.3.3.20, Circulating Water System
Communications	See Footnote No. 1
Component Cooling	Section 2.3.3.7, Component Cooling System
Condensate	Section 2.3.4.5, Condensate System

Table 2.2-1 Systems Within the Scope of License Renewal

System Name	Screening Results Section
Containment Hydrogen Analyzers	Section 2.3.3.14, Reactor Building Ventilation System
Containment Vessel Internal Spray	Section 2.3.2.1, Containment Vessel Internal Spray System
Control Rod Drive	See Footnote No. 3
Control Room Air Conditioning	Section 2.3.3.10, Control Room Air Conditioning System
Cranes (Excluding Fuel Handling)	Section 2.3.3.5, Cranes (Excluding Fuel Handling) System
DC and Emergency AC Distribution	See Footnote No. 1
Diesel Generator - Electrical	Section 2.3.3.19, Diesel Generator System
Diesel Generator - Mechanical	Section 2.3.3.19, Diesel Generator System
Engineered Safety Features Actuation	See Footnote No. 1
Feedwater	Section 2.3.4.4, Feedwater System
Fire Protection	Section 2.3.3.18, Fire Protection System
Fuel Handling	Section 2.3.3.4, Fuel Handling System
Gaseous Waste Processing and Discharge	Section 2.3.3.21, Gaseous Waste Processing and Discharge System
Heater and Moisture Separator Drains	Section 2.3.4.9, Heater and Moisture Separator Drains System
Heating Steam	Section 2.3.4.10, Heating Steam System
Incore Instrumentation and Inadequate Core Cooling Monitoring	See Footnote No. 2

Table 2.2-1 Systems Within the Scope of License Renewal

System Name	Screening Results Section
Lighting	See Footnote No. 1
Liquid Waste Processing and Discharge	Section 2.3.3.22, Liquid Waste Processing and Discharge System
Main Generator (Mechanical) and Auxiliaries	Section 2.3.4.11, Main Generator (Mechanical) and Auxiliaries System
Main Steam and Steam Dump	Section 2.3.4.2, Main Steam and Steam Dump System
Makeup and Demineralized Water	Section 2.3.3.24, Makeup and Demineralized Water System
Miscellaneous Drains and Sumps	Section 2.3.3.26, Miscellaneous Drains and Sumps System
Miscellaneous Gas	Section 2.3.3.27, Miscellaneous Gas System
Nitrogen and Hydrogen Supply	Section 2.3.3.27, Miscellaneous Gas System
Nuclear Instrumentation	See Footnote No. 1
Potable Water	Section 2.3.3.28, Potable Water System
Primary Sampling	Section 2.3.3.29, Primary Sampling System
Radiation Monitoring	Section 2.3.3.23, Radiation Monitoring System
Reactor Building Ventilation	Section 2.3.3.14, Reactor Building Ventilation System
Reactor Control and Protection	See Footnote No. 1
Reactor Coolant	Section 2.3.1, Reactor Coolant System
Residual Heat Removal	Section 2.3.2.3, Residual Heat Removal System

Table 2.2-1 Systems Within the Scope of License Renewal

System Name	Screening Results Section
Safety Injection	Section 2.3.2.2, Safety Injection System
Secondary Sampling	Section 2.3.4.12, Secondary Sampling System
Sequence of Events Recorder & Control Room Annunciators	See Footnote No. 1
Service Water	Section 2.3.3.6, Service Water System
Service Water Pretreatment	Section 2.3.3.25, Service Water Pretreatment System
Shield Building Ventilation	Section 2.3.3.16, Shield Building Ventilation System
Spent Fuel Pool Cooling	Section 2.3.3.3, Spent Fuel Pool Cooling System
Station and Instrument Air	Section 2.3.3.8, Station and Instrument Air System
Steam Generator Blowdown Treatment	Section 2.3.4.6, Steam Generator Blowdown Treatment System
Substation Electrical 345 & 138 kV Distribution	See Footnote No. 1
Technical Support Center Ventilation	Section 2.3.3.17, Technical Support Center Ventilation System
Turbine	Section 2.3.4.1, Turbine System
Turbine Building and Screenhouse Ventilation	Section 2.3.3.15, Turbine Building and Screenhouse Ventilation System

Table 2.2-1 Systems Within the Scope of License Renewal

System Name	Screening Results Section
Turbine Oil Purification	Section 2.3.4.13, Turbine Oil Purification System
Turbine Room Traps and Drains	Section 2.3.4.14, Turbine Room Traps and Drains System
Wide Range Containment Sump Level Monitor	See Footnote No. 1

1. This system does not contain any mechanical components that require an AMR. However, this system does contain electrical/I&C and/or structural components, which were evaluated on a commodity basis.

2. Excluding the flux thimble tubes that were evaluated with the reactor vessel internals in Section 2.3.1.2, and the BMI guide tubes that were evaluated with the reactor vessel in Section 2.3.1.1, this system does not contain any mechanical components that require an AMR. However, this system does contain electrical/I&C and/or structural components, which were evaluated on a commodity basis.

3. Excluding the CRDM Pressure Housings that were evaluated with the reactor vessel in Section 2.3.1.1, this system does not contain any mechanical components that require an AMR. However, this system does contain electrical/I&C and/or structural components, which were evaluated on a commodity basis.

Table 2.2-2 Systems Not Within the Scope of License Renewal

System Name	Reference
Administration Building Air Conditioning	Section 9.6.3
Cathodic Protection	None
Electrical Generation	Section 8.2
Elevators	None
Meteorological/Environmental	Section 2.7
Office/Warehouse Annex HVAC	None
Plant Computer	None
QA Vaults HVAC	None
Security	None
Security Building Ventilation	None
Sewage Treatment	Section 11.1.2.4
Solid Waste Processing	Section 11.1.2.4
Training Center Ventilation	None

Table 2.2-3 Structures Within the Scope of License Renewal

Structure	Screening Results Section
Administration Building	Section 2.4.2.2, Administration Building
Auxiliary Building	Section 2.4.2.3, Auxiliary Building
Discharge Structure	Section 2.4.2.8, Discharge Structure
Discharge Tunnel and Pipe	Section 2.4.2.9, Discharge Tunnel and Pipe
Intake Structure	Section 2.4.2.10, Intake Structure
New Fuel Storage	Section 2.3.3.1, New Fuel Storage
Reactor Containment Vessel	Section 2.4.1, Reactor Containment Vessel
Screenhouse	Section 2.4.2.11, Screenhouse
Screenhouse Access Tunnel	Section 2.4.2.4, Screenhouse Access Tunnel
Shield Building	Section 2.4.2.1, Shield Building
Spent Fuel Storage	Section 2.3.3.2, Spent Fuel Storage
Technical Support Center	Section 2.4.2.5, Technical Support Center
Turbine Building	Section 2.4.2.6, Turbine Building
Yard Structures	Section 2.4.2.7, Yard Structures

Table 2.2-4 Structures Not Within the Scope of License Renewal

Structure	USAR Reference
Administration & Training Facility	Figure 1.1-2
Augmented Water Supply Building	None
Ballistic Resistant Enclosures	None
Cable Storage Yard	Figure 1.1-2
Decon Building	None
Human Performance Simulator Trailers	None
Instrument House and Radio Antenna	None
ISFSI Facility	None
Lighting Poles (P1, P3, P6 thru P8)	None
Loading Dock Facility	None
Maintenance Vehicle Garage	Figure 1.1-2
Maintenance Waste Oil and Material Storage Building	Figure 1.1-2
Meteorological Towers	Figure 1.1-2/Section 2.7.1
Microwave and Surge Protection House	Figure 1.1-2
Microwave Tower	Figure 1.1-2
North Access Facility	None
Office Trailers	None
Office/Warehouse Annex	Section 1.2.1/Table B.2-1

Table 2.2-4 Structures Not Within the Scope of License Renewal

Structure	USAR Reference
Operating Training Facility	Figure 1.1-2
Pump House 1 & 2	Figure 1.1-2
Security Building	Section 1.2.1/Table B.2-1
Sewage Treatment Plant and Laboratory	Figure 1.1-2
SGR Buildings	None
Shore line stabilization	Section 2.6.2
Site Service Building #1	None
Substation Control House	Figure 1.1-2
Training Facility	None
Trench (electrical)	None
Vehicle Garage	Figure 1.1-2
Warehouse No. 1	Figure 1.1-2
Welding Shop	None

2.3 SCOPING AND SCREENING RESULTS: MECHANICAL SYSTEMS

Structures, systems, and components classifications are defined in USAR Section B.2.1, Definition of Nuclear Safety Design Classifications.

A listing of the abbreviations used in this section is provided in Section 1.4.

2.3.1 REACTOR COOLANT SYSTEM

Section 2.3.1 provides a description of the Reactor Coolant System and major Reactor Coolant System components as indicated below:

- Reactor vessel (Section 2.3.1.1)
- Reactor vessel internals (Section 2.3.1.2)
- Reactor Coolant System (Section 2.3.1.3)
- Steam generator (Section 2.3.1.4)

2.3.1.1 REACTOR VESSEL

Component Description

The reactor vessel is categorized as a standard Westinghouse 132" ID two-loop reactor vessel. The reactor vessel is a cylindrical shell with a welded, hemispherical lower head and a removable, bolted, flanged, and gasketed (O-ring), hemispherical upper head, which was replaced in the Fall of 2004. The reactor vessel provides a container for the reactor core and the primary coolant in which the core is submerged.

The cylindrical portion of the reactor vessel is constructed of ring forgings joined by full penetration circumferential weld seams. The reactor vessel is vertically mounted on six individual air-cooled support pads. Four of the support pads are attached to the bottom side of the primary nozzles and two of the support pads are attached to vessel-attached support brackets. Four reactor coolant and two safety injection nozzles penetrate the Reactor Vessel. The piping from each of the systems attaches to the reactor vessel nozzles. The internal surfaces of the vessel in contact with the coolant are clad, which provides increased corrosion resistance. The hemispherical welded bottom head has penetrations for movable in-core thimble tubes, which are housed in guide tubes and extend from the seal table into the reactor vessel interior and mate with the lower internals assembly. The core support ledge, which is part of the vessel flange, is located inside the vessel just below the vessel flange face, and supports the entire weight of the reactor vessel internals and the fuel. The lower internals assembly hangs from the core support ledge and is provided with lateral support by core support guides.

The vessel flange mates with the closure head flange. Closure studs are threaded into the vessel flange. Nuts and spherical washers hold the closure head in place on the studs. Two concentric, hollow, metallic O-rings between the closure head flange and the vessel flange form an inner and outer seal. A dynamic seal is formed by the compression of the closure studs and nuts on these O-rings and by the vessel's internal pressure. O-ring leakage is carried away by the vessel flange leak detection line. The O-rings are replaced each refueling outage.

The closure head is penetrated by one-inch pipes used for the head vent and reactor vessel level indication system and four-inch housings used for control rod drive mechanisms, instrumentation devices, and spares.

The reactor vessel is in the scope of license renewal because it meets 10 CFR 54.4(a)(1). The reactor vessel maintains the Reactor Coolant System pressure boundary and provides fission product boundaries, supports and contains the reactor core and core support structures, supports and contains the control rod drive mechanism internals, supports and guides reactor controls and instrumentation, and contains the reactor coolant around the reactor core and directs the coolant flow into the core and out into the reactor coolant piping and upper head. Additionally, the reactor vessel meets 10 CFR 54.4(a)(3) since it performs a function that supports compliance with 10 CFR 50.61, Fracture Toughness Requirements for Protection Against Pressurized Thermal Shock Events.

The evaluation boundary of the reactor vessel includes the shell, bottom head, closure head and vessel flange, nozzles and safe ends, penetrations, guide tubes and seal table, closure head stud assembly, and control rod drive mechanism pressure housings. Other non-pressure boundary subcomponents included that support intended functions are the core support guides, closure head lifting lugs, ventilation shroud support structure, and vessel support brackets. The supports for the reactor vessel are evaluated for aging management with NSSS Supports.

USAR Reference

Additional details of the reactor vessel can be found in the USAR, Chapter 4, Sections 3.2 and 7.6, and Appendix B, Table B.2-1.

License Renewal Drawings

The license renewal drawings for the reactor vessel are listed below:

LRXK-100-10

Subcomponents Subject to Aging Management Review

The subcomponents of the reactor vessel that require aging management review are indicated in Table 2.3.1-1, Reactor Vessel.

The aging management review results for these subcomponents are provided in Table 3.1.2-1: Reactor Vessel, Internals, and Reactor Coolant System - Reactor Vessel - Aging Management Evaluation.

2.3.1.2 REACTOR VESSEL INTERNALS

Component Description

The components of the reactor vessel internals are divided into three parts consisting of an upper core support structure that is removed during each refueling operation to obtain access to the reactor core, a lower core support structure, which includes the entire core barrel and thermal shield assembly that can be removed, if desired, following a complete core unload, and the in-core instrumentation support structure.

The upper core support structure consists of the upper support plate assembly (upper support plate and deep beam sections), and the upper core plate between which are contained the upper support columns and RCCA guide tubes.

The lower core support structure consists of the core barrel, core baffle, thermal shield, lower core plate, lower support columns and bolts, and lower support forging, which is welded to the core barrel.

The in-core instrumentation support structure consists of an upper system (upper instrumentation columns) to convey and support thermocouples penetrating the vessel through the head and a lower system, which is suspended below the lower core support structure. The lower system, which includes the BMI columns and contains the secondary core support assembly guides the flux thimble tubes into various core locations.

The reactor vessel internals are within the scope of license renewal since the components have intended functions that meet the criteria stated in 10 CFR 54.4(a)(1). The reactor vessel internals support the capability to shut down the reactor and maintain it in a safe shutdown condition by providing support and orientation of the reactor core (fuel assemblies), support, orientation, guidance, and protection of rod cluster control assemblies, a passageway for the distribution of reactor coolant flow to the reactor core, a passageway for support, guidance, and protection of in-core instrumentation, gamma and neutron shielding for the reactor vessel, and a secondary support structure for limiting the core support structure downward displacement. Additionally, the reactor vessel internals directly maintain the Reactor Coolant System pressure boundary (flux thimble tubes).

The evaluation boundary of the reactor vessel internals include the subcomponents that provide structural support, flow distribution, pressure boundary integrity, and gamma and neutron shielding for the reactor vessel, which includes the components of the upper core support structure, lower core support structure, and in-core instrumentation support structure.

USAR Reference

Additional details of the reactor vessel internals can be found in the USAR, Chapter 3, Section 3.2.3, Figure 3.2-3, Figure 3.2-6, and Figure 3.2-7.

License Renewal Drawings

None

Subcomponents Subject to Aging Management Review

The subcomponents of the reactor vessel internals that require aging management review are indicated in Table 2.3.1-2, Reactor Vessel Internals.

The aging management review results for these subcomponents are provided in Table 3.1.2-2: Reactor Vessel, Internals, and Reactor Coolant System - Reactor Vessel Internals - Aging Management Evaluation.

2.3.1.3 REACTOR COOLANT SYSTEM

System Description

The Reactor Coolant System transfers heat produced by the reactor core's nuclear reaction to the steam generators, where steam is generated to drive the turbine generator. Primary treated water is circulated through the core at a flow rate and temperature consistent with achieving the desired reactor core thermal-hydraulic performance. The primary treated water also acts as a neutron moderator, a reflector, and a solvent for the neutron absorber. The Reactor Coolant System provides a pressure boundary for containing the primary treated water. It also serves to confine radioactive material, and limits uncontrolled release to the secondary system and the other parts of the unit.

The Reactor Coolant System consists of two loops interconnected at the reactor vessel. Each loop consists of a reactor coolant pump, steam generator, and interconnecting piping. A pressurizer connected to Loop B provides a means for controlling Reactor Coolant System pressure. The Reactor Coolant System contains piping that allows filling, draining, sampling and venting of specific Reactor Coolant System components.

During operation, the Reactor Coolant System’s heat capacity attenuates thermal transients. The Reactor Coolant System accommodates coolant volume changes during normal operation and during anticipated transient conditions. The thermal-hydraulic effects resulting from loss of power to the reactor coolant pumps are reduced to acceptable levels by the inertia of the reactor coolant pumps, so that core damage does not result. The layout of the system ensures natural circulation following a loss-of-flow incident, to permit cooldown without overheating the core. Reactor Coolant System piping is used by the Safety Injection System to deliver cooling water to the core for emergency cooling during a loss-of-coolant accident.

The pressurizer is designed to accommodate in-surges and out-surges caused by load transients. During an in-surge caused by a decrease in load, the spray system condenses steam in the pressurizer to prevent the pressure from reaching the operating point of the power-operated relief valves. In addition, the pressurizer spray valves can be manually operated from the control room. The spray system provides a small continuous spray flow to ensure that the pressurizer liquid is homogenous with the coolant, and to limit thermal transients in the spray line and surge line piping.

During an out-surge caused by an increase in load, flashing of primary treated water to steam and generation of steam by automatic actuation of the electric heaters keep the pressure above the minimum allowable limit. The electrical heaters are also energized upon receipt of a high water level signal, to heat the subcooled primary treated water entering the pressurizer from the reactor coolant loop.

The Reactor Coolant System is in the scope of license renewal because it meets 10 CFR 54.4(a)(1). The safety-related intended functions of the Reactor Coolant

System are to provide fission product barriers including the fuel barrier and Reactor Coolant System pressure boundary, transfer heat from the reactor core to the Main Steam System, provide pressurizer pressure control and over-pressure protection, provide safety-related indication, provide a means of venting non-condensable gases from system high points after an accident, and provide a pressure boundary for the Component Cooling System. The Reactor Coolant System meets 10 CFR 54.4(a)(2) because the system contains non-safety-related components spatially oriented such that a failure could prevent the satisfactory accomplishment of a safety-related function of a safety-related system, structure or component, and contains components required to support safe shutdown in the event of a HELB. The system also meets 10 CFR 54.4(a)(2) criteria because the system contains non-safety-related piping that is attached to safety-related piping and that is seismically designed and supported up to and including the first structural anchor point beyond the safety-related/non-safety-related boundary. The Reactor Coolant System also meets 10 CFR 54.4(a)(3) because it contains EQ components and components that support fire protection, station blackout, and pressurized thermal shock.

The evaluation boundary of the Reactor Coolant System includes the piping, and components from the reactor pressure vessel nozzle safe-ends to the steam generator inlet nozzle safe-ends, and from the steam generator outlet nozzle safe-ends through the reactor coolant pump to the reactor vessel inlet nozzle safe-ends. The evaluation boundary includes the pressurizer surge line, pressurizer spray lines, and pressurizer and pressurizer subcomponents. It also includes the non-safety-related interconnecting system piping attached to safety-related piping out to and including the first structural anchor, and non-safety-related components with a spatial orientation near safety-related SSCs that are located in the Reactor Containment Vessel. The Reactor Vessel, reactor vessel internals, and Steam Generator are within the scope of License Renewal, but are evaluated separately.

<u>USAR Reference</u>

Additional details of the Reactor Coolant System can be found in the USAR, Sections 1.2.2, Chapter 4, and Appendix B, Table B.2-1.

License Renewal Drawings

The license renewal drawings for the Reactor Coolant System are listed below:

LRM-203
LRM-205
LRM-216
LRM-219
LRM-350
LRXK-100-10
LRXK-100-131
LRXK-100-18
LRXK-100-20
LRXK-100-28
LRXK-100-35
LRXK-100-44

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.1-3, Reactor Coolant.

The aging management review results for these components are provided in Table 3.1.2-3: Reactor Vessel, Internals, and Reactor Coolant System - Reactor Coolant - Aging Management Evaluation.

2.3.1.4 STEAM GENERATOR

Component Description

The NSSS utilizes two steam generators to transfer the heat generated in the Reactor Coolant System to the secondary system and produce steam at the warranted steam pressure and quality.

The lower portions of each steam generator were replaced with Westinghouse (model 54F) replacement units in 2001. Although similar in general design concept and capacity, the replacement steam generators utilize materials (alloy 690 tubes and stainless steel support plates) that have improved resistance to known corrosion issues affecting pressurized-water reactor steam generators. Additionally, the upper portions of each steam generator were refurbished. The refurbishment included installing a steam flow limiter inside the steam nozzle, installing a replacement feedring assembly with a welded thermal sleeve, feedwater nozzle improvements, and modifications to the moisture separation equipment.

Each steam generator is a recirculating-type vertical shell and tube heat exchanger, where heat transferred from a single-phase fluid at high temperature and pressure (the reactor coolant) on the tube side is used to generate a two-phase (steam-water) mixture at a lower temperature and pressure on the secondary side.

The reactor coolant coming from the reactor vessel enters the steam generator through a single nozzle into the primary channel head, flows through the inverted U-tubes, and exits through a nozzle in the primary channel head to the reactor coolant pump. The steam-water mixture, generated in the secondary side, flows upward through the moisture separators to the steam outlet nozzle at the top of the steam generator.

The steam generators are in the scope of license renewal since the steam generators have intended functions that meet the criteria stated in 10CFR54.4(a). The steam generators meet 10CFR54.4(a)(1) because they directly maintain the Reactor Coolant System pressure boundary, support the capability to shut down the reactor and maintain it in a safe shutdown condition, and limit the steam release rate during a steam line break transient. The steam generators meet 10CFR54.4(a)(2) because they contain non-safety-related subcomponents spatially oriented such that their failure could prevent the satisfactory accomplishment of a safety-related function. Additionally, the steam generators meet 10CFR54.4(a)(3) because they provide for core heat removal in support of station blackout and fire protection.

The evaluation boundary of the steam generator includes the subcomponents that provide pressure integrity, structural support, flow distribution, and steam flow restriction. The supports for the steam generators are evaluated for aging management with NSSS Supports.

USAR Reference

Additional details of the steam generator can be found in the USAR, Chapter 4, Chapter 10, and Appendix B, Table B.2-1, Table B.7-1, Sections B.3, and B.7.1.

License Renewal Drawings

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

LRXK-100-10

Subcomponents Subject to Aging Management Review

The subcomponents of the steam generator that require aging management review are indicated in Table 2.3.1-4, Steam Generator.

The aging management review results for these subcomponents are provided in Table 3.1.2-4: Reactor Vessel, Internals, and Reactor Coolant System - Steam Generator - Aging Management Evaluation.

Screening Results Tables: Reactor Coolant System

Table 2.3.1-1 Reactor Vessel

Subcomponent	Intended Function(s)
BMI Guide Tubes and Seal Table	Pressure Boundary, Structural Support
Bottom Head	Pressure Boundary, Structural Support
Bottom Head Instrument Tube Penetrations	Pressure Boundary, Structural Support
Closure Head	Pressure Boundary, Structural Support
Closure Head CRDM Head Penetrations	Pressure Boundary, Structural Support
Closure Head Instrument Tube and Spare CRDM Penetrations	Pressure Boundary, Structural Support
Closure Head Lifting Lugs and Ventilation Shroud Support Structure	Structural Support
Closure Head Stud Assembly Including Nuts and Washers	Pressure Boundary
Closure Head Vent and RVLIS Head Penetrations	Pressure Boundary, Structural Support
Core Support Guides	Structural Support
CRDM Pressure Housings	Pressure Boundary, Structural Support
Primary Nozzles	Pressure Boundary, Structural Support
Primary Nozzles Safe End	Pressure Boundary
Safety Injection Nozzle	Pressure Boundary
Upper, Intermediate and Lower Shell	Pressure Boundary

See Table 2.0-1 for definition of intended function.

Table 2.3.1-1 Reactor Vessel

Subcomponent	Intended Function(s)
Vessel Flange	Pressure Boundary, Structural Support
Vessel Flange Leakage Monitoring Lines	Pressure Boundary
Vessel Support Brackets	Structural Support

See Table 2.0-1 for definition of intended function.

Table 2.3.1-2 Reactor Vessel Internals

Subcomponent	Intended Function(s)
Baffle/former bolts	Structural Support
Baffle/former plates	Flow Distribution, Structural Support
BMI Columns	Structural Support
Clevis insert bolts	Structural Support
Clevis inserts	Structural Support
Core barrel	Flow Distribution, Structural Support
Core barrel flange	Structural Support
Core barrel outlet nozzles	Flow Distribution
Flux thimble tubes	Pressure Boundary
Head and vessel alignment pins	Structural Support
Hold-down spring	Structural Support
Lower core plate	Flow Distribution, Structural Support
Lower fuel alignment pins	Structural Support
Lower support column bolts	Structural Support
Lower support columns	Structural Support
Lower support forging	Flow Distribution, Structural Support
Radial support keys	Structural Support
RCCA guide tube bolts	Structural Support

See Table 2.0-1 for definition of intended function.

Table 2.3.1-2 Reactor Vessel Internals

Subcomponent	Intended Function(s)
RCCA guide tube support pins	Structural Support
RCCA guide tubes	Structural Support
Secondary core support assembly	Structural Support
Thermal shield	Enclosure Protection, Structural Support
Upper core plate	Flow Distribution, Structural Support
Upper core plate alignment pins	Structural Support
Upper fuel alignment pins	Structural Support
Upper instrumentation columns	Structural Support
Upper support column bolts	Structural Support
Upper support columns	Structural Support
Upper support plate assembly	Flow Distribution, Structural Support

See Table 2.0-1 for definition of intended function.

Table 2.3.1-3 Reactor Coolant

Component Type	Intended Function(s)
Bolting	Pressure Boundary
Condensing and Seal Chambers	Pressure Boundary
Flow Elements	Pressure Boundary
Flow Orifices	Pressure Boundary, Restricts Flow
Pipe	Pressure Boundary
Pressurizer	Pressure Boundary
Pressurizer Heater Sleeves and Sheaths[1]	Pressure Boundary
Pressurizer Integral Support[1]	Structural Support
Pressurizer Manway[1]	Pressure Boundary
Pressurizer Relief Tank	Pressure Boundary
Reactor Coolant Pumps	Pressure Boundary
Resistance Temperature Detectors	Pressure Boundary
Rupture Discs	Pressure Boundary
RxCP Motor Lower Bearing Oil Coolers[1]	Pressure Boundary
RxCP Motor Upper Bearing Oil Coolers[1]	Pressure Boundary
RxCP Thermal Barriers[1]	Pressure Boundary
Thermal Sleeves	Limit Thermal Cycling
Tubing	Pressure Boundary

See Table 2.0-1 for definition of intended function.

Table 2.3.1-3 Reactor Coolant

Component Type	Intended Function(s)
Valves	Pressure Boundary

1. This component is not shown on the Reactor Coolant System license renewal drawings.

See Table 2.0-1 for definition of intended function.

Table 2.3.1-4 Steam Generator

Subcomponent	Intended Function(s)
Anti-Vibration Bars	Structural Support
Channel Head	Pressure Boundary, Structural Support
Closure Ring	Structural Support
Divider Plate	Flow Distribution
Feedwater Inlet Ring and Supports	Pressure Boundary
Feedwater Inlet Ring J Nozzles	Pressure Boundary
Feedwater Nozzle	Pressure Boundary
Feedwater Nozzle Thermal Sleeve	Limit Thermal Cycling
Flow Distribution Baffle	Flow Distribution
Moisture Separator Assembly	Pressure Boundary
Primary Manway Bolting	Pressure Boundary
Primary Manway Cover and Diaphragm	Pressure Boundary
Primary Nozzles	Pressure Boundary
Primary Nozzles Safe End/Buttering	Pressure Boundary
Secondary Manway and Handhole Bolting	Pressure Boundary
Secondary Manway and Handhole Covers	Pressure Boundary
Secondary Side Nozzles (Except Main Steam and Feedwater)	Pressure Boundary

See Table 2.0-1 for definition of intended function.

Table 2.3.1-4 Steam Generator

Subcomponent	Intended Function(s)
Shell - Top Elliptical Head	Pressure Boundary
Shell - Upper, Lower and Transition Cone	Pressure Boundary
Steam Nozzle	Pressure Boundary
Steam Nozzle Flow Restrictor	Restricts Flow
Tube Bundle Support Hardware	Structural Support
Tube Plugs	Pressure Boundary
Tube Support Plates	Structural Support
Tube Wrapper	Flow Distribution, Structural Support
Tubes and Sleeves	Heat Transfer, Pressure Boundary
Tubesheet	Pressure Boundary

See Table 2.0-1 for definition of intended function.

2.3.2 ENGINEERED SAFETY FEATURES SYSTEMS

2.3.2.1 CONTAINMENT VESSEL INTERNAL SPRAY SYSTEM

System Description

The Containment Vessel Internal Spray System in conjunction with the Containment Cooling System, which is a subsystem of the Reactor Building Ventilation System, is designed to reduce Reactor Containment Vessel pressure during design basis accidents. Pressure reduction is accomplished by spraying treated borated water from spray nozzles located in the dome of the Reactor Containment Vessel. In addition to reducing Reactor Containment Vessel pressure, the Containment Vessel Internal Spray System is effective in scrubbing fission products from the Reactor Containment Vessel atmosphere. Initially, the Containment Vessel Internal Spray System is aligned to take suction from the refueling water storage tank. Caustic (NaOH) is added to the treated borated water to raise the pH upon an actuation of the Containment Vessel Internal Spray System. The addition of the caustic enhances the ability of the spray to scavenge fission products from the Reactor Containment Vessel atmosphere and preclude the possibility of stress corrosion cracking of the austenitic stainless steel components within the Reactor Containment Vessel.

After the refueling water storage tank is emptied, the Residual Heat Removal System is placed in the recirculation mode. During the recirculation mode of operation, the containment vessel internal spray pumps may be placed in series with the residual heat removal pumps and the residual heat removal heat exchangers to allow continued cooling and scrubbing of the Reactor Containment Vessel atmosphere.

The Containment Vessel Internal Spray System consists of two trains with a common suction line from the refueling water storage tank. Each train consists of a containment vessel internal spray pump, valves, interconnecting piping, and spray nozzles.

For the purpose of license renewal, portions of the Chemical Injection System are evaluated with the Containment Vessel Internal Spray System.

The Containment Vessel Internal Spray System is in the scope of license renewal since the system has intended functions that meet the criteria stated in 10CFR54.4(a). The system meets 10CFR54.4(a)(1) because the system removes heat from the Reactor Containment Vessel via refueling water storage tank water spray, provides spray scrubbing of the post-accident Reactor Containment Vessel atmosphere to limit fission product release and control chloride stress corrosion cracking, provides Reactor Containment Vessel pressure boundary integrity/isolation, provides safety-related indication, controls, and protection, and provides caustic (NaOH) in order to maintain recirculation water in the Reactor Containment Vessel following a LOCA at a pH greater than 7.0.

The Containment Vessel Internal Spray System meets 10CFR54.4(a)(2) because the system contains non-safety-related components spatially oriented such that their failure could prevent the satisfactory accomplishment of a safety-related function associated with a safety-related system, structure or component. The system contains non-safety-related piping that is attached to safety-related piping and that is seismically designed and supported up to and including the first structural anchor point beyond the safety-related/non-safety-related boundary. The Containment Vessel Internal Spray System meets 10CFR54.4(a)(3) because the system includes EQ components.

The evaluation boundary for the Containment Vessel Internal Spray System components subject to aging management review includes components that extend from the refueling water storage tank and caustic additive standpipe through the spray nozzles. The evaluation boundary for the Containment Vessel Internal Spray System also includes non-safety-related components with a spatial orientation near a safety-related system, structure or component located in the Auxiliary Building or the Reactor Containment Vessel. Included in the evaluation boundary are components that are relied upon to provide structural seismic support.

USAR Reference

Additional details of the Containment Vessel Internal Spray System can be found in the USAR, Sections 1.2, 1.2.8, 1.3.4, 1.3.7, 1.5.5, 1.6.1, 1.8 (Item VII), 5.1.1, 5.4.3, 6.4, and Table B.2-1.

License Renewal Drawings

The license renewal drawings for the Containment Vessel Internal Spray System are listed below:

LRM-217

LRXK-100-131
LRXK-100-20
LRXK-100-29

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.2-1, Containment Vessel Internal Spray.

The aging management review results for these components are provided in Table 3.2.2-1: Engineered Safety Features - Containment Vessel Internal Spray - Aging Management Evaluation.

2.3.2.2 SAFETY INJECTION SYSTEM

System Description

The Safety Injection System provides a source of treated borated water to the Reactor Coolant System in the event of a design basis accident to ensure that there is an adequate shutdown margin and to cool the core.

The Safety Injection System consists of two independent trains, each consisting of a safety injection pump with a pressurized lube oil subsystem, and interconnecting piping. The safety injection pumps, which have a design shutoff head of approximately 2210 psig, are used to deliver water to the Reactor Coolant System from the refueling water storage tank during the injection phase and from the residual heat removal pumps during the recirculation phase. The safety injection pumps inject treated borated water into the Reactor Coolant System when the Reactor Coolant System pressure decreases below the shutoff head of the safety injection pumps.

The Safety Injection System also contains the safety injection accumulators. The purpose of the safety injection accumulators is to provide rapid refilling of the lower reactor core plenum in the event of a large break in the Reactor Coolant System. Each safety injection accumulator is pressurized with nitrogen and filled to a preset level with treated borated water. If the Reactor Coolant System pressure falls below the safety injection accumulator pressure, the treated borated water is injected into the Reactor Coolant System. The safety injection accumulators are passive components in the Safety Injection System. They fulfill their purpose without operator action, component repositioning, or electrical power.

The Safety Injection System is in the scope of license renewal since the system has intended functions that meet the criteria stated in 10CFR54.4(a). The system meets 10CFR54.4(a)(1) because it provides automatic or manual high-head injection of treated borated water to the Reactor Coolant System following a design basis accident to cool the core, provides passive injection of treated borated water to the Reactor Coolant System following an accident to cool the core, provides high-head injection of water that is recirculated from the Reactor Containment Vessel sump via the Residual Heat Removal System, provides a pressure boundary for the Reactor Coolant System, provides Reactor Containment Vessel pressure boundary integrity/isolation, and provides safety-related indication, controls, and protection.

The Safety Injection System meets 10CFR54.4(a)(2) because the system contains non-safety-related components spatially oriented such that their failure could prevent the satisfactory accomplishment of a safety-related function of a safety-related system, structure or component, and contains components required to support safe shutdown in the event of a HELB. The system contains non-safety-related piping that is attached to safety-related piping and that is seismically designed and supported up to and including the first structural anchor point beyond the safety-related/non-safety-related boundary. The Safety Injection System meets 10CFR54.4(a)(3) because the system includes EQ components and components that support fire protection.

The evaluation boundary for the Safety Injection System components subject to aging management review includes components that extend from the refueling water storage tank through the safety injection pumps, and to the Reactor Coolant System. The evaluation boundary includes the safety injection accumulators, and non-safety-related components with a spatial orientation near a safety-related system, structure or component located in the Auxiliary Building or Reactor Containment Vessel. The evaluation boundary also includes valve enclosures and components that are relied upon to provide structural seismic support.

USAR Reference

Additional details of the Safety Injection System can be found in the USAR, Sections 1.2, 1.3.7, 1.5, 5.1, 6.2, 6.3, 6.4, 7.5, 9.3, and Table B.2-1.

License Renewal Drawings

The license renewal drawings for the Safety Injection System are listed below:

LRM-202-2
LRM-216
LRM-217
LRM-218
LRM-350
LRXK-100-10
LRXK-100-131
LRXK-100-18
LRXK-100-20
LRXK-100-28
LRXK-100-29
LRXK-100-36
LRXK-100-38

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.2-2, Safety Injection.

The aging management review results for these components are provided in Table 3.2.2-2: Engineered Safety Features - Safety Injection - Aging Management Evaluation.

2.3.2.3 RESIDUAL HEAT REMOVAL SYSTEM

System Description

The Residual Heat Removal System is a dual purpose system, operating as a portion of the low pressure Safety Injection System during normal operations, and removing decay heat during plant cooldown and shutdown/refueling operations. Normally, the refueling water storage tank is aligned to the suction of the residual heat removal pumps and automatically injects treated borated water into the Reactor Coolant System for cooling under design basis accident conditions. The Residual Heat Removal System enters the recirculation mode of operation where the residual heat removal pumps automatically take suction from Reactor Containment Vessel

Sump B after the refueling water storage tank is depleted. The contents of Reactor Containment Vessel Sump B is cooled in the residual heat removal heat exchangers and pumped back to the Reactor Coolant System using the discharge head of the residual heat removal pumps or the safety injection pumps. There is also the option to align the recirculated flow of the Reactor Containment Vessel sump to the Containment Vessel Internal Spray System.

The Residual Heat Removal System may be used to transfer refueling water between the refueling cavity and the refueling water storage tank at the beginning and end of refueling operations. It may also provide backup cooling for the spent fuel pool.

The Residual Heat Removal System consists of two 100 percent capacity redundant trains. Each train consists of a residual heat removal pump, heat exchanger, piping, valves and instrumentation.

The Residual Heat Removal System is in the scope of license renewal since the system meets 10CFR54.4(a). The system meets 10CFR54.4(a)(1) because the Residual Heat Removal System provides low-head safety injection of refueling water storage tank water into the reactor vessel head, provides long term cooling and recirculation of coolant from the Reactor Containment Vessel Sump B to the safety injection pumps, containment vessel internal spray pumps and for low pressure injection directly into the reactor vessel, provides Reactor Containment Vessel pressure boundary integrity/isolation, provides safety-related indication, controls, and protection, provides low temperature overpressure protection for the Reactor Coolant System during shutdown conditions, and provides a pressure boundary for the Reactor Coolant System.

The Residual Heat Removal System meets 10CFR54.4(a)(2) because the system contains non-safety-related components spatially oriented such that their failure could prevent the satisfactory accomplishment of a safety-related function associated with a safety-related system, structure or component. The system contains non-safety-related piping that is attached to safety-related piping and that is seismically designed and supported up to and including the first structural anchor point beyond the safety-related/non-safety-related boundary. The Residual Heat Removal System meets 10CFR54.4(a)(3) because the system includes EQ components and components that support fire protection.

The evaluation boundary for the Residual Heat Removal System components subject to aging management review includes components that extend from the Reactor Coolant System piping through the residual heat removal pumps, heat exchangers, piping and back to the Reactor Coolant System. The evaluation boundary includes non-safety-related components with a spatial orientation near a safety-related system, structure or component located in the Auxiliary Building or the Reactor Containment Vessel. Included in the evaluation boundary are components that are relied upon to provide structural support.

USAR Reference

Additional details of the Residual Heat Removal System can be found in the USAR, Sections 6.2, 6.4, and Table B.2-1.

License Renewal Drawings

The license renewal drawings for the Residual Heat Removal System are listed below:

- LRM-217
- LRM-218
- LRM-350
- LRXK-100-10
- LRXK-100-18
- LRXK-100-19
- LRXK-100-20
- LRXK-100-28
- LRXK-100-29
- LRXK-100-36
- LRXK-100-44

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.2-3, Residual Heat Removal.

The aging management review results for these components are provided in Table 3.2.2-3: Engineered Safety Features - Residual Heat Removal - Aging Management Evaluation.

Screening Results Tables: Engineered Safety Features Systems

Table 2.3.2-1 Containment Vessel Internal Spray

Component Type	Intended Function(s)
Bolting	Pressure Boundary
Caustic Additive Filter Housing	Pressure Boundary
Caustic Additive Recirculation & Fill Pump	Pressure Boundary
Caustic Additive Standpipe	Pressure Boundary
Caustic Fill Tank	Pressure Boundary
Containment Spray Pump Gland Seal Coolers	Heat Transfer, Pressure Boundary
Containment Spray Pumps	Pressure Boundary
Flow Elements	Pressure Boundary
Flow Orifices	Pressure Boundary, Restricts Flow
Pipe	Pressure Boundary
Spray Nozzles	Spray Pattern
Tubing	Pressure Boundary
Valves	Pressure Boundary

See Table 2.0-1 for definition of intended function.

Table 2.3.2-2 Safety Injection

Component Type	Intended Function(s)
Accumulators	Pressure Boundary
Bolting	Pressure Boundary
Flow Elements	Pressure Boundary
Flow Indicators	Pressure Boundary
Flow Orifices	Pressure Boundary, Restricts Flow
Pipe	Pressure Boundary
Reactor Containment Vessel Sump Strainers	Filtration
Refueling Water Storage Tank	Pressure Boundary
Safety Injection Pump Gland Seal Coolers	Heat Transfer, Pressure Boundary
Safety Injection Pump Lube Oil Coolers[1]	Heat Transfer, Pressure Boundary
Safety Injection Pumps	Pressure Boundary
SI Pump Lube Oil Reservoirs	Pressure Boundary
Sight Glass	Pressure Boundary
Tubing	Pressure Boundary
Valve Enclosures	Pressure Boundary
Valves	Pressure Boundary

1. This component is short-lived.

See Table 2.0-1 for definition of intended function.

Table 2.3.2-3 Residual Heat Removal

Component Type	Intended Function(s)
Bolting	Pressure Boundary
Expansion Tanks	Pressure Boundary
Flow Elements	Pressure Boundary
Miniflow Orifice	Pressure Boundary, Restricts Flow
Pipe	Pressure Boundary
Residual Heat Exchangers	Heat Transfer, Pressure Boundary
Residual Heat Removal Pumps	Pressure Boundary
Rupture Disks	Pressure Boundary
Shaft Seal Heat Exchangers	Heat Transfer, Pressure Boundary
Tubing	Pressure Boundary
Valves	Pressure Boundary

See Table 2.0-1 for definition of intended function.

2.3.3 AUXILIARY SYSTEMS

2.3.3.1 NEW FUEL STORAGE

System Description

New fuel assemblies are stored in a vertical rack in a dry pit adjacent to the spent fuel pool. The new fuel storage rack is a Class I structure and has storage positions for 44 new fuel assemblies.

The new fuel storage rack is in the scope of license renewal since the rack has an intended function that meets the criteria stated in 10CFR54.4(a). The new fuel storage rack meet 10CFR54.4(a)(1) because they provide storage for new fuel assemblies and maintain a subcritical configuration.

The evaluation boundary of the new fuel storage rack structural members subject to aging management review extends from where the rack is bolted to the new fuel storage pit floor to the top of the rack.

FSAR Reference

Additional details of new fuel storage can be found in the USAR, Sections 9.5.1, 9.5.2, Table 9.5-1 and Table B.2-1.

License Renewal Drawings

None

Components Subject to AMR

The new fuel storage structural members that require aging management review are indicated in Table 2.3.3-1, New Fuel Storage.

The aging management review results for these structural members are provided in Table 3.3.2-1, New Fuel Storage - Aging Management Evaluation.

2.3.3.2 SPENT FUEL STORAGE

System Description

The spent fuel assemblies are stored in high-density vertical Class I storage racks in the north and south spent fuel pools, and in the north end of the fuel transfer canal pool.

The north and south spent fuel pool storage racks are constructed with boron carbide neutron absorber plates located between a stainless steel inner and outer wall. These spent fuel racks have been modified to allow venting of the space that contains the boron carbide neutron absorber plate to prevent bulging of the stainless steel inner and outer walls.

The fuel transfer canal pool storage racks are constructed with Boral neutron absorber plates between a stainless steel inner and outer wall. These racks have been designed such that the enclosures that contain the Boral are vented.

The north spent fuel pool storage racks can accommodate 270 spent fuel assemblies, the south spent fuel pool storage racks can accommodate 720 spent fuel assemblies and the fuel transfer canal pool storage racks can accommodate 215 spent fuel assemblies.

The spent fuel storage racks are in the scope of license renewal since the racks have an intended function that meets the criteria stated in 10CFR54.4(a). The spent fuel storage racks meet 10CFR54.4(a)(1) because they provide storage for spent fuel assemblies and maintain a subcritical configuration.

The evaluation boundary of the Spent Fuel Storage System components subject to aging management review includes the spent fuel racks in the north spent fuel pool, south spent fuel pool, and fuel transfer canal pool up to and including where the racks rest on the pool liners.

USAR Reference

Additional details of spent fuel storage can be found in the USAR, Sections 9.5.1, 9.5.2, Table 9.5-1 and Table B.2-1.

License Renewal Drawings

None

Components Subject to AMR

The spent fuel storage structural members that require aging management review are indicated in Table 2.3.3-2, Spent Fuel Storage.

The aging management review results for these structural members are provided in Table 3.3.2-2, Spent Fuel Storage - Aging Management Evaluation.

2.3.3.3 SPENT FUEL POOL COOLING SYSTEM

System Description

The Spent Fuel Pool Cooling System is designed to remove the decay heat from fuel stored in the spent fuel pool, such that the temperature of the spent fuel pool is maintained within design temperature limits. The spent fuel pool pumps draw water from the pool, circulate it through filters and a heat exchanger, and then returns the cooled water to the spent fuel pool. Alternate cooling of the spent fuel pool can be provided by a residual heat removal heat exchanger. Additionally, connections to the Service Water System are provided that allow emergency makeup water to the spent fuel pool. The Spent Fuel Pool Cooling System also provides water cleanup capability following refueling.

The Spent Fuel Pool Cooling System is in the scope of license renewal since the system has intended functions that meet the criteria stated in 10CFR54.4(a). The Spent Fuel Pool Cooling System meets 10CFR54.4(a)(1) because the system provides a pressure boundary for the spent fuel pool and the refueling water storage tank and provides a flow path for emergency makeup to the spent fuel pool from the Service Water System. The Spent Fuel Pool Cooling System meets 10CFR54.4(a)(2) because the system contains non-safety-related components spatially oriented such that their failure could prevent the satisfactory accomplishment of a safety-related function associated with a safety-related system, structure, or component. The system also contains non-safety-related piping that is attached to safety-related piping and that is seismically designed and supported up to and including the first structural anchor point beyond the safety-related/non-safety-related boundary. Additionally, the system provides heat removal from the spent fuel pool.

The evaluation boundary for the Spent Fuel Pool Cooling System components subject to aging management review includes the spent fuel pool pumps, refueling water purification pump, spent fuel pool heat exchanger, spent fuel pool filters, demineralizer, pre- and post-filters, and associated piping and valves. The evaluation boundary includes non-safety-related components with a spatial orientation near a safety-related system, structure, or component located in the Auxiliary Building. Included in the boundary are components that are relied upon to provide structural seismic support. The spent fuel pool liner is evaluated for aging management with the Auxiliary Building structure.

USAR Reference

Additional details of the Spent Fuel Pool Cooling System can be found in the USAR, Section 9.3.1, Table 9.3-3 and Table B.2-1, and Figure 9.3-4.

License Renewal Drawings

The license renewal drawings for the Spent Fuel Pool Cooling System are listed below:

LRM-202-2
LRM-209-2
LRM-218
LRM-350
LRXK-100-18
LRXK-100-29
LRXK-100-44

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.3-3, Spent Fuel Pool Cooling.

The aging management review results for these components are provided in Table 3.3.2-3, Spent Fuel Pool Cooling - Aging Management Evaluation.

2.3.3.4 FUEL HANDLING SYSTEM

System Description

The Fuel Handling System is comprised of light load handling cranes and devices used to support refueling activities. Fuel Handling System light load handling cranes and devices within the scope of license renewal are listed below:

- Auxiliary Building fuel upending rig winch
- Fuel pool bridge crane
- Fuel transfer equipment
- Manipulator crane

The light load handling cranes and devices for the Fuel Handling System that support refueling activities are in the scope of license renewal since their structural members have intended functions that meet the criteria stated in 10CFR54.4(a). The Fuel Handling System meets 10CFR54.4(a)(1) because the system contains safety-related components that handle and store fuel. The Fuel Handling System meets 10CFR54.4(a)(2) because the light load handling cranes and devices have structural members whose failure could affect the function of safety-related systems, structures and components.

The evaluation boundary for Fuel Handling System cranes and devices components subject to aging management review is limited to those load-bearing elements that support the lift in a passive manner. The fuel transfer tube and gate valve are evaluated for aging management with the Reactor Containment Vessel structure.

USAR Reference

Additional details for the Fuel Handling System light load handling cranes and devices can be found in the USAR, Section 9.5.2, 9.5.3, Figure 1.2-8, Figure 9.5-1, Figure 9.5-2, and Table B.2-1.

License Renewal Drawings

None

Components Subject to AMR

The Fuel Handling structural members that require aging management review are indicated in Table 2.3.3-4, Fuel Handling.

The aging management review results for these structural members are provided in Table 3.3.2-4, Fuel Handling - Aging Management Evaluation.

2.3.3.5 CRANES (EXCLUDING FUEL HANDLING) SYSTEM

System Description

The Cranes (excluding fuel handling) System is comprised of load handling cranes and devices provided throughout the plant to support operation and maintenance activities. The Cranes (excluding fuel handling) System includes the following load handling cranes and devices within the scope of license renewal:

- Polar crane
- Auxiliary Building crane

- Turbine Building crane
- Reactor Building Pedestal crane
- Diesel Generator 1A and 1B monorails
- Shield Building Annulus trolley
- Boric acid concentrates filter hoist
- Filter room hoist

The Cranes (excluding fuel handling) System is within in the scope of license renewal since the load handling cranes and devices have structural members with intended functions that meet the criteria stated in 10CFR54.4(a). The Cranes (excluding fuel handling) System meets 10CFR54.4(a)(2) because the load handling cranes and devices have structural members whose failure could affect the function of safety-related systems, structures and components.

The evaluation boundary for Cranes (excluding fuel handling) System components subject to aging management review is limited to those load-bearing elements that support the lift in a passive manner, such as the structural members that make up the bridge and trolley. The structural support steel and runway girders are evaluated with the structure serviced by the crane.

USAR Reference

Additional details for the Cranes (excluding fuel handling) System load handling cranes and devices can be found in the USAR, Sections 5.2.1, 9.5.2, B.8 and Table B.2-1

License Renewal Drawings

None

Components Subject to AMR

The Cranes (excluding fuel handling) System structural members that require aging management review are indicated in Table 2.3.3-5, Cranes (Excluding Fuel Handling).

The aging management review results for these structural members are provided in Table 3.3.2-5, Cranes (Excluding Fuel Handling) - Aging Management Evaluation.

2.3.3.6 SERVICE WATER SYSTEM

System Description

The Service Water System is an open-cycle cooling water system that provides cooling water from the Screenhouse forebay to various safety-related and non-safety-related components. Water in the forebay is filtered by traveling water screens prior to entering the service water pumps. The Service Water System is designed with two redundant headers, each capable of providing all anticipated normal and post-accident heat removal requirements. The major equipment cooled by service water includes the containment fan coil units, control room chillers, component cooling heat exchangers, and the emergency diesel generators. Service water is also supplied to the fire protection jockey pump and fire protection hose stations in the Auxiliary Building. The Service Water System provides an alternate source of feedwater to the steam generators, via the auxiliary feedwater pumps, and a source of emergency makeup water to the spent fuel pool and Component Cooling System.

For the purpose of license renewal, portions of the Chemical Injection System are evaluated with the Service Water System.

The Service Water System is in the scope of license renewal since the system has intended functions that meet the criteria stated in 10CFR54.4(a). The Service Water System meets 10CFR54.4(a)(1) because the system provides cooling water to safety-related equipment, automatically isolates service water to the Turbine Building following an accident to ensure cooling to safety-related loads, provides safety-related indication, controls, and protection, provides Reactor Containment Vessel pressure boundary integrity/isolation, provides emergency makeup to the Component Cooling System and Spent Fuel Pool, and provides an emergency source of water to the auxiliary feedwater pumps suction. The Service Water System meets 10CFR54.4(a)(2) because the system contains non-safety-related components spatially oriented such that their failure could prevent the satisfactory accomplishment of a safety-related function associated with a safety-related system, structure, or component, and contains components required to support safe shutdown in the event of a HELB. The system also contains non-safety-related piping that is attached to safety-related piping and that is seismically designed and supported up to and including the first structural anchor point beyond the safety-related/non-safety-related boundary. Additionally, the traveling water screens prevent debris from entering the Service Water System. The system meets 10CFR54.4(a)(3) because the system includes EQ components and components that support fire protection.

The evaluation boundary for the Service Water System components subject to aging management review includes piping, valves, and other components from the traveling water screens to the various heat loads and out to the Discharge Tunnel and Pipe. The evaluation boundary includes non-safety-related components with a spatial orientation near a safety-related system, structure, or component located in the Reactor Containment Vessel, Shield Building, Screenhouse, Turbine Building, or Auxiliary Building. Included in the boundary are components that are relied upon to provide structural seismic support.

Coolers and heat exchangers cooled by service water are not evaluated as part of the Service Water System. These components are evaluated for aging management with their associated systems. The passive portion of the traveling water screen (frames and covers) are evaluated for aging management with the Screenhouse structure.

USAR Reference

Additional details of the Service Water System can be found in the USAR, Sections 6.2, 6.3.1, 6.4.1, 6.6.2, 9.6.2, Table 6.2-9, Table B.2-1, Figure 9.6-1, Figure 9.6-2, Figure 9.6-3 and Figure 9.6-4.

License Renewal Drawings

The license renewal drawings for the Service Water System are listed below:

LRM-1274
LRM-202-1
LRM-202-2
LRM-202-3
LRM-208-1
LRM-213-1
LRM-213-9
LRM-215
LRM-218
LRM-219

LRM-394
LRM-436
LRM-547
LRM-588
LRM-605-1
LRM-606
LRXK-100-19
LRXK-100-400
LRXK-100-829

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.3-6, Service Water.

The aging management review results for these components are provided in Table 3.3.2-6, Service Water - Aging Management Evaluation.

2.3.3.7 COMPONENT COOLING SYSTEM

System Description

The Component Cooling System is a closed-cycle cooling water system that acts as an intermediate cooling loop between the NSSS heat loads and the Service Water System. Some of the major components cooled by the system include the RHR heat exchangers, reactor coolant pumps, letdown and seal water heat exchangers, and primary sample coolers. During normal operation, one component cooling pump and both component cooling heat exchangers are in service to accommodate the heat loads.

Heat from the Component Cooling System is transferred to the Service Water System. The component cooling surge tank accommodates expansion, contraction and in-leakage of water. A radiation monitor is provided to detect radioactive in-leakage. Demineralized water is the normal source of makeup water to the Component Cooling System, although the Service Water System can be used as an emergency source of makeup water.

The Component Cooling System is in the scope of license renewal since the system has intended functions that meet the criteria stated in 10CFR54.4(a). The

Component Cooling System meets 10CFR54.4(a)(1) because the system provides cooling water to safety-related equipment, provides a means of isolating the reactor coolant pump thermal barrier return line in the event of a thermal barrier heat exchanger leak to prevent Component Cooling System overpressurization and to limit the amount of reactor coolant released to the Component Cooling System, provides a pressure boundary for cooling water supplied to non-safety related loads, provides safety-related indications, controls, and protection, and provides Reactor Containment Vessel pressure boundary integrity/isolation. The Component Cooling System meets 10CFR54.4(a)(2) because the system contains non-safety-related components spatially oriented such that their failure could prevent the satisfactory accomplishment of a safety-related function associated with a safety-related system, structure, or component. The system also contains non-safety-related piping that is attached to safety-related piping and that is seismically designed and supported up to and including the first structural anchor point beyond the safety-related/non-safety-related boundary. The system meets 10CFR54.4(a)(3) because the system includes EQ components and components that support fire protection.

The evaluation boundary for the Component Cooling System components subject to aging management review includes the component cooling surge tank, piping, valves, and other components from the discharge of the component cooling pumps and component cooling heat exchangers to the various heat loads and back to the suction of the component cooling pumps. The evaluation boundary includes non-safety-related components with a spatial orientation near a safety-related system, structure, or component located in the Reactor Containment Vessel, Shield Building, Turbine Building, or Auxiliary Building. Included in the boundary are components that are relied upon to provide structural seismic support. Coolers and heat exchangers cooled by component cooling water are not evaluated as part of the Component Cooling System. These components are evaluated for aging management with their associated systems.

USAR Reference

Additional details of the Component Cooling System can be found in the USAR, Sections 9.3.1, Table 9.3-1, Table 9.3-5, Table B.2-1, Figure 9.3-1, Figure 9.3-2 and Figure 9.3-3.

License Renewal Drawings

The license renewal drawings for the Component Cooling System are listed below:

LRM-202-2
LRM-217
LRXK-100-131
LRXK-100-132
LRXK-100-18
LRXK-100-19
LRXK-100-20
LRXK-100-29
LRXK-100-35
LRXK-100-36
LRXK-100-400
LRXK-100-44
LRXK-100-829

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.3-7, Component Cooling.

The aging management review results for these components are provided in Table 3.3.2-7, Component Cooling - Aging Management Evaluation.

2.3.3.8 STATION AND INSTRUMENT AIR SYSTEM

System Description

The Station and Instrument Air System provides a reliable source of oil-free compressed air at the proper pressure to supply air-operated valves, instruments, hose connections, and other miscellaneous components. The major components of the system include two high-capacity air compressors, three low-capacity air compressors, and three instrument air dryers with associated filters.

Compressed air is mechanically dried and filtered prior to entering the instrument air headers. The dryers and associated filters remove moisture and particulate matter, which minimizes internal corrosion of instrument air header components. The system includes backup air supplies (i.e., accumulators) to specific valves.

The Station and Instrument Air System is in the scope of license renewal since the system has intended functions that meet the criteria stated in 10CFR54.4(a). The Station and Instrument Air System meets 10CFR54.4(a)(1) because the system provides Reactor Containment Vessel pressure boundary integrity/isolation and provides a backup air supply to essential air operated valves and dampers. The Station and Instrument Air System meets 10CFR54.4(a)(2) because the system contains non-safety-related piping that is attached to safety-related piping and that is seismically designed and supported up to and including the first structural anchor point beyond the safety-related/non-safety-related boundary. The system also provides a control room pressure boundary function, supports post-LOCA hydrogen control, and provides a flow path for nitrogen to the Spent Fuel Pool gate inflatable seals. The system meets 10CFR54.4(a)(3) because the system includes EQ components and components that support fire protection and station blackout.

The evaluation boundary for the Station and Instrument Air System components subject to aging management review includes the low capacity air compressors (1A, 1B, and 1C), air dryers 1A and 1C, and associated piping, valves, and instrumentation. Instrument air components associated with certain control valves having backup accumulators are also in scope. Included in the boundary are components that are relied upon to provide structural seismic support.

USAR Reference

Additional details of the Station and Instrument Air System can be found in the USAR, Table B.2-1.

License Renewal Drawings

The license renewal drawings for the Station and Instrument Air System are listed below:

LRM-208-2
LRM-213-1
LRM-213-2
LRM-213-3
LRM-213-4
LRM-213-5
LRM-213-6

LRM-213-7
LRM-213-8
LRM-403
LRM-603

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.3-8, Station and Instrument Air.

The aging management review results for these components are provided in Table 3.3.2-8, Station and Instrument Air - Aging Management Evaluation.

2.3.3.9 CHEMICAL AND VOLUME CONTROL SYSTEM

System Description

The Chemical and Volume Control System provides a method for controlling the inventory, boration and chemistry of the Reactor Coolant System and supplies seal injection flow for the reactor coolant pumps. In addition, the system provides a method for boron recovery and emergency boration.

The charging and letdown flow is not required for accident mitigation or to achieve/maintain safe shutdown conditions subsequent to an accident. The Chemical and Volume Control System provides an alternate and preferred means of emergency boration during post-shutdown and accident conditions.

For the purpose of license renewal, portions of the Chemical Injection System are evaluated with the Chemical and Volume Control System.

The Chemical and Volume Control System is in the scope of license renewal since the system has intended functions that meet the criteria stated in 10CFR54.4(a). The system meets 10CFR54.4(a)(1) because the system provides a pressure boundary for the Reactor Coolant System and Component Cooling System, provides Reactor Containment Vessel pressure boundary integrity/isolation, provides pressure boundary to prevent an additional release of radiation during plant accidents, and provides safety-related indications, controls, and protection. The Chemical and Volume Control System meets 10CFR54.4(a)(2) because the system contains non-safety-related components spatially oriented such that failure could prevent the satisfactory accomplishment of a safety-related function associated with a safety-related system, structure or component, and contains components required to support safe shutdown in the event of a HELB. The system also contains non-safety-related piping that is attached to safety-related piping and that is seismically designed and supported up to and including the structural anchor point beyond the safety-related/non-safety-related boundary. The system meets 10CFR54.4(a)(3) because the system includes EQ components and components that support fire protection and station blackout.

The evaluation boundary of the Chemical and Volume Control System components subject to aging management review includes components that extend from the Reactor Coolant System through the Chemical and Volume Control System and back to the Reactor Coolant System. This includes components related to Reactor Coolant System letdown and makeup, reactor coolant pump seal leak-off, reactor coolant pump seal injection, and boric acid recovery. The evaluation boundary also includes non-safety-related components with a spatial orientation near a safety-related system, structure or component located in the Auxiliary Building or the Reactor Containment Vessel; and components that are relied upon to provide structural seismic support.

USAR Reference

Additional details of the Chemical Volume and Control System can be found in the USAR, Sections 1.3.5, 7.3, 7.7, 9.2, 11.1, 14.1.4, Appendix D, and Table B.2-1.

License Renewal Drawings

The license renewal drawings for the Chemical and Volume Control System are listed below:

LRM-216
LRM-218
LRM-350
LRM-368
LRM-385
LRM-605-1
LRXK-100-10
LRXK-100-131
LRXK-100-132

LRXK-100-18
LRXK-100-19
LRXK-100-20
LRXK-100-29
LRXK-100-35
LRXK-100-36
LRXK-100-37
LRXK-100-38
LRXK-100-400
LRXK-100-44

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.3-9, Chemical and Volume Control.

The aging management review results for these components are provided in Table 3.3.2-9, Chemical and Volume Control - Aging Management Evaluation.

2.3.3.10 CONTROL ROOM AIR CONDITIONING SYSTEM

System Description

The Control Room Air Conditioning System conditions the air in the control room, relay room, Shift Managers office, Central Alarm Station room, and the mechanical equipment room above the control room for personnel comfort and equipment cooling. The normal air supply is from the Auxiliary Building Air Conditioning System air intake. The emergency air supply is from the Auxiliary Building Ventilation System air intake. The control room is kept under a positive pressure with respect to the Turbine and Auxiliary Buildings in order to prevent in-leakage.

The system consists of two 100% capacity air conditioning units, which filter and cool air supplied to the control room, relay room, and mechanical equipment rooms. At the inlet to each air conditioner unit is a high efficiency filter, which removes most particulate matter from the air stream. Humidification of the air supply to the control room, Shift Managers office, and the relay room is provided. The fresh air is pre-heated, as needed, by heating coils supplied by hot water from the Auxiliary Building hot water converter.

Each air conditioning unit is supplied with chilled water from a water chiller package consisting of compressors, evaporator, condensers, expansion tank, and chiller pump. The condensers are cooled by the Service Water System.

The Control Room Air Conditioning System is in the scope of license renewal since the system has intended functions that meet the criteria stated in 10CFR54.4(a). The system meets 10CFR54.4(a)(1) because the system provides cooling air to the Control Room Environmental Zone, provides for post-accident recirculation and air filtration, maintains Zone SV pressure boundary integrity, and provides safety-related indications, controls, and protection. The system meets 10CFR54.4(a)(2) because the system contains components required to support safe shutdown in the event of a HELB. The system meets 10CFR54.4(a)(3) because the system contains components that support EQ and fire protection.

The evaluation boundary for the Control Room Air Conditioning System components subject to aging management review includes the dampers, ductwork, filters, and fans that provide controlled air ventilation to the Control Room Environmental Zone boundary during normal and post-accident recirculation operation. This includes the refrigerant units (chillers), cooling coils, heaters and humidifier necessary to provide a habitable environment for personnel and equipment during normal and post-accident recirculation modes.

USAR Reference

Additional details of the Control Room Air Conditioning System can be found in the USAR, Sections 9.6.4, 10A.3.3, 10A.4.3, 11.2.4, and Table B.2-1.

License Renewal Drawings

The license renewal drawings for the Control Room Air Conditioning System are listed below:

LRM-588
LRM-603
LRM-605-1
LRM-606

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.3-10, Control Room Air Conditioning.

The aging management review results for these components are provided in Table 3.3.2-10, Control Room Air Conditioning - Aging Management Evaluation.

2.3.3.11 AUXILIARY BUILDING AIR CONDITIONING SYSTEM

System Description

The Auxiliary Building Air Conditioning System maintains environmental conditions as required for personnel comfort in occupied areas of the Auxiliary Building. The chiller is a package unit consisting of a compressor, a condenser, and an evaporator. The condenser is water cooled by the Service Water System using a chiller package. Ultimately, the air is exhausted to the atmosphere via the Auxiliary Building vent. Some zones include the use of high efficiency particulate and/or charcoal filters if the areas being serviced warrant the additional filtration.

The Auxiliary Building Air Conditioning System is in the scope of license renewal since the system has intended functions that meet the criteria stated in 10CFR54.4(a). The system meets 10CFR54.4(a)(1) because portions of the system maintain Zone SV pressure boundary integrity. The Auxiliary Building Air Conditioning System meets 10CFR54.4(a)(2) because the system contains non-safety-related components spatially oriented such that failure could prevent the satisfactory accomplishment of a safety-related function associated with a safety-related system, structure or component, and contains components required to support safe shutdown in the event of a HELB. The system also contains non-safety-related piping that is attached to safety-related piping and that is seismically designed and supported up to and including the structural anchor point beyond the safety-related/non-safety-related boundary. The system meets 10CFR54.4(a)(3) because the system contains components that support EQ and fire protection.

The evaluation boundary for the Auxiliary Building Air Conditioning System components subject to aging management review includes the dampers and ductwork that form boundaries for the Zone SV and/or steam exclusion zones, as well as any other fire dampers in the system.

USAR Reference

Additional details of the Auxiliary Building Air Conditioning System can be found in the USAR, Table B.2-1.

License Renewal Drawings

The license renewal drawings for the Auxiliary Building Air Conditioning System are listed below:

LRM-601
LRM-604
LRM-606

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.3-11, Auxiliary Building Air Conditioning.

The aging management review results for these components are provided in Table 3.3.2-11, Auxiliary Building Air Conditioning - Aging Management Evaluation.

2.3.3.12 AUXILIARY BUILDING SPECIAL VENTILATION AND STEAM EXCLUSION SYSTEM

System Description

The Auxiliary Building Special Ventilation and Steam Exclusion System collects and filters any potential Reactor Containment Vessel leakage that might bypass the Shield Building annulus before reaching the environment. Areas in the Auxiliary Building that house systems which process reactor coolant or where there is potential for bypass leakage can be ventilated using the system. The system also provides emergency ventilation in certain areas of the Auxiliary Building upon a high temperature, high radiation, or a safety injection signal.

The system maintains the associated Zone SV areas at a slight vacuum when operating and provides for ventilation and fission product removal. When the system is actuated, the normal supply and exhaust dampers for areas in the Zone SV are closed automatically, and the normal supply and exhaust fans for the Auxiliary Building are tripped. Under these conditions, safety related components located within the Zone SV are cooled by small fan coil units that are part of the Auxiliary Building Ventilation System.

The Zone SV is equipped with two parallel exhaust trains. The duct work in each train is connected to a filter assembly via a control damper. Each filter assembly consists of an electric heater, a prefilter, two high efficiency particulate filters, and a charcoal filter (with spray nozzles for fire protection). Each filter assembly is connected to an exhaust fan. A control damper is located at the discharge of each exhaust fan. The parallel trains join and exhaust to the Auxiliary Building vent.

The Auxiliary Building Special Ventilation and Steam Exclusion System is in the scope of license renewal since the system has intended functions that meet the criteria stated in 10CFR54.4(a). The system meets 10CFR54.4(a)(1) because the system maintains a negative pressure in the Zone SV in the event of a design basis accident, collects any potential leakage from the Reactor Containment Vessel that bypasses the Shield Building annulus and filters the leakage through high efficiency particulate and charcoal filters, provides emergency ventilation in certain areas upon receiving either a safety injection, high radiation, or steam exclusion signal, and provides safety-related indications, controls, and protection. The system meets 10CFR54.4(a)(2) because the system contains components required to support safe shutdown in the event of a HELB. The system meets 10CFR54.4(a)(3) because the system contains components that support EQ and fire protection.

The evaluation boundary for the Auxiliary Building Special Ventilation and Steam Exclusion System components subject to aging management review includes the dampers, ductwork, fans, and filters that control the airflow in the designated steam exclusion and Zone SV areas up to the system discharge into the Auxiliary Building vent.

USAR Reference

Additional details of the Auxiliary Building Special Ventilation and Steam Exclusion System can be found in the USAR, Sections 1.2.8, 5.7.3, 7.2.1, 9.6.5, 11.2.1, 14.3.5, and Table B.2-1.

License Renewal Drawings

The license renewal drawings for the Auxiliary Building Special Ventilation and Steam Exclusion System are listed below:

LRM-601
LRM-604
LRM-606

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.3-12, Auxiliary Building Special Ventilation and Steam Exclusion.

The aging management review results for these components are provided in Table 3.3.2-12, Auxiliary Building Special Ventilation and Steam Exclusion - Aging Management Evaluation.

2.3.3.13 AUXILIARY BUILDING VENTILATION SYSTEM

System Description

The Auxiliary Building Ventilation System provides general heating and ventilation for the Auxiliary Building. The bulk of the supply air is directed to the operating floor, the mezzanine, and the basement of the Auxiliary Building. Ducted and non-ducted paths supply air to, and exhaust air from, specific areas and rooms in such a manner that the air moves from clean, or low activity areas toward areas of progressively higher activity. The system also provides normal ventilation to the auxiliary equipment areas, the Spent Fuel Pool area, the non-radioactive area, and the control room area. Additionally, safety-related fan coil units cool safeguards equipment in the event the normal ventilation system fails and during post accident conditions. Air is exhausted out of the Auxiliary Building vent to the atmosphere through high efficiency particulate filters. Radiation monitors are located in the Auxiliary Building Vent to monitor the exhaust air.

The Auxiliary Building Ventilation System is in the scope of license renewal since the system has intended functions that meet the criteria stated in 10CFR54.4(a). The system meets 10CFR54.4(a)(1) because the system provides area cooling for safety-related equipment, maintains Zone SV pressure boundary integrity, and provides safety-related indications, controls, and protection. The system meets

10CFR54.4(a)(2) because the system contains components required to support safe shutdown in the event of a HELB. The system meets 10CFR54.4(a)(3) because the system includes EQ components and components that support fire protection.

The evaluation boundary for the Auxiliary Building Ventilation System components subject to aging management review includes the Auxiliary Building intake ductwork up to the Control Room Air Conditioning System, air intake heaters, duct work within the Zone SV and Steam Exclusion zones, and the exhaust ductwork up to the Auxiliary Building exhaust vent. The evaluation boundary also includes the fan coil units for specific equipment areas such as the residual heat removal pits, safeguard battery rooms, CRDM equipment rooms, charging pumps, component cooling pumps and filter assemblies for the Spent Fuel Pool.

USAR Reference

Additional details of the Auxiliary Building Ventilation System can be found in the USAR, Sections 9.6.3, 11.1.2, 11.2.3, H.2, and Table B.2-1.

License Renewal Drawings

The license renewal drawings for the Auxiliary Building Ventilation System are listed below:

LRM-588
LRM-601
LRM-603
LRM-604
LRM-605-1
LRM-606

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.3-13, Auxiliary Building Ventilation.

The aging management review results for these components are provided in Table 3.3.2-13, Auxiliary Building Ventilation - Aging Management Evaluation.

2.3.3.14 REACTOR BUILDING VENTILATION SYSTEM

System Description

The Reactor Building Ventilation System consists of the following eight subsystems:

- Containment Air Cooling Subsystem
- Reactor Support Cooling Subsystem
- Reactor Gap and Neutron Detector Cooling Subsystem
- Containment Dome Ventilation Subsystem
- Containment Purge and Vent Subsystem
- Control Rod Drive Mechanisms Cooling Subsystem
- Post-LOCA Hydrogen Control Subsystem
- Vacuum Relief Subsystem

Containment Air Cooling Subsystem

The Containment Air Cooling Subsystem cools the air inside the Reactor Containment Vessel during all modes of plant operation. Four containment fan coil units are installed in pairs on either side of the Reactor Containment Vessel. These four fan coil units provide the majority of air cooling during normal operation. Each pair is connected to ductwork which distributes the cool air to the reactor coolant pump vaults, the ring duct above the refueling floor, the intake of the Reactor Gap and Neutron Detector Cooling Subsystem, and various other floor levels in the Reactor Containment Vessel. In the event of a design basis accident, the system keeps the Reactor Containment Vessel atmosphere well mixed and limits the post-LOCA pressure and temperature to within the design basis.

Reactor Support Cooling Subsystem

The Reactor Support Cooling Subsystem maintains the proper temperature profile in the reactor vessel supports, shoes, shims, and supporting steel. Two 100% capacity fans draw air from the refueling floor and force the air through ductwork to each of three pairs of reactor support plenums.

Reactor Gap and Neutron Detector Cooling Subsystem

The Reactor Gap and Neutron Detector Cooling Subsystem limits the maximum temperature of the concrete surrounding the reactor vessel and keeps the neutron detectors cool. Two 100% capacity fans draw cool air from the ring duct above the refueling floor to two branch ducts. One branch supplies air to the eight neutron detector wells. The other branch supplies air to the bottom of the reactor vessel and up through the gap between the vessel and liner.

Containment Dome Ventilation Subsystem

The Containment Dome Ventilation Subsystem pulls air and any post-LOCA hydrogen from the Reactor Containment Vessel dome through separate supply ductwork and discharges the air at the intakes of the associated containment fan coil unit pair.

Containment Purge and Vent Subsystem

The Containment Purge and Vent Subsystem consists of a fresh air supply, exhaust and filtration. Isolation valves are installed both inside and outside the Reactor Containment Vessel where ducts from this system penetrate the Reactor Containment Vessel.

Control Rod Drive Mechanisms Cooling Subsystem

The CRDM Cooling Subsystem provides CRDM cooling by drawing air from the refueling pool area up through the CRDM enclosing shroud and up through three ducts connected to the CRDM shroud plenum mounted on top of the missile shield above the CRDMs. The air leaving the ducts is pulled through two CRDM shroud cooling coils to the fan inlets and exhausted with sufficient velocity to mix with the containment air. The two CRDM shroud cooling coils are supplied with service water from the discharge of the containment fan coil units.

Post-LOCA Hydrogen Control Subsystem

The Post-LOCA Hydrogen Control Subsystem controls the hydrogen concentration in the post-accident containment atmosphere. Venting and replacement of the containment atmosphere, dilution by pressurization, or a combination of both methods can be used. The necessary piping, control valves, and power supplies for the hydrogen recombiners has been installed. If required, the hydrogen recombiners are brought on site. Two redundant containment hydrogen analyzers monitor containment air and provide a continuous indication of hydrogen concentration.

For the purpose of license renewal, the Auxiliary Building Ventilation System, Post-LOCA Hydrogen Control Subsystem, includes the Containment Hydrogen Analyzers System.

Vacuum Relief Subsystem

The Vacuum Relief Subsystem protects the Reactor Containment Vessel from damage due to negative pressure. The subsystem consists of an isolation valve and a vacuum breaker in series in each of two large vent lines.

The Reactor Building Ventilation System is in the scope of license renewal since the system has intended functions that meet the criteria stated in 10CFR54.4(a). The system meets 10CFR54.4(a)(1) because the system provides Reactor Containment Vessel cooling and pressure reduction during post-accident conditions, disperses possible high concentrations of hydrogen in the Reactor Containment Vessel dome following a LOCA, provides the capability to vent or pressurize the Reactor Containment Vessel for post LOCA hydrogen control, relieves the Reactor Containment Vessel of excessive negative pressure due to rapid temperature drop by means of vacuum breakers, provides for Reactor Containment Vessel integrity and pressure boundary isolation, provides cooling to the ex-core neutron detectors, provides a pressure boundary for the Service Water System, maintains Zone SV pressure boundary integrity, and provides safety-related indications, controls, and protection. The system meets 10CFR54.4(a)(2) because the system includes components that cool the concrete around the reactor vessel, and the reactor vessel supports, provides the capability to utilize an external hydrogen recombiner for post-LOCA hydrogen control, and maintains Zone SV pressure boundary integrity. The system meets 10CFR54.4(a)(3) because the system includes EQ components and components that support fire protection.

The evaluation boundary for the Reactor Building Ventilation System components subject to aging management review includes the entire portions of the Containment Air Cooling Subsystem, the Reactor Support Cooling Subsystem, the Reactor Gap and Neutron Detector Cooling Subsystem, the Containment Dome Ventilation Subsystem, the Post-LOCA Hydrogen Control Subsystem, and the Vacuum Relief Subsystem. The evaluation boundary for the Containment Purge and Vent Subsystem includes all safety-related portions as well as the non-safety-related portions that are within Zone SV boundaries. The evaluation boundary for the CRDM Cooling Subsystem includes the CRDM shroud coolers. Additionally, the evaluation boundary includes several pipe and valve segments associated with the Reactor Containment Vessel and Shield Building penetrations used for penetration testing.

USAR Reference

Additional details of the Reactor Building Ventilation System can be found in the USAR, Section 5.4, Figure 14.3-32, and Table B.2-1.

License Renewal Drawings

The license renewal drawings for the Reactor Building Ventilation System are listed below:

LRM-350
LRM-403
LRM-532
LRM-547
LRM-601
LRM-602
LRM-606

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.3-14, Reactor Building Ventilation.

The aging management review results for these components are provided in Table 3.3.2-14, Reactor Building Ventilation - Aging Management Evaluation.

2.3.3.15 TURBINE BUILDING AND SCREENHOUSE VENTILATION SYSTEM

System Description

The Turbine Building and Screenhouse Ventilation System provides a supply of fresh air to maintain acceptable operating temperatures and adequate ventilation in the Turbine Building and Screenhouse. The system also provides cooling and combustion air to the diesel generators.

Safeguards fan coil units are provided for safety-related areas of the Turbine Building in order to provide the required safeguards cooling for these areas. A dedicated, non-redundant, fan coil unit is provided for each of the Train A and Train B areas of the Class I aisle (Safeguards Alley). The fan coil units discharge ductwork is cross-connected through a normally closed, manually operated damper. The auxiliary feedwater pump rooms and both battery rooms are each provided with a dedicated fan coil unit and exhaust fan. All the safeguards fan coil units are supplied with cooling water from the Service Water System.

The Turbine Building basement has two, non-safeguards fan coil units that provide additional cooling as necessary in the basement. These cooling coils are supplied with cooling water from the Circulating Water System.

The Turbine Building and Screenhouse Ventilation System is in the scope of license renewal since the system has intended functions that meet the criteria stated in 10CFR54.4(a). The system meets 10CFR54.4(a)(1) because the system provides cooling air to the Screenhouse, diesel generator rooms, Safeguards Alley, and safeguard battery rooms, provides combustion air to the diesel generators, maintains Zone SV pressure boundary integrity, and provides safety-related indications, controls, and protection. The system meets 10CFR54.4(a)(2) because the system contains components required to support safe shutdown for a HELB. The system meets 10CFR54.4(a)(3) because the system includes EQ components and components that support fire protection and station blackout.

The evaluation boundary for the Turbine Building and Screenhouse Ventilation System components subject to aging management review includes the ductwork, dampers, and fans that supply and exhaust fresh air throughout the Screenhouse and the safeguard battery rooms, diesel generator rooms, and auxiliary feedwater pump rooms within the Turbine Building. The evaluation boundary also includes the fan coil units which provide cooling to the safeguard battery rooms, the auxiliary feedwater pump rooms, and the Turbine Building general areas.

USAR Reference

Additional details of the Turbine Building and Screenhouse Ventilation System can be found in the USAR, Table B.2-1.

License Renewal Drawings

The license renewal drawings for the Turbine Building and Screenhouse Ventilation System are listed below:

LRM-215
LRM-601
LRM-602

LRM-603

LRM-604

LRM-606

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.3-15, Turbine Building and Screenhouse Ventilation.

The aging management review results for these components are provided in Table 3.3.2-15, Turbine Building and Screenhouse Ventilation - Aging Management Evaluation.

2.3.3.16 SHIELD BUILDING VENTILATION SYSTEM

System Description

An annular space is provided between the Reactor Containment Vessel shell and the wall of the Shield Building. The annulus acts as a collection space for any containment leakage following a Design Basis Accident. During normal plant operations, the Shield Building Ventilation System is not used.

The system consists of two redundant, 100% capacity fan and filter trains. One common reactor building discharge vent is shared by the two trains. Each train collects and filters leakage air through a de-mister, electric heater, pre-filter, two high efficiency particulate filters, and a charcoal filter. The fan in each train is used for exhaust and re-circulation/mixing of the Shield Building air volume.

The Shield Building Ventilation System is in the scope of license renewal since the system has intended functions that meet the criteria stated in 10CFR54.4(a). The system meets 10CFR54.4(a)(1) because the system provides a negative pressure in the Shield Building annulus to minimize containment leakage to the environment, limits temperature induced pressure transients in the Shield Building following a Design Basis Accident, maintains Zone SV pressure boundary integrity, provides safety-related indications, controls, and protection, mixes and collects leakage or air that is intentionally vented for hydrogen control from the Reactor Containment Vessel and filters the air through high efficiency particulate and charcoal filters. The system meets 10CFR54.4(a)(3) because the system contains EQ equipment.

The evaluation boundary for the Shield Building Ventilation System components subject to aging management review includes the ductwork, dampers, and fans that maintain a slightly negative pressure in the annulus between the Reactor Containment Vessel and the Shield Building walls and includes the filtration system to process air prior to release into the environment through the reactor building discharge vent.

USAR Reference

Additional details of the Shield Building Ventilation System can be found in the USAR, Sections 5.1, 5.2, 5.5, 5.8, H.3, and Table B.2-1.

License Renewal Drawings

The license renewal drawings for the Shield Building Ventilation System are listed below:

LRM-602
LRM-606

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.3-16, Shield Building Ventilation.

The aging management review results for these components are provided in Table 3.3.2-16, Shield Building Ventilation - Aging Management Evaluation.

2.3.3.17 TECHNICAL SUPPORT CENTER VENTILATION SYSTEM

System Description

The Technical Support Center Ventilation System is designed to keep the Technical Support Center habitable during a declared plant emergency. The system provides proper environmental conditions for the equipment and for health, safety, and comfort of personnel. During an emergency, the system processes 100% recirculated air and prevents all but a minimal leakage into areas intended for human occupancy by a controlled pressurization. The system has the capability to clean the air using charcoal filters to remove contaminants such as radioactive iodine.

The Technical Support Center Ventilation System is in the scope of license renewal since the system has intended functions that meet the criteria stated in

10CFR54.4(a). The system meets 10CFR54.4(a)(3) because the system includes components that support fire protection and station blackout.

The evaluation boundary for the Technical Support Center Ventilation System components subject to aging management review includes only the ductwork, dampers, and fans that supply and exhaust fresh air to the non-safeguard battery room, the electrical equipment room, and the Technical Support Center diesel generator room. The air cooled refrigerant unit for cooling the non-safeguard battery room and all facility fire dampers are also within the evaluation boundary.

USAR Reference

None.

License Renewal Drawings

The license renewal drawings for the Technical Support Center Ventilation System are listed below:

LRM-501

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.3-17, Technical Support Center Ventilation.

The aging management review results for these components are provided in Table 3.3.2-17, Technical Support Center Ventilation - Aging Management Evaluation.

2.3.3.18 FIRE PROTECTION SYSTEM

System Description

The Fire Protection System provides for detection and suppression of fires such that plant equipment damage is minimized and safe shutdown of the plant can be achieved. The Fire Protection system is comprised of fire and smoke detection components, alarms, water-based fire suppression components, and both CO_2 and Halon gaseous fire suppression components. The system also includes the components of the reactor coolant pump motor oil collection subsystem.

The water-based fire suppression subsystem, which takes water from Lake Michigan, consists of two fire pumps, a jockey pump, main and branch supply line piping, automatic sprinkler subsystems, automatic deluge subsystems, standpipes, and hose stations.

A low pressure CO_2 subsystem provides fire protection to certain hazards and areas where water is unsuitable. The CO_2 supply is contained in a 7.5 ton storage tank. The CO_2 storage tank primarily supplies CO_2 for automatic total flooding protection for the diesel generator rooms and also supplies CO_2 to manual hose stations at various locations in the Turbine Building and the Auxiliary Building.

The Halon subsystem is a self-contained system that protects various plant locations including the computer rooms, and count room areas in the Technical Support Center.

The Fire Protection System is in the scope of license renewal since the system has intended functions that meet the criteria stated in 10CFR54.4(a). The system meets 10CFR54.4(a)(1) because the system provides fire protection for the emergency diesel generators. The system meets 10CFR54.4(a)(3) because the system includes components that support fire protection.

The evaluation boundary for the Fire Protection System components subject to aging management review includes the fire loop and hydrant system around the outside of the plant, the transformer bays deluge system outside the Turbine Building, the fire protection pumps located in the Screenhouse, and the necessary instrumentation, distribution piping and valves located throughout the plant. The evaluation boundary also includes the CO_2 and Halon gaseous suppression systems.

USAR Reference

Additional details of the Fire Protection System can be found in the USAR, Sections 7.7.5, 8.2.2, 9.6.1, 10.2.2 and Table B.2-1.

License Renewal Drawings

The license renewal drawings for the Fire Protection System are listed below:

LRM-202-2
LRM-202-3
LRM-208-1
LRM-208-2
LRM-208-3
LRM-384

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.3-18, Fire Protection.

The aging management review results for these components are provided in Table 3.3.2-18, Fire Protection - Aging Management Evaluation.

2.3.3.19 DIESEL GENERATOR SYSTEM

System Description

For the purpose of license renewal, the Diesel Generator System includes the Diesel Generator - Mechanical and Diesel Generator - Electrical Systems.

The Diesel Generator System provides a dependable on-site power source, capable of automatically starting and supplying the loads necessary to safely shut down the plant and maintain it in a safe shutdown condition under all circumstances, including a loss of coolant accident and station blackout event. The system includes the two emergency diesel generators and one TSC diesel generator. The TSC diesel generator provides electrical power during a station blackout event.

The Diesel Generator System includes the following five subsystems:

- Starting Subsystem
- Lube Oil Subsystems
- Cooling Water Subsystems
- Air Intake and Exhaust Subsystems
- Fuel Oil Subsystems

Starting Subsystem

The starting subsystem for the emergency diesel generators provides high-pressure air in sufficient volume to rotate the emergency diesel generator crankshaft until the ignition cycle begins. Starting of the TSC diesel generator is accomplished by energizing a DC electric motor from batteries.

Lube Oil Subsystems

The lube oil subsystems provide cool, filtered lubricating oil to the diesel engine. The subsystems also provide oil to engine components to ensure adequate lubrication during engine startup and operation. During shutdown, the lube oil subsystems, in conjunction with the cooling water subsystems, keep the emergency diesel engines warm in preparation for a fast startup.

Cooling Water Subsystems

The cooling water subsystems provide cooling water flow to remove heat generated by combustion from the space around the engine cylinders and cylinder liners of the diesel engine. During shutdown, the cooling water subsystems, in conjunction with the lube oil subsystems keep the emergency diesel engines warm in preparation for a fast startup. The emergency diesel generators are ultimately cooled by the Service Water System. The TSC diesel generator is cooled by outdoor air, via a radiator.

Air Intake and Exhaust Subsystems

The air intake and exhaust subsystems provide a volume of pressurized air to each cylinder of the diesel engines for support of the combustion process, then exhausts the combustion gases to the atmosphere outside the diesel rooms.

Fuel Oil Subsystems

The fuel oil subsystems provide filtered fuel oil to the engine injectors. Fuel oil transfer pumps pump fuel oil from the underground fuel oil storage tanks to the day tanks. Fuel oil from the day tanks is delivered to the engines by fuel oil pumps.

The Diesel Generator System is in the scope of license renewal since the system has intended functions that meet the criteria stated in 10CFR54.4(a). The Diesel Generator System meets 10CFR54.4(a)(1) because the system provides emergency electrical power to the engineered safety features equipment, provides safety-related indications, controls, and protection, provides air for operation of service water valves and ventilation dampers required to support diesel generator operation. The Diesel Generator System meets 10CFR54.4(a)(2) because the system contains non-safety-related components spatially oriented such that their failure could prevent the satisfactory accomplishment of a safety-related function associated with a safety-related system, structure, or component, and contains components required to support safe shutdown during a HELB. The system also contains non-safety-related piping that is attached to safety-related piping and that is seismically designed and supported up to and including the first structural anchor point beyond the safety-related/non-safety-related boundary. The system meets 10CFR54.4(a)(3) because the system includes EQ components and components that support fire protection and station blackout.

The evaluation boundary for the Diesel Generator System components subject to aging management review includes the subcomponents associated with the diesel engines, as well as the components associated with the support subsystems. The evaluation boundary includes non-safety-related components with a spatial orientation near a safety-related system, structure, or component located in the Turbine Building or Administration Building basement. Included in the boundary are components that are relied upon to provide structural seismic support.

USAR Reference

Additional details of the Diesel Generator System can be found in the USAR, Sections 8.1.1, 8.2.3, Table 8.2-1, Table B.2-1, and Figure 8.2-10.

License Renewal Drawings

The license renewal drawings for the Diesel Generator System are listed below:

LRM-202-1
LRM-213-2
LRM-213-3
LRM-213-9
LRM-220
LRM-504

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.3-19, Diesel Generator.

The aging management review results for these components are provided in Table 3.3.2-19, Diesel Generator - Aging Management Evaluation.

2.3.3.20 CIRCULATING WATER SYSTEM

System Description

The Circulating Water System is an open-cycle cooling water system that provides cooling water to the main condenser. The system also provides normal and alternate sources of water to the suction of the service water pumps and fire protection pumps. The Circulating Water System draws water from Lake Michigan through the Intake Structure that consists of three submerged intake cones. From the Intake Structure, water is drawn into the Screenhouse forebay through a buried ten foot diameter steel intake pipe. From the forebay area, water discharges through the traveling water screens to the suction of the circulating water pumps, service water pumps, and fire protection pumps.

The circulating water pumps discharge to the condenser water boxes. The discharge from the condenser water boxes is directed to the Discharge Tunnel. A buried ten foot diameter discharge pipe connects the Discharge Tunnel to the Discharge Structure, and ultimately to Lake Michigan. A recirculating water pump is used to direct warm water from the circulating water discharge pipe to the intake cones to prevent ice formation. An additional safety-related recirculation line and distribution pipe between the Discharge Structure and Screenhouse forebay provides an alternate source of water to the service water pumps and fire protection pumps and allows for de-icing of the traveling water screens.

The Circulating Water System is in the scope of license renewal since the system has intended functions that meet the criteria stated in 10CFR54.4(a). The Circulating Water System meets 10CFR54.4(a)(1) because the system provides normal and alternate sources of water to the Service Water System, and provides safety-related indications, controls, and protection. The Circulating Water System meets 10CFR54.4(a)(2) because the system provides a flow path from the Discharge Structure to the inlet of the traveling water screens to prevent ice formation, contains non-safety-related components spatially oriented such that their failure could prevent the satisfactory accomplishment of a safety-related function associated with a safety-related system, structure, or component, provides a flow path for the discharge of service water, and minimizes flooding by tripping the circulating water pumps on high water level in the Turbine Building basement. The system meets 10CFR54.4(a)(3) because the system includes components that support fire protection.

The evaluation boundary for the Circulating Water System components subject to aging management review includes the circulating water intake piping, recirculation line and distribution pipe, the circulating water pumps, recirculating water pump, chlorine monitoring pump, condenser shell and water boxes, and associated expansion joints and valves. The evaluation boundary includes non-safety-related components with a spatial orientation near a safety-related system, structure, or component located in the Screenhouse or Turbine Building. The circulating water discharge piping, Discharge Tunnel, the Intake Structure, and Discharge Structure are evaluated for aging management with their related structure.

USAR Reference

Additional details of the Circulating Water System can be found in the USAR, Sections 2.6, 10.2.2, Table 10.1-1, Table B.2-1, Figure 10.2-7, Figure 10.2-8, Figure 10.2-9, and Figure 10.2-10.

License Renewal Drawings

The license renewal drawings for the Circulating Water System are listed below:

LRM-202-1
LRM-203
LRM-204
LRM-205
LRM-206
LRM-207
LRM-211
LRM-212
LRM-215
LRM-219
LRM-368
LRM-436
LRM-605-2
LRXK-101-17A

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.3-20, Circulating Water.

The aging management review results for these components are provided in Table 3.3.2-20, Circulating Water - Aging Management Evaluation.

2.3.3.21 GASEOUS WASTE PROCESSING AND DISCHARGE SYSTEM

System Description

The Gaseous Waste Processing and Discharge System collects gaseous radioactive waste produced during operation and processes the waste gases as required to permit discharge within the limits established by the applicable regulatory guidelines.

The Gaseous Waste Processing and Discharge System is in the scope of license renewal since the system has intended functions that meet the criteria stated in 10CFR54.4(a). The system meets 10CFR54.4(a)(1) because the system provides for Reactor Containment Vessel integrity and isolation, maintains a pressure boundary to prevent an accidental release of radiation, maintains a pressure boundary for the Component Cooling System, and provides safety-related indications, controls, and protection. The system meets 10CFR54.4(a)(2) because the system contains non-safety-related piping that is attached to safety-related piping and that is seismically designed and supported up to and including the first structural anchor point beyond the safety-related/non-safety-related boundary. The system meets 10CFR54.4(a)(3) because the system includes EQ components.

The evaluation boundary for the Gaseous Waste Processing and Discharge System components subject to aging management review includes the entire system.

USAR Reference

Additional details of the Gaseous Waste Processing and Discharge System can be found in the USAR, Section 11.1.2 and Table B.2-1.

License Renewal Drawings

The license renewal drawings for the Gaseous Waste Processing and Discharge System are listed below:

LRM-216
LRM-350
LRM-539
LRM-601
LRM-604
LRXK-100-10
LRXK-100-131

LRXK-100-132
LRXK-100-20
LRXK-100-36
LRXK-100-37

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.3-21, Gaseous Waste Processing and Discharge.

The aging management review results for these components are provided in Table 3.3.2-21, Gaseous Waste Processing and Discharge - Aging Management Evaluation.

2.3.3.22 LIQUID WASTE PROCESSING AND DISCHARGE SYSTEM

System Description

The Liquid Waste Processing and Discharge System collects radioactive wastes produced during operation and processes the waste as required to permit discharge within the limits established by applicable regulatory guidelines. Liquid wastes are processed by filtration, demineralization, and/or dilution as appropriate. Liquids are routinely discharged to the Auxiliary Building standpipe through a radiation detector and automatic control valves which automatically trip closed on an elevated radiation signal.

The Liquid Waste Processing and Discharge System is in the scope of license renewal since the system has intended functions that meet the criteria stated in 10CFR54.4(a). The system meets 10CFR54.4(a)(1) because the system provides for Reactor Containment Vessel integrity and isolation and provides safety-related indications, controls, and protection. The system meets 10CFR54.4(a)(2) because the system contains non-safety-related components spatially oriented such that their failure could prevent the satisfactory accomplishment of a safety-related function associated with a safety-related system, structure or component. The system contains non-safety-related piping that is attached to safety-related piping and that is seismically designed and supported up to and including the first structural anchor point beyond the safety-related/non-safety-related boundary. The system meets 10CFR54.4(a)(3) because the system includes EQ components.

The evaluation boundary for the Liquid Waste Processing and Discharge System components subject to aging management review includes the majority of the system pressure boundary piping, valves, and components, as well as the sludge interceptor, waste holdup, de-aerated drains, laundry and hot shower, reactor coolant drain, waste condensate, and the Auxiliary Building sump tanks. The pumps for these tanks are also included. Included in the evaluation boundary are non-safety-related components with a spatial orientation near a safety-related system, structure, or component located in the Turbine Building or Auxiliary Building. The evaluation boundary includes components that are relied upon to provide structural seismic support.

Liquid wastes are no longer processed by evaporation. Although this subsystem has not been physically removed, it is no longer used. The evaporator subsystem is drained and isolated from the rest of the Liquid Waste Processing and Discharge System. Portions of the evaporator subsystem that are connected to the Component Cooling System are within the evaluation boundary for the Liquid Waste Processing and Discharge System since they are relied upon to provide structural seismic support.

USAR Reference

Additional details of the Liquid Waste Processing and Discharge System can be found in the USAR, Section 11.1.2 and Table B.2-1.

License Renewal Drawings

The license renewal drawings for the Liquid Waste Processing and Discharge System are listed below:

- LRM-202-2
- LRM-216
- LRM-217
- LRM-218
- LRM-350
- LRM-368
- LRM-539
- LRM-605-1
- LRXK-100-10

LRXK-100-131
LRXK-100-132
LRXK-100-18
LRXK-100-19
LRXK-100-20
LRXK-100-28
LRXK-100-29
LRXK-100-35
LRXK-100-36
LRXK-100-37
LRXK-100-38
LRXK-100-400
LRXK-100-44
LRXK-100-829

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.3-22, Liquid Waste Processing and Discharge.

The aging management review results for these components are provided in Table 3.3.2-22, Liquid Waste Processing and Discharge - Aging Management Evaluation.

2.3.3.23 RADIATION MONITORING SYSTEM

System Description

The Radiation Monitoring System provides continuous radiological surveillance of critical plant systems and work areas. The Radiation Monitoring System warns operating personnel of radiological health hazards which have developed, gives early warning of certain plant malfunctions which might lead to a radiological health hazard or plant damage, prevents or minimizes the effects of an inadvertent radioactive release to the environment, and provides routine monitoring of controlled offsite plant releases.

The Radiation Monitoring System also monitors radiation levels in various work areas of the plant including the Auxiliary Building, Reactor Containment Vessel, Shield Building, and the Technical Support Center.

The Radiation Monitoring System is in the scope of license renewal since the system has intended functions that meet the criteria stated in 10CFR54.4(a). The system meets 10CFR54.4(a)(1) because the system provides for Reactor Containment Vessel integrity and isolation, prevents or minimizes inadvertent releases of radioactivity to the environment via monitoring and/or automatic action capability, and provides safety-related indications, controls, and protection. The system meets 10CFR54.4(a)(2) because the system actuates the post-accident recirculating fans and necessary dampers to isolate the control room environment, provides a pressure boundary for the Reactor Building and Auxiliary Building Ventilation Systems, contains non-safety-related components spatially oriented such that their failure could prevent the satisfactory accomplishment of a safety-related function of a safety-related system, structure, or component. The system meets 10CFR54.4(a)(3) because the system includes EQ components.

The evaluation boundary for the Radiation Monitoring System components subject to aging management review includes the Reactor Containment Vessel high range area radiation monitors and the gaseous process monitors components with direct action in meeting the intended functions of isolation and control of radioactive releases. Also, included in the evaluation boundary are non-safety-related liquid process monitor components with a spatial orientation near a safety-related system, structure, or component.

USAR Reference

Additional details of the Radiation Monitoring System can be found in the USAR, Section 11.2.3, Table B.2-1 and Table 11.2-7.

License Renewal Drawings

The license renewal drawings for the Radiation Monitoring System are listed below:

LRM-202-2
LRM-219
LRM-368
LRM-601
LRM-602
LRM-603
LRXK-100-131

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.3-23, Radiation Monitoring.

The aging management review results for these components are provided in Table 3.3.2-23, Radiation Monitoring - Aging Management Evaluation.

2.3.3.24 MAKEUP AND DEMINERALIZED WATER SYSTEM

System Description

The Makeup and Demineralized Water System demineralizes and degasifies the water from the outlet of the Service Water Pretreatment System pressure filters. The Makeup and Demineralized Water System consists of two redundant trains of equipment. Each train contains a cation ion exchanger, an anion ion exchanger, and a mixed bed ion exchanger. Filtered water enters the system from the Service Water Pretreatment System pressure filters. Water can also be supplied by the condensate recycle pumps. The Makeup and Demineralized Water System provides demineralized water suitable for use in primary and secondary systems.

The Makeup and Demineralized Water System is in the scope of license renewal since the system has intended functions that meet the criteria stated in 10CFR54.4(a). The Makeup and Demineralized Water System meets 10CFR54.4(a)(1) because the system provides a safety-related pressure boundary for the Reactor Coolant System, Component Cooling System, Chemical and Volume Control System, and Gaseous Waste System. The system also provides Reactor Containment Vessel pressure boundary integrity/isolation. The Makeup and Demineralized Water System meets 10CFR54.4(a)(2) because the system contains non-safety-related components spatially oriented such that their failure could prevent the satisfactory accomplishment of a safety-related function associated with a safety-related system, structure, or component. The system also contains non-safety-related piping that is attached to safety-related piping and that is seismically designed and supported up to and including the first structural anchor point beyond the safety-related/non-safety-related boundary. The system meets 10CFR54.4(a)(3) because the system includes components that support fire protection and station blackout.

The evaluation boundary for the Makeup and Demineralized Water System components subject to aging management review includes portions of the demineralized water distribution header and associated valves, piping, and instrumentation. The Reactor Containment Vessel isolation valves and piping are included in the boundary. The evaluation boundary also includes non-safety-related components with a spatial orientation near a safety-related system, structure, or component located in the Reactor Containment Vessel, Shield Building, Auxiliary Building, or Turbine Building. Included in the boundary are components that are relied upon to provide structural seismic support.

USAR Reference

Additional details of the Makeup and Demineralized Water System can be found in the USAR, Figure 9.2-5.

License Renewal Drawings

The license renewal drawings for the Makeup and Demineralized Water System are listed below:

LRM-202-2
LRM-204
LRM-209-2
LRM-209-4
LRM-218
LRM-219
LRM-350
LRM-368
LRM-385
LRM-605-1
LRM-606
LRXK-100-10
LRXK-100-131
LRXK-100-132
LRXK-100-19
LRXK-100-35
LRXK-100-36
LRXK-100-37
LRXK-100-38

LRXK-100-400
LRXK-100-44
LRXK-100-829

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.3-24, Makeup and Demineralized Water.

The aging management review results for these components are provided in Table 3.3.2-24, Makeup and Demineralized Water - Aging Management Evaluation.

2.3.3.25 SERVICE WATER PRETREATMENT SYSTEM

System Description

The Service Water Pretreatment System normally receives water from the Potable Water System and removes suspended solids to supply clarified water to the Makeup and Demineralized Water System and various Screenhouse and Turbine Building components. The Service Water System can also provide a source of water to the Service Water Pretreatment System. The system components include the service water pretreatment filters, which discharge to the service water pump upper and lower bearings.

The Service Water Pretreatment System is in the scope of license renewal since the system has intended functions that meet the criteria stated in 10CFR54.4(a). The Service Water Pretreatment System meets 10CFR54.4(a)(1) because the system provides a safety-related pressure boundary for the Service Water System. The Service Water Pretreatment System meets 10CFR54.4(a)(2) because the system contains non-safety-related components spatially oriented such that their failure could prevent the satisfactory accomplishment of a safety-related function associated with a safety-related system, structure, or component. The system also contains non-safety-related piping that is attached to safety-related piping and that is seismically designed and supported up to and including the first structural anchor point beyond the safety-related/non-safety-related boundary. Additionally, the system provides filtered bearing lube water to the service water pump bearings.

The evaluation boundary for the Service Water Pretreatment System components subject to aging management review includes the service water pretreatment filters and associated piping, valves, and instrumentation. The evaluation boundary includes non-safety-related components with a spatial orientation near a safety-related system, structure, or component located in the Screenhouse or Turbine Building. Included in the boundary are components that are relied upon to provide structural seismic support.

USAR Reference

None.

License Renewal Drawings

The license renewal drawings for the Service Water Pretreatment System are listed below:

LRM-202-1
LRM-202-2
LRM-208-1
LRM-211
LRM-394

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.3-25, Service Water Pretreatment.

The aging management review results for these components are provided in Table 3.3.2-25, Service Water Pretreatment - Aging Management Evaluation.

2.3.3.26 MISCELLANEOUS DRAINS AND SUMPS SYSTEM

System Description

The Miscellaneous Drains and Sumps System provides separate drains and sumps that require physical separation based on radiological, environmental, chemical, or toxicological reasons. The Miscellaneous Drains and Sumps System collects drainage from the floor drains, aerated equipment drains and leaks, and the decontamination area drains. Pumps are installed in the sumps to transfer these liquid wastes to other systems for processing and/or disposal as part of the Liquid Waste Processing and Discharge System.

The Miscellaneous Drains and Sumps System is in the scope of license renewal since the system has intended functions that meet the criteria stated in

10CFR54.4(a). The system meets 10CFR54.4(a)(1) because the system provides for Reactor Containment Vessel integrity and isolation, provides Residual Heat Removal pump pit flood control, provides a pressure boundary to prevent additional radiological release during plant accidents, and provides safety-related indications, controls, and protection. The system meets 10CFR54.4(a)(2) because the system contains non-safety-related components spatially oriented such that their failure could prevent the satisfactory accomplishment of a safety-related function of a safety-related system. The system contains non-safety-related piping that is attached to safety-related piping and that is seismically designed and supported up to and including the first structural anchor point beyond the safety-related/non-safety-related boundary. The system includes components used to mitigate an internal flooding event, including inadvertent operation of the fire protection sprinkler system. The system meets 10CFR54.4(a)(3) because the system includes EQ components.

The evaluation boundary for the Miscellaneous Drains and Sumps System components subject to aging management review includes the Shield Building Annulus and Residual Heat Removal System sump pumps and associated valves and piping up to the interface with the Liquid Waste Processing and Discharge System and the de-aerated drain tank emergency pumps and the associated valves and piping to the Reactor Containment Vessel Sump A. The Screenhouse sump pump and piping to the forebay area are also included. Not included in the evaluation boundary are the actual sump structures since they are considered part of the building structures and are evaluated with their associated buildings. Various floor drain piping and collection funnels throughout the Auxiliary Building, Turbine Building, Technical Support Center, and Screenhouse are also included. The evaluation boundary includes non-safety-related components with a spatial orientation near a safety-related system, structure or component located in the Auxiliary Building or the Reactor Containment Vessel. Included in the evaluation boundary are components that are relied upon to provide structural support.

<u>USAR Reference</u>

Additional details of the Miscellaneous Drains and Sumps System can be found in the USAR, Sections 6.2.5, 6.5.1, and 11.1.2.

License Renewal Drawings

The license renewal drawings for the Miscellaneous Drains and Sumps System are listed below:

LRM-202-1
LRM-202-2
LRM-202-3
LRM-211
LRM-213-9
LRM-215
LRM-219
LRM-350
LRM-368
LRM-394
LRM-539
LRM-605-1
LRXK-100-131
LRXK-100-132
LRXK-100-36

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.3-26, Miscellaneous Drains and Sumps.

The aging management review results for these components are provided in Table 3.3.2-26, Miscellaneous Drains and Sumps - Aging Management Evaluation.

2.3.3.27 MISCELLANEOUS GAS SYSTEM

System Description

For the purpose of license renewal, the Miscellaneous Gas System includes the Nitrogen and Hydrogen Supply System.

The Miscellaneous Gas System provides adequate supplies of nitrogen, hydrogen, propane, and carbon dioxide for distribution to various plant equipment.

High pressure nitrogen is supplied to the safety injection accumulators, while some of the more significant loads supplied with low pressure nitrogen include the waste gas decay tanks, volume control tank, Chemical and Volume Control System holdup tanks, and the pressurizer relief tank. Independent nitrogen bottles are also used to supply nitrogen to the Spent Fuel Pool gate inflatable seals and some control valves.

Hydrogen is provided to the main generator and volume control tank. Hydrogen is also used in chemical analysis. Carbon dioxide supports fire protection and purging of the main generator. Local gas bottles containing argon and oxygen are provided to support post-accident sampling. There are no components containing propane in the scope of license renewal.

The Miscellaneous Gas System is in the scope of license renewal since the system has intended functions that meet the criteria stated in 10CFR54.4(a). The Miscellaneous Gas System meets 10CFR54.4(a)(1) because the system provides Reactor Containment Vessel pressure boundary integrity/isolation, provides a pressure boundary for the Reactor Coolant, Safety Injection, and Chemical and Volume Control Systems, and provides safety-related indication, controls, and protection. The Miscellaneous Gas System meets 10CFR54.4(a)(2) because the system provides backup nitrogen to the Spent Fuel Pool gate inflatable seals and provides oxygen to support operation of the containment hydrogen analyzers. Additionally, the system contains non-safety-related piping that is attached to safety-related piping and that is seismically designed and supported up to and including the first structural anchor point beyond the safety-related/non-safety-related boundary. The system meets 10CFR54.4(a)(3) because the system includes components that support fire protection and station blackout.

The evaluation boundary for the Miscellaneous Gas System components subject to aging management review includes safety-related components and components that support fire protection, station blackout events, and post-accident chemical analysis. Included in the evaluation boundary are components that are relied upon to provide structural seismic support.

Miscellaneous Gas System components containing carbon dioxide and that support fire protection (including the carbon dioxide storage tank) are evaluated for the effects of aging with the Fire Protection System.

USAR Reference

None.

License Renewal Drawings

The license renewal drawings for the Miscellaneous Gas System are listed below:

LRM-213-1
LRM-213-2
LRM-213-5
LRM-216
LRM-384
LRM-403
LRM-605-1
LRXK-100-10
LRXK-100-28
LRXK-100-36
LRXK-100-37
LRXK-100-400
LRXK-100-829

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.3-27, Miscellaneous Gas.

The aging management review results for these components are provided in Table 3.3.2-27, Miscellaneous Gas - Aging Management Evaluation.

2.3.3.28 POTABLE WATER SYSTEM

System Description

The Potable Water System supplies domestic water used by plant personnel for drinking, food preparation, domestic and washing purposes, and some plant equipment operation. The source of the plant Potable Water System is two on-site deep wells located outside the protected area. Hydropneumatic tanks in the Simulator Training Facility and in the south end of the Auxiliary Building basement provide the necessary system water pressure.

The Potable Water System is in the scope of license renewal since the system has intended functions that meet the criteria stated in 10CFR54.4(a). The system meets 10CFR54.4(a)(2) because the system contains non-safety-related components that are part of the control room pressure boundary and the system contains non-safety-related components spatially oriented such that their failure could prevent the satisfactory accomplishment of a safety-related function associated with a safety-related system, structure or component.

The evaluation boundary for the Potable Water System components subject to aging management review includes the portions of the distribution piping and valves that penetrate the control room pressure boundary up to and including the first isolation valve and includes non-safety-related components with a spatial orientation near a safety-related system, structure, or component that is located in the Class I structures or Turbine Building.

USAR Reference

None.

License Renewal Drawings

The license renewal drawings for the Potable Water System are listed below:

LRM-209-3
LRXK-100-44

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.3-28, Potable Water.

The aging management review results for these components are provided in Table 3.3.2-28, Potable Water - Aging Management Evaluation.

2.3.3.29 PRIMARY SAMPLING SYSTEM

System Description

The Primary Sampling System provides the means for sampling and analysis of the Reactor Coolant System, Reactor Containment Vessel atmosphere, Reactor Containment Vessel sump and other support locations. The Primary Sampling System is normally isolated at the Reactor Containment Vessel boundary.

The Primary Sampling System consists of two parallel systems. The first system includes sample lines, heat exchangers, and valves to direct a sample to a sample sink inside the Auxiliary Building Sample Room. The second system includes independent sample lines, heat exchangers, and valves to direct a sample to a High Radiation Sampling System located inside the Auxiliary Building High Radiation Sample Room.

The Primary Sampling System is in the scope of license renewal since the system has intended functions that meet the criteria stated in 10CFR54.4(a). The system meets 10CFR54.4(a)(1) because the system provides Reactor Containment Vessel pressure boundary integrity/isolation, provides a pressure boundary for the Component Cooling System, and provides safety-related indications, controls, and protection.

The Primary Sampling System meets 10CFR54.4(a)(2) because the system contains non-safety-related components spatially oriented such that their failure could prevent the satisfactory accomplishment of a safety-related function associated with a safety-related system, structure or component. The system contains non-safety-related piping that is attached to safety-related piping and that is seismically designed and supported up to and including the first structural anchor point beyond the safety-related/non-safety-related boundary. The Primary Sampling System meets 10CFR54.4(a)(3) because the system includes EQ components.

The evaluation boundary for the Primary Sampling System components subject to aging management review includes components that extend from the Reactor Coolant System and Reactor Containment Vessel atmosphere to the sample sink and the high rad sample room. The evaluation boundary includes sample lines from the Residual Heat Removal System, through which the Reactor Containment Vessel sump is sampled, and the Chemical and Volume Control System to the sample sink and to the high rad sample room. The evaluation boundary for the Primary Sampling System also includes non-safety-related components with a spatial orientation near a safety-related system, structure, or component located in the Auxiliary Building. Included in the evaluation boundary are components that are relied upon to provide structural seismic support.

<u>USAR Reference</u>

Additional details of the Primary Sampling System can be found in the USAR, Sections 1.8 (Criterion 51), 9.1, 9.4, 10A.1.2, 10A.7 and Table B.2-1.

License Renewal Drawings

The license renewal drawings for the Primary Sampling System are listed below:

LRM-403
LRXK-100-19
LRXK-100-20
LRXK-100-36
LRXK-100-44

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.3-29, Primary Sampling.

The aging management review results for these components are provided in Table 3.3.2-29, Primary Sampling - Aging Management Evaluation.

Screening Results Tables: Auxiliary Systems

Table 2.3.3-1 New Fuel Storage

Structural Member	Intended Function(s)
Bolting	Structural Support
New Fuel Storage Rack	Structural Support

See Table 2.0-1 for definition of intended function.

Table 2.3.3-2 Spent Fuel Storage

Structural Member	Intended Function(s)
Spent Fuel Storage Racks	Absorb Neutrons, Structural Support

See Table 2.0-1 for definition of intended function.

Table 2.3.3-3 Spent Fuel Pool Cooling

Component Type	Intended Function(s)
Bolting	Pressure Boundary
Convection Tank	Pressure Boundary
Filter Housings	Pressure Boundary
Pipe	Pressure Boundary
Pumps	Pressure Boundary
Spent Fuel Pool Demineralizer	Pressure Boundary
Spent Fuel Pool Heat Exchanger	Heat Transfer, Pressure Boundary
Tubing	Pressure Boundary
Valves	Pressure Boundary

See Table 2.0-1 for definition of intended function.

Table 2.3.3-4 Fuel Handling

Structural Member	Intended Function(s)
Auxiliary Building upending rig winch (support housing and frame)	Structural Support
Cranes and Monorails including bridge & trolley support members (girders, beams, angles, plates, rails and fasteners)	Structural Support
Fuel transfer equipment (carriage, lifting frame, support frame, rails and fasteners)	Structural Support

See Table 2.0-1 for definition of intended function.

Table 2.3.3-5 Cranes (Excluding Fuel Handling)

Structural Member	Intended Function(s)
Cranes and Monorails including bridge & trolley support members (girders, beams, angles, plates, rails and fasteners)	Structural Support
Reactor Building Pedestal Crane (boom, structural frame and plates)	Structural Support

See Table 2.0-1 for definition of intended function.

Table 2.3.3-6 Service Water

Component Type	Intended Function(s)
Bolting	Pressure Boundary
Filter Elements[1]	Filtration
Filter Housings	Pressure Boundary
Flex Connections	Pressure Boundary
Flexible Hoses	Pressure Boundary
Flow Elements	Pressure Boundary
Flow Switches	Pressure Boundary
Gage Glasses	Pressure Boundary
Orifices	Pressure Boundary, Restricts Flow
Pipe	Pressure Boundary
Service Water Chlorination Pumps	Pressure Boundary
Service Water Pumps	Pressure Boundary
Sight Flow Indicators	Pressure Boundary
Spray Nozzles	Pressure Boundary, Spray Pattern
Standpipes	Pressure Boundary
Strainer Housings	Pressure Boundary
Tubing	Pressure Boundary
Valves	Pressure Boundary

1. This component is short-lived.

See Table 2.0-1 for definition of intended function.

Table 2.3.3-7 Component Cooling

Component Type	Intended Function(s)
Bolting	Pressure Boundary
Component Cooling Heat Exchangers	Heat Transfer, Pressure Boundary
Component Cooling Pumps	Pressure Boundary
Component Cooling Surge Tank	Pressure Boundary
Flow Elements	Pressure Boundary
Flow Orifices	Pressure Boundary, Restricts Flow
Pipe	Pressure Boundary
Strainer Housings	Pressure Boundary
Tubing	Pressure Boundary
Valves	Pressure Boundary

See Table 2.0-1 for definition of intended function.

Table 2.3.3-8 Station and Instrument Air

Component Type	Intended Function(s)
Accumulators	Pressure Boundary
Aftercoolers	Heat Transfer, Pressure Boundary
Air Dryers	Pressure Boundary
Air Receivers	Pressure Boundary
Bolting	Pressure Boundary
Compressors	Pressure Boundary
Filter Elements[2]	Filtration
Filter Housings	Pressure Boundary
Filter/Regulators	Filtration, Pressure Boundary
Filter-Silencer Filter Elements[2]	Filtration
Filter-Silencer Housings	Pressure Boundary
Flow Indicators	Pressure Boundary
Flow Meters	Pressure Boundary
Hoses	Pressure Boundary
Lubricators	Pressure Boundary
Moisture Separators	Pressure Boundary
Oil Filters[1, 2]	Filtration, Pressure Boundary
Oilers	Pressure Boundary

See Table 2.0-1 for definition of intended function.

Table 2.3.3-8 Station and Instrument Air

Component Type	Intended Function(s)
Orifices	Pressure Boundary
Pipe	Pressure Boundary
SFP Gate Inflatable Seal IA Rubber Hoses	Pressure Boundary
Signal Converters	Pressure Boundary
Strainer Housings	Pressure Boundary
Traps	Pressure Boundary
Tubing	Pressure Boundary
Valves	Pressure Boundary
Volume Boosters	Pressure Boundary

1. This component is not shown on the Station and Instrument Air System license renewal drawings.
2. This component is short-lived.

See Table 2.0-1 for definition of intended function.

Table 2.3.3-9 Chemical and Volume Control

Component Type	Intended Function(s)
Absorption Tower	Pressure Boundary
Batching Tank	Pressure Boundary
Bolting	Pressure Boundary
Boric Acid Blender	Pressure Boundary
Boric Acid Evaporator Distillate Sample Cooler	Pressure Boundary
Boric Acid Tanks	Pressure Boundary
Chemical Mixing Tank	Pressure Boundary
Concentrates Holding Tank	Pressure Boundary
Conductivity Probes	Pressure Boundary
Demineralizers and Ion Exchangers	Pressure Boundary
Distillate Cooler	Pressure Boundary
Eductors	Pressure Boundary
Evaporator	Pressure Boundary
Evaporator Condenser	Pressure Boundary
Excess Letdown Heat Exchanger	Pressure Boundary, Heat Transfer
Feed Preheater	Pressure Boundary
Filter Elements[1]	Filtration
Filter Housings	Pressure Boundary

See Table 2.0-1 for definition of intended function.

Table 2.3.3-9 Chemical and Volume Control

Component Type	Intended Function(s)
Flow Elements	Pressure Boundary
Flow Indicators	Pressure Boundary
Flow Orifices	Pressure Boundary
Holdup Tanks	Pressure Boundary
Letdown Heat Exchanger	Pressure Boundary, Heat Transfer
Monitor Tanks	Pressure Boundary
Pipe	Pressure Boundary
Pulsation Dampeners	Pressure Boundary
Pumps	Pressure Boundary
Regenerative Heat Exchanger	Pressure Boundary, Heat Transfer
Seal Water Heat Exchanger	Pressure Boundary
Standpipes	Pressure Boundary
Stripping Column	Pressure Boundary
Suction Stabilizers	Pressure Boundary
Tank Heaters	Pressure Boundary
Tubing	Pressure Boundary
Valves	Pressure Boundary
Vent Condenser	Pressure Boundary

See Table 2.0-1 for definition of intended function.

Table 2.3.3-9 Chemical and Volume Control

Component Type	Intended Function(s)
Volume Control Tank	Pressure Boundary

1. This component is short lived.

See Table 2.0-1 for definition of intended function.

Table 2.3.3-10 Control Room Air Conditioning

Component Type	Intended Function(s)
Air Handling Units	Heat Transfer, Pressure Boundary
Bolting	Pressure Boundary
Chiller Pumps	Pressure Boundary
Compressor Casings	Pressure Boundary
Condensers	Heat Transfer, Pressure Boundary
CRPA Recirculation Filter Assemblies	Pressure Boundary
Damper Housings	EQ Barrier, Fire Barrier, Pressure Boundary
Ductwork	EQ Barrier, Pressure Boundary
Evaporators	Heat Transfer, Pressure Boundary
Expansion Tanks	Pressure Boundary
Fan/blower Housings	Pressure Boundary
Filter Elements[2]	Filtration
Flexible Connections[1]	Pressure Boundary
Pipe	Pressure Boundary
Smoke Detector	Pressure Boundary
Steam Humidifier Sparger	Pressure Boundary
Temperature Elements	EQ Barrier, Pressure Boundary

See Table 2.0-1 for definition of intended function.

Table 2.3.3-10 Control Room Air Conditioning

Component Type	Intended Function(s)
Tubing	Pressure Boundary
Valves	Pressure Boundary

1. This component is not shown on the Control Room Air Conditioning System license renewal drawings.
2. This component is short-lived.

See Table 2.0-1 for definition of intended function.

Table 2.3.3-11 Auxiliary Building Air Conditioning

Component Type	Intended Function(s)
Bolting	Pressure Boundary
Condensers	Pressure Boundary
Damper Housings	EQ Barrier, Fire Barrier, Pressure Boundary
Ductwork	EQ Barrier, Pressure Boundary
Fan/Blower Housings	Pressure Boundary
Flexible Connections[1]	Pressure Boundary
Temperature Elements	EQ Barrier, Pressure Boundary

1. This component is not shown on the Auxiliary Building Air Conditioning System license renewal drawings.

See Table 2.0-1 for definition of intended function.

Table 2.3.3-12 Auxiliary Building Special Ventilation and Steam Exclusion

Component Type	Intended Function(s)
Bolting	Pressure Boundary
Damper Housings	EQ Barrier, Fire Barrier, Pressure Boundary
Ductwork	EQ Barrier, Pressure Boundary
Fan/blower Housings	Pressure Boundary
Filter Elements[2]	Filtration
Flexible Connections[1]	Pressure Boundary
Tubing	Pressure Boundary
Zone SV Exhaust Filter Assemblies	Pressure Boundary

1. This component is not shown on the Auxiliary Building Special Ventilation and Steam Exclusion System license renewal drawings.
2. This component is short-lived.

See Table 2.0-1 for definition of intended function.

Table 2.3.3-13 Auxiliary Building Ventilation

Component Type	Intended Function(s)
Auxiliary Building Vent	Pressure Boundary
Bolting	Pressure Boundary
Damper Housings	EQ Barrier, Fire Barrier, Pressure Boundary
Ductwork	EQ Barrier, Pressure Boundary
Fan Coil Units	Heat Transfer, Pressure Boundary
Fan/blower Housings	Pressure Boundary
Filter Assemblies	Pressure Boundary
Filter Elements[2]	Filtration
Flexible Connections[1]	Pressure Boundary
Heating Coils	Pressure Boundary
Temperature Elements	EQ Barrier, Pressure Boundary
Tubing	Pressure Boundary

1. This component is not shown on the Auxiliary Building Ventilation System license renewal drawings.
2. This component is short-lived.

See Table 2.0-1 for definition of intended function.

Table 2.3.3-14 Reactor Building Ventilation

Component Type	Intended Function(s)
Bolting	Pressure Boundary
Containment Fan Coil Units	Enclosure Protection, Heat Transfer, Pressure Boundary
Damper Housings	Pressure Boundary
Drip Pans	Enclosure Protection
Ductwork	Pressure Boundary
Electric Heater Housings	Pressure Boundary
Fan/blower Housings	Pressure Boundary
Filter Assemblies	Pressure Boundary
Filter Elements[2]	Filtration
Flexible Connections[1]	Pressure Boundary
Flow Elements	Pressure Boundary
Pipe	Pressure Boundary
Shroud Cooling Coils	Pressure Boundary
Tubing	Pressure Boundary
Valves	Pressure Boundary

1. This component is not shown on the Reactor Building Ventilation System license renewal drawings.
2. This component is short-lived.

See Table 2.0-1 for definition of intended function.

Table 2.3.3-15 Turbine Building and Screenhouse Ventilation

Component Type	Intended Function(s)
Bolting	Pressure Boundary
Damper Housings	EQ Barrier, Fire Barrier, Pressure Boundary
Ductwork	EQ Barrier, Pressure Boundary
Fan Coil Units	Heat Transfer, Pressure Boundary
Fan/blower Housings	Pressure Boundary
Flexible Connections[1]	Pressure Boundary
Flow Elements	Pressure Boundary
Temperature Elements	EQ Barrier, Pressure Boundary

1. This component is not shown on the Turbine Building and Screenhouse Ventilation System license renewal drawings.

See Table 2.0-1 for definition of intended function.

Table 2.3.3-16 Shield Building Ventilation

Component Type	Intended Function(s)
Bolting	Pressure Boundary
Damper Housings	Pressure Boundary
Ductwork	Pressure Boundary
Fan/Blower Housings	Pressure Boundary
Filter Elements[2]	Filtration
Flexible Connections[1]	Pressure Boundary
Reactor Building Discharge Vent	Pressure Boundary
Shield Building Vent Filter Assemblies	Pressure Boundary
Tubing	Pressure Boundary

1. This component is not shown on the Shield Building Ventilation System license renewal drawings.
2. This component is short-lived.

See Table 2.0-1 for definition of intended function.

Table 2.3.3-17 Technical Support Center Ventilation

Component Type	Intended Function(s)
Air Conditioning Units	Heat Transfer, Pressure Boundary
Air Handling Units	Pressure Boundary
Bolting	Pressure Boundary
Damper Housings	Fire Barrier, Pressure Boundary
Ductwork	Pressure Boundary
Fan/blower Housings	Pressure Boundary
Filter Elements[2]	Filtration
Flexible Connections[1]	Pressure Boundary
Tubing	Pressure Boundary

1. This component is not shown on the Technical Support Center Ventilation System license renewal drawings.
2. This component is short-lived.

See Table 2.0-1 for definition of intended function.

Table 2.3.3-18 Fire Protection

Component Type	Intended Function(s)
Bolting	Pressure Boundary
CO_2 Storage Tank	Pressure Boundary
CO_2 Storage Tank Compressor	Pressure Boundary
Drip Funnel	Enclosure Protection
Drip Pans and Enclosures[1]	Enclosure Protection
Fire Extinguishers[1, 2]	Pressure Boundary
Fire Hydrants	Pressure Boundary
Fire Pumps	Pressure Boundary
Flame Arrestor[1]	Fire Barrier, Pressure Boundary
Flexible Hoses[1]	Pressure Boundary
Halon Cylinders[1]	Pressure Boundary
Hose Reels/Stations	Pressure Boundary
Hose Valve Head	Pressure Boundary
Hoses[2]	Pressure Boundary
Jockey Pump	Pressure Boundary
Nozzles	Flow Distribution, Pressure Boundary
Odorizers	Pressure Boundary
Pipe	Pressure Boundary

See Table 2.0-1 for definition of intended function.

Table 2.3.3-18 Fire Protection

Component Type	Intended Function(s)
Reactor Coolant Pump Oil Collection Tank[1]	Pressure Boundary
Retarding Chambers	Pressure Boundary
Self-Contained Breathing Apparatus[1,2]	Pressure Boundary
Sight Glasses	Pressure Boundary
Sprinkler Heads	Spray Pattern
Strainers	Filtration
Tubing	Pressure Boundary
Turbine Bearing Fire Protection CO_2 Vaporizer	Pressure Boundary
Valves	Pressure Boundary

1. This component is not shown on the Fire Protection System license renewal drawings.
2. This component is short-lived.

Table 2.3.3-19 Diesel Generator

Component Type	Intended Function(s)
Air Dryers	Pressure Boundary
Bolting	Pressure Boundary
Compressor Casings	Pressure Boundary
Diesel Generator Cooling Water Heat Exchangers	Heat Transfer, Pressure Boundary
Diesel Generator Fuel Oil Day Tanks	Pressure Boundary
Diesel Generator Fuel Oil Storage Tanks	Pressure Boundary
Exhaust Manifold	Pressure Boundary
Exhaust Mufflers and Silencers	Pressure Boundary
Expansion Tanks	Pressure Boundary
Filter Elements[2]	Filtration
Filter Housings	Pressure Boundary
Flame Arrestors, Hoods and Caps	Enclosure Protection, Fire Barrier, Pressure Boundary
Flexible Connections	Pressure Boundary
Float Chamber	Pressure Boundary
Heater[1]	Pressure Boundary
Hoses[2]	Pressure Boundary
Lube Oil Coolers	Heat Transfer, Pressure Boundary

See Table 2.0-1 for definition of intended function.

Table 2.3.3-19 Diesel Generator

Component Type	Intended Function(s)
Oil Sumps	Pressure Boundary
Oilers	Pressure Boundary
Pipe	Pressure Boundary
Primary/Reserve Air Start Receivers	Pressure Boundary
Pumps[1, 2]	Pressure Boundary
Radiator	Heat Transfer, Pressure Boundary
Regulators	Pressure Boundary
Sight Glass[1]	Pressure Boundary
Snow Screen	Enclosure Protection
Standpipes	Pressure Boundary
Starter Motors[2]	Pressure Boundary
Starting Air Precoolers and Aftercoolers	Pressure Boundary
Strainer Housings	Pressure Boundary
Traps	Pressure Boundary
Tubing	Pressure Boundary
Turbocharger Aftercoolers	Heat Transfer, Pressure Boundary
Turbocharger Casings	Pressure Boundary
Valves	Pressure Boundary

See Table 2.0-1 for definition of intended function.

1. This component is not shown on the Diesel Generator System license renewal drawings. For the component type ‘Pump’, this only includes the main and piston oil pump, scavenging oil pump, keep-warm circulating oil pump, turbo soak oil pump, and jacket water pumps.
2. This component is short-lived. For the component type ‘Pump’, this only includes the emergency diesel generator engine driven and motor driven fuel oil pumps and engine water pumps.

See Table 2.0-1 for definition of intended function.

Table 2.3.3-20 Circulating Water

Component Type	Intended Function(s)
Bolting	Pressure Boundary
Chlorine Monitoring Water Pump	Pressure Boundary
Circulating Water Pumps	Pressure Boundary
Condensers	Pressure Boundary
Expansion Joints[1]	Pressure Boundary
Flow Elements	Pressure Boundary
Flow Indicators	Pressure Boundary
Pipe	Pressure Boundary
Recirculating Water Pump	Pressure Boundary
Recirculation Line Distribution Pipe	Flow Distribution, Pressure Boundary
Tubing	Pressure Boundary
Valves	Pressure Boundary

1. This component is short-lived.

Table 2.3.3-21 Gaseous Waste Processing and Discharge

Component Type	Intended Function(s)
Bolting	Pressure Boundary
Filter Housings	Pressure Boundary
Gas Decay Tanks	Pressure Boundary
Heat Exchangers	Heat Transfer, Pressure Boundary
Moisture Separators	Pressure Boundary
Orifices	Pressure Boundary, Restricts Flow
Pipe	Pressure Boundary
Sight Glass	Pressure Boundary
Strainer Housings	Pressure Boundary
Tubing	Pressure Boundary
Valves	Pressure Boundary
Waste Gas Compressors	Pressure Boundary

See Table 2.0-1 for definition of intended function.

Table 2.3.3-22 Liquid Waste Processing and Discharge

Component Type	Intended Function(s)
Bolting	Pressure Boundary
Deaerated Drains Tank	Pressure Boundary
Deaerated Drains Tank Pump	Pressure Boundary
Distillate Cooler	Pressure Boundary
Evaporator Condenser	Pressure Boundary
Filter Housings	Pressure Boundary
Flexible Hoses	Pressure Boundary
Flow Elements	Pressure Boundary
Flow Orifices	Pressure Boundary
Flow Transmitters	Pressure Boundary
Gage Glasses	Pressure Boundary
Laundry and Hot Shower Tanks	Pressure Boundary
Laundry Pump	Pressure Boundary
Level Switches	Pressure Boundary
Pipe	Pressure Boundary
Reactor Cavity Filtration Pump	Pressure Boundary
Reactor Coolant Drain Pumps	Pressure Boundary
Reactor Coolant Drain Tank	Pressure Boundary

See Table 2.0-1 for definition of intended function.

Table 2.3.3-22 Liquid Waste Processing and Discharge

Component Type	Intended Function(s)
Sludge Interceptor Pump	Pressure Boundary
Sludge Interceptor Tank	Pressure Boundary
Standpipes	Pressure Boundary
Strainer Housings	Pressure Boundary
Sump Tank Pumps	Pressure Boundary
Sump Tanks	Pressure Boundary
Tubing	Pressure Boundary
Valves	Pressure Boundary
Waste Condensate Pumps	Pressure Boundary
Waste Condensate Tanks	Pressure Boundary
Waste Evaporator Concentrates Sample Cooler	Pressure Boundary
Waste Evaporator Feed Pump	Pressure Boundary
Waste Holdup Tank	Pressure Boundary

See Table 2.0-1 for definition of intended function.

Table 2.3.3-23 Radiation Monitoring

Component Type	Intended Function(s)
Bolting	Pressure Boundary
Radiation Detectors	Pressure Boundary
Tubing	Pressure Boundary
Valves	Pressure Boundary

See Table 2.0-1 for definition of intended function.

Table 2.3.3-24 Makeup and Demineralized Water

Component Type	Intended Function(s)
Bolting	Pressure Boundary
Filter Housing	Pressure Boundary
Flow Elements	Pressure Boundary
Flow Indicators	Pressure Boundary
Hot Water Heater	Pressure Boundary
Pipe	Pressure Boundary
Strainer Housing	Pressure Boundary
Tubing	Pressure Boundary
Valves	Pressure Boundary

See Table 2.0-1 for definition of intended function.

Table 2.3.3-25 Service Water Pretreatment

Component Type	Intended Function(s)
Bolting	Pressure Boundary
Filter Elements[1]	Filtration
Filter Housings	Pressure Boundary
Flow Elements	Pressure Boundary
Mixers	Pressure Boundary
Pipe	Pressure Boundary
Tubing	Pressure Boundary
Valves	Pressure Boundary

1. This component is short-lived.

Table 2.3.3-26 Miscellaneous Drains and Sumps

Component Type	Intended Function(s)
Annulus Sump Pumps	Pressure Boundary
Bolting	Pressure Boundary
Deaerated Drains Tank Emergency Pumps	Pressure Boundary
Flow Elements	Pressure Boundary
Orifices	Pressure Boundary
Pipe	Pressure Boundary
Reactor Containment Vessel Sump Pumps	Pressure Boundary
RHR Pump Pit Sump Pumps	Pressure Boundary
Safeguards Alley Sump Pumps[1]	Pressure Boundary
Screen House Sump Pumps	Pressure Boundary
Valves	Pressure Boundary

1. This component is not shown on the Miscellaneous Drains and Sumps System license renewal drawings.

See Table 2.0-1 for definition of intended function.

Table 2.3.3-27 Miscellaneous Gas

Component Type	Intended Function(s)
Bolting	Pressure Boundary
CO_2 Vaporizer	Pressure Boundary
Flexible Connections	Pressure Boundary
Gas Bottles/Cylinders	Pressure Boundary
Hoses	Pressure Boundary
Pipe	Pressure Boundary
Regulators	Pressure Boundary
SFP Gate Inflatable Seal N_2 Rubber Hoses	Pressure Boundary
Strainer Housings	Pressure Boundary
Tubing	Pressure Boundary
Valves	Pressure Boundary

See Table 2.0-1 for definition of intended function.

Table 2.3.3-28 Potable Water

Component Type	Intended Function(s)
Bolting	Pressure Boundary
Nozzles[1]	Pressure Boundary
Pipe	Pressure Boundary
Valves	Pressure Boundary

1. This component is not shown on the Potable Water System license renewal drawings.

See Table 2.0-1 for definition of intended function.

Table 2.3.3-29 Primary Sampling

Component Type	Intended Function(s)
Bolting	Pressure Boundary
Expansion Tanks	Pressure Boundary
Filter Housings	Pressure Boundary
Flow Indicators	Pressure Boundary
Rupture Disks	Pressure Boundary
Sample Heat Exchangers	Pressure Boundary
Sample Pressure Vessel	Pressure Boundary
Tubing	Pressure Boundary
Valves	Pressure Boundary

2.3.4 STEAM AND POWER CONVERSION SYSTEMS

2.3.4.1 TURBINE SYSTEM

System Description

The main turbine converts the thermal energy of steam into mechanical rotational energy to drive the main generator. The main turbine is composed of one high-pressure turbine and two low-pressure turbines. The main turbine is supported by auxiliary subsystems that monitor, control, lubricate, cool and improve the efficiency and safety of the main turbine.

The Turbine System is in scope of license renewal since the system has intended functions that meet the criteria stated in 10CFR54.4(a). The Turbine System meets 10CFR54.4(a)(1) because the system provides safety-related indications, controls and protection. The Turbine System meets 10CFR54.4(a)(2) because the system contains non-safety-related components spatially oriented such that their failure could prevent the satisfactory accomplishment of a safety-related function associated with a safety-related system, structure, or component. The system meets 10CFR54.4(a)(3) because the system contains components that support safe shutdown in the event of an anticipated transient without scram.

The evaluation boundary for the Turbine System components subject to aging management review includes safety-related instrumentation and controls. Additionally, the evaluation boundary includes non-safety-related components with a spatial orientation near a safety-related system, structure, or component located in the Turbine Building.

USAR Reference

Additional details of the Turbine System can be found in the USAR, Sections 10.2.2, B.9, Table 7.2-1 and Table B.2-1.

License Renewal Drawings

The license renewal drawings for the Turbine System are listed below:

LRM-202-3
LRM-203
LRM-204
LRM-206

LRM-207
LRM-210
LRM-211
LRM-212
LRM-219
LRXK-101-16
LRXK-101-17
LRXK-101-17A
LRXK-101-24-1
LRXK-101-24-2

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.4-1, Turbine.

The aging management review results for these components are provided in Table 3.4.2-1: Steam and Power Conversion System - Turbine - Aging Management Evaluation.

2.3.4.2 MAIN STEAM AND STEAM DUMP SYSTEM

System Description

The Main Steam and Steam Dump System transports saturated steam from the steam generators to the turbine for conversion of thermal energy to mechanical energy. The steam dump portion of the system provides an artificial steam load by dumping steam to the condenser and/or atmosphere. Steam is also supplied to a number of plant auxiliaries including the moisture separator reheaters, turbine gland seal steam, condenser air ejector, hogging jet, turbine driven auxiliary feedwater pump, plant auxiliary steam loads including the Heating Steam System and the Fire Protection System carbon dioxide vaporizer.

The Main Steam and Steam Dump System transports steam from the steam generators through main steam isolation valves to the turbine stop and control valves. The two main steam lines are interconnected upstream of the turbine stop valves to equalize pressure. A flow nozzle inside the Reactor Containment Vessel, immediately downstream from the steam generator outlets, is used to measure steam flow rate for control, indication, and protection systems.

The Main Steam and Steam Dump System provides overpressure protection and pressure control for the steam generators and the main steam headers. Five ASME code safety valves are provided on each header and are located outside of the Reactor Containment Vessel, upstream of the main steam isolation valves. The ASME code safety valves discharge through vent stacks to atmosphere.

Each main steam header has an atmospheric power operated relief valve, adjacent to the safety valves. The atmospheric power operated relief valve limits steam generator pressure during minor system pressure excursions and minimizes ASME code safety valve operation. The atmospheric power operated relief valves can be used for controlled release of steam to remove heat from the Reactor Coolant System. The power operated relief valves also provide for pressure control during hot shutdown and during periods when the main condenser is not available.

Heat removal during plant heatup, startup, low power operation, shutdown, or cooldown is provided by the steam dumps, assuming the main condenser is available. In the event the main condenser is unavailable, heat removal can also be accomplished by dumping steam to atmosphere with the atmospheric dump valves.

The Main Steam and Steam Dump System is in scope of license renewal since the system has intended functions that meet the criteria stated in 10CFR54.4(a). The Main Steam and Steam Dump System meets 10CFR54.4(a)(1) because the system provides a steam flow path to remove heat from the Reactor Coolant System, provides a source of steam to the turbine driven auxiliary feedwater pump, provides overpressure protection for the steam generators and system components, limits Reactor Coolant System cooldown and resultant reactivity insertion during a main steam line break, provides safety-related indications, controls, and protection, and provides Reactor Containment Vessel pressure boundary integrity/isolation. The Main Steam and Steam Dump System meets 10CFR54.4(a)(2) because the system contains non-safety-related components spatially oriented such that their failure could prevent the satisfactory accomplishment of a safety-related function associated with a safety-related system, structure, or component, and contains components required to support safe shutdown in the event of a HELB. The system also contains non-safety-related piping that is attached to safety-related piping and that is seismically designed and supported up to and including the first structural anchor point beyond the safety-related/non-safety-related boundary. The system meets 10CFR54.4(a)(3) because the system includes EQ components and components that support fire protection and station blackout.

The evaluation boundary for the Main Steam and Steam Dump System components subject to aging management review includes the steam lines from the steam generators to the main turbine and moisture separator reheaters in the Turbine Building. Piping, including drain lines, valves, steam traps, safety valves, and relief valves are within the evaluation boundary. Lines tap off upstream of the main steam isolation valves to supply steam to the auxiliary feedwater pump turbine, which is located in the Class I portion of the Turbine Building. The evaluation boundary includes components that are relied upon to provide structural seismic support. Included in the evaluation boundary are non-safety-related components with a spatial orientation near a safety-related system, structure, or component located in the Auxiliary Building or Turbine Building.

USAR Reference

Additional details of the Main Steam and Steam Dump System can be found in the USAR, Sections 10.2, Table 10.3-1, Table B.2-1, Chapter 10A, and Figure 10.2-1.

License Renewal Drawings

The license renewal drawings for the Main Steam and Steam Dump System are listed below:

LRM-203
LRM-206
LRM-207
LRM-211
LRM-212
LRM-219
LRXK-101-16
LRXK-101-17
LRXK-101-17A

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.4-2, Main Steam and Steam Dump.

The aging management review results for these components are provided in Table 3.4.2-2: Steam and Power Conversion System - Main Steam and Steam Dump - Aging Management Evaluation.

2.3.4.3 BLEED STEAM SYSTEM

System Description

The Bleed Steam System provides high pressure turbine exhaust and extraction steam to the high and low pressure feedwater heaters to improve overall plant efficiency and remove moisture from the turbine. The system consists of piping from the turbine extraction and exhaust points to the feedwater heaters and vent paths from the moisture separator reheaters, heater drain tank, and feedwater heaters. The moisture separator reheaters are included in the scope of the Bleed Steam System.

The Bleed Steam System is in the scope of license renewal since the system has intended functions that meet the criteria stated in 10CFR54.4(a). The Bleed Steam System meets 10CFR54.4(a)(2) because the system contains 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 system, structure, or component.

The evaluation boundary for the Bleed Steam System components subject to aging management review includes non-safety-related components with a spatial orientation near a safety-related system, structure, or component located in the Turbine Building.

USAR Reference

Additional details of the Bleed Steam System can be found in the USAR, Sections 10.2.2, Table B.2-1, and Figure 10.2-4.

License Renewal Drawings

The license renewal drawings for the Bleed Steam System are listed below:

LRM-203
LRM-206
LRM-207

LRM-211

LRM-605-2

LRXK-101-16

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.4-3, Bleed Steam.

The aging management review results for these components are provided in Table 3.4.2-3: Steam and Power Conversion System - Bleed Steam - Aging Management Evaluation.

2.3.4.4 FEEDWATER SYSTEM

System Description

The Feedwater System, in conjunction with the Condensate System, returns condensed steam from the main condensers and the drains from the heating cycle to the steam generators. The system utilizes two motor-driven feedwater pumps to increase the pressure of the condensate for delivery through high-pressure feedwater heaters and feedwater flow control valves to the steam generators. Each feedwater pump is equipped with a pressurized lubricating oil subsystem.

Each feedwater pump discharges into a common header, which directs the feedwater to the high-pressure feedwater heaters. Downstream of the high-pressure feedwater heaters, the flow paths again join together into a common header where the feedwater is allowed to mix thoroughly to equalize the temperature. The flow path then splits into two lines containing the feedwater flow control stations and flow nozzles to feed the two steam generators. The flow nozzle in each line provides flow information required for feedwater control and the Reactor Protection Systems. An ultrasonic flow measurement device is installed, which allows reactor thermal power to be calculated more accurately.

Downstream of each feedwater flow control station is a motor operated feedwater isolation valve and a check valve. The Auxiliary Feedwater System taps into the feedwater line upstream of the steam generator inlet and downstream of the check valve.

For the purpose of license renewal, portions of the Chemical Injection System are evaluated with the Feedwater System.

The Feedwater System is in scope of license renewal since the system has intended functions that meet the criteria stated in 10CFR54.4(a). The Feedwater System meets 10CFR54.4(a)(1) because the system provides a flow path for auxiliary feedwater flow to the steam generators, provides isolation of feedwater flow to the steam generators to limit RCS cooldown and energy release to the Reactor Containment Vessel during a steam line break, provides safety-related indications, controls, and protection, and provides Reactor Containment Vessel pressure boundary integrity/isolation. The Feedwater System meets 10CFR54.4(a)(2) because the system contains non-safety-related components spatially oriented such that their failure could prevent the satisfactory accomplishment of a safety-related function associated with a safety-related system, structure, or component, and contains components required to support safe shutdown in the event of a HELB. The system also contains non-safety-related piping that is attached to safety-related piping and that is seismically designed and supported up to and including the first structural anchor point beyond the safety-related/non-safety-related boundary. Additionally, the system provides non-safety-related flow signals for calorimetric calibrations. The system meets 10CFR54.4(a)(3) because the system includes EQ components and components that support fire protection.

The evaluation boundary for the Feedwater System components subject to aging management review includes the feedwater piping and piping components from the feedwater pump suction to the steam generators, including the high-pressure feedwater heaters. The evaluation boundary includes components that are relied upon to provide structural seismic support. Included in the evaluation boundary are non-safety-related components with a spatial orientation near a safety-related system, structure, or component located in the Auxiliary Building or Turbine Building.

USAR Reference

Additional details of the Feedwater System can be found in the USAR, Sections 10.2.2, 10.3, Chapter 10A, Table 10.1-1, Table 10.3-1, Table B.2-1, Figure 10.2-3, and Figure 10.2-11.

License Renewal Drawings

The license renewal drawings for the Feedwater System are listed below:

LRM-202-3
LRM-204
LRM-205
LRM-206
LRM-207
LRM-214
LRM-219

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.4-4, Feedwater.

The aging management review results for these components are provided in Table 3.4.2-4: Steam and Power Conversion System - Feedwater - Aging Management Evaluation.

2.3.4.5 CONDENSATE SYSTEM

System Description

The Condensate System is designed to transfer water in the condenser hotwell to the suction of the feedwater pumps. The condensate storage tanks provide the normal condensate makeup and a source of water to the suction of the auxiliary feedwater pumps. Condensate serves as the cooling medium for the air ejector condensers, gland steam condenser, and low-pressure feedwater heaters. The Condensate System also supplies cooling water to the steam generator blowdown heat exchangers, supplies seal water to condensate pump and heater drain pump glands, supplies seal water for feedwater pump seal water injection, and furnishes condensate to the turbine exhaust hood sprays for turbine exhaust temperature control.

For the purpose of license renewal, portions of the Chemical Injection System are evaluated with the Condensate System.

The Condensate System is in the scope of license renewal since the system has intended functions that meet the criteria stated in 10CFR54.4(a). The Condensate

System meets 10CFR54.4(a)(2) because the system contains non-safety-related components spatially oriented such that their failure could prevent the satisfactory accomplishment of a safety-related function associated with a safety-related system, structure, or component. The system also contains non-safety-related piping that is attached to safety-related piping and that is seismically designed and supported up to and including the first structural anchor point beyond the safety-related/non-safety-related boundary. The system meets 10CFR54.4(a)(3) because the system includes components that support fire protection and station blackout.

The evaluation boundary for the Condensate System components subject to aging management review includes the majority of the system pressure boundary piping, valves, and components, as well as the condensate storage tanks. Included in the evaluation boundary are non-safety-related components with a spatial orientation near a safety-related system, structure, or component located in the Turbine Building or Auxiliary Building. The evaluation boundary includes components that are relied upon to provide structural seismic support.

USAR Reference

Additional details of the Condensate System can be found in the USAR Sections 6.6.2, 8.2.4, 10.2, Table 10.1-1, Table B.2-1, and Figure 10.2-2.

License Renewal Drawings

The license renewal drawings for the Condensate System are listed below:

- LRM-204
- LRM-205
- LRM-206
- LRM-207
- LRM-212
- LRM-214
- LRM-219
- LRM-436
- LRM-606
- LRXK-101-17

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.4-5, Condensate.

The aging management review results for these components are provided in Table 3.4.2-5: Steam and Power Conversion System - Condensate - Aging Management Evaluation.

2.3.4.6 STEAM GENERATOR BLOWDOWN TREATMENT SYSTEM

System Description

The Steam Generator Blowdown Treatment System includes steam generator blowdown and steam generator blowdown treatment. The system assists in maintaining secondary chemistry of the steam generators and the Main Steam and Steam Dump System by removing contaminants. Also, the system provides the means to monitor steam generator tube integrity and has the ability to treat radioactive contaminated water from the steam generators following a steam generator tube rupture.

The blowdown treatment portion of the system processes radioactive contaminated water. During normal plant operation, radioactive water from the Waste Disposal System is periodically transferred to the blowdown treatment portion of the system for processing. Following a steam generator tube rupture, the system processes the radioactive water with filters and ion exchangers to remove contaminants.

The Steam Generator Blowdown Treatment System is in scope of license renewal since the system has intended functions that meet the criteria stated in 10CFR54.4(a). The Steam Generator Blowdown Treatment System meets 10CFR54.4(a)(1) because the system isolates steam generator blowdown upon start of the auxiliary feedwater pumps or detection of high radiation, isolates the system to conserve steam generator inventory, isolates a ruptured or faulted steam generator, provides Reactor Containment Vessel pressure boundary integrity/isolation, and provides safety-related indications, controls, and protection. The Steam Generator Blowdown Treatment System meets 10CFR54.4(a)(2) because the system contains non-safety-related components spatially oriented such that their failure could prevent the satisfactory accomplishment of a safety-related function associated with a safety-related system, structure, or component, and contains components required to support safe shutdown in the event of a HELB. The system also contains non-safety-related piping that is attached to safety-related piping and that is seismically designed and supported up to and including the first structural anchor point beyond the safety-related/non-safety-related boundary. The system meets 10CFR54.4(a)(3) because the system includes EQ components and components that support fire protection and station blackout.

The evaluation boundary for the Steam Generator Blowdown Treatment System components subject to aging management review includes the blowdown piping, valves, and steam traps. Included in the evaluation boundary are the steam generator blowdown and blowdown sample Reactor Containment Vessel isolation valves, steam generator blowdown heat exchangers, steam generator blowdown tank, blowdown recovery ion exchangers, and pre- and post-filters. The evaluation boundary includes components that are relied upon to provide structural seismic support. Included in the evaluation boundary are non-safety-related components with a spatial orientation near a safety-related system, structure, or component located in the Auxiliary Building or Turbine Building.

USAR Reference

Additional details of the Steam Generator Blowdown Treatment System can be found in the USAR, Sections 10.2.3, 11.1.2, 11.2.3, Table B.2-1, Chapter 10A, Figure 11.1-3, and Figure 11.1-4.

License Renewal Drawings

The license renewal drawings for the Steam Generator Blowdown Treatment System are listed below:

LRM-202-3
LRM-203
LRM-204
LRM-219
LRM-368
LRM-436

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.4-6, Steam Generator Blowdown Treatment.

The aging management review results for these components are provided in Table 3.4.2-6: Steam and Power Conversion System - Steam Generator Blowdown Treatment - Aging Management Evaluation.

2.3.4.7 AUXILIARY FEEDWATER SYSTEM

System Description

The Auxiliary Feedwater System is designed to provide feedwater for the removal of sensible and decay heat in the event the main feedwater pumps are inoperative. The Auxiliary Feedwater System delivers feedwater from the condensate storage tanks (or from the Service Water System) to the main feedwater piping at a location near the steam generator inlet.

The Auxiliary Feedwater System consists of one turbine-driven pump capable of delivering feedwater to either or both steam generators. In addition, there are two motor-driven pumps, one for each steam generator, which are interconnected on the discharge side by a cross-over pipe, which may be isolated by two normally-open motor operated valves. Each pump is equipped with a pressurized lube oil subsystem and is capable of supplying feedwater to either or both steam generators. The two motor-driven pumps are powered from separate safeguard buses.

Normal feedwater supply to the auxiliary feedwater pumps is from two 75,000-gallon condensate storage tanks. The Service Water System provides a safety-related backup water supply to the pumps. The Service Water System is isolated from the Auxiliary Feedwater System by normally closed motor-operated valves.

Each auxiliary feedwater pump is provided with a continuous recirculation flowpath to the condensate storage tanks. A breakdown orifice limits the total recirculation flow. A portion of the pump recirculation flow is used to cool the pump sleeve-bearing oil coolers and the turbine bearings for the turbine-driven pump.

For the purpose of license renewal, portions of the Chemical Injection System are evaluated with the Auxiliary Feedwater System.

The Auxiliary Feedwater System is in scope of license renewal since the system has intended functions that meet the criteria stated in 10CFR54.4(a). The system meets 10CFR54.4(a)(1) because the system provides water to the steam generators when normal feedwater is unavailable to ensure tube sheet coverage and adequate removal of sensible and decay heat from the Reactor Coolant System following a limiting event, maintains an inventory of water in the steam generator following a steam generator tube rupture to ensure an adequate fission product barrier exists, provides safety-related indications, controls, and protection, provides Reactor Containment Vessel pressure boundary integrity/isolation, and provides manual isolation of a faulted steam generator in the event of a main steam line break. The Auxiliary Feedwater System meets 10CFR54.4(a)(2) because the system contains non-safety-related components spatially oriented such that their failure could prevent the satisfactory accomplishment of a safety-related function associated with a safety-related system, structure, or component, and contains components required to support safe shutdown in the event of a HELB. The system also contains non-safety-related piping that is attached to safety-related piping and that is seismically designed and supported up to and including the first structural anchor point beyond the safety-related/non-safety-related boundary. The system meets 10CFR54.4(a)(3) because the system includes EQ components and components that support fire protection, station blackout, and anticipated transient without scram.

The evaluation boundary for the Auxiliary Feedwater System components subject to aging management review includes piping, valves, and other components from the suction of the auxiliary feedwater pumps to the Feedwater System. The auxiliary feedwater pump recirculation line to the condensate storage tanks is included in the evaluation boundary. The steam piping to the turbine driven auxiliary feedwater pump is evaluated as part of the Main Steam and Steam Dump System. The evaluation boundary includes non-safety-related components with a spatial orientation near a safety-related system, structure, or component located in the Turbine Building or Auxiliary Building. Included in the boundary are components that are relied upon to provide structural seismic support.

USAR Reference

Additional details of the Auxiliary Feedwater System can be found in the USAR, Sections 6.6, 10.3.1, Table 7.2-1, Table 10.1-1, Table 10.3-1, Table B.2-1, Chapter 10A, and Figure 10.2-3.

License Renewal Drawings

The license renewal drawings for the Auxiliary Feedwater System are listed below:

LRM-202-2
LRM-202-3
LRM-203
LRM-204
LRM-205
LRM-211
LRM-214

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.4-7, Auxiliary Feedwater.

The aging management review results for these components are provided in Table 3.4.2-7: Steam and Power Conversion System - Auxiliary Feedwater - Aging Management Evaluation.

2.3.4.8 AIR REMOVAL SYSTEM

System Description

The Air Removal System removes non-condensable gases from the main condenser and the gland steam condenser. Air is also removed from the turbine oil reservoir and the turbine oil loop seal tank. A vacuum breaker valve is provided to break condenser vacuum and quickly slow the turbine rotor in the event of a loss of turbine oil pressure.

The Air Removal System is in the scope of license renewal since the system has intended functions that meet the criteria stated in 10CFR54.4(a). The system meets 10CFR54.4(a)(2) because the system contains non-safety-related components spatially oriented such that their failure could prevent the satisfactory accomplishment of a safety-related function associated with a safety-related system, structure, or component.

The evaluation boundary for the Air Removal System components subject to aging management review includes non-safety-related components with a spatial orientation near a safety-related system, structure, or component located in the Turbine Building.

USAR Reference

Additional details of the Air Removal System can be found in the USAR Sections 10.2.2, Table B.2-1, and Figure 10.2-6.

License Renewal Drawings

The license renewal drawings for the Air Removal System are listed below:

LRM-203
LRM-204
LRM-211
LRM-212
LRM-219
LRXK-101-17

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.4-8, Air Removal.

The aging management review results for these components are provided in Table 3.4.2-8: Steam and Power Conversion System - Air Removal - Aging Management Evaluation.

2.3.4.9 HEATER AND MOISTURE SEPARATOR DRAINS SYSTEM

System Description

The Heater and Moisture Separator Drains System collects condensate drained from Main Steam and Steam Dump and Bleed Steam Systems and returns the drains to the Condensate System. Condensate from the moisture separator reheaters and feedwater heaters 14 A/B and 15 A/B are collected in the heater drain tank and then returned to the Condensate System. Drains from the reheater portion of the moisture separators are collected in the reheater drain tanks and returned to the high-pressure feedwater heaters.

The Heater and Moisture Separator Drains System is in the scope of license renewal since the system has intended functions that meet the criteria stated in

10CFR54.4(a). The Heater and Moisture Separator Drains System meets 10CFR54.4(a)(2) because the system contains non-safety-related components spatially oriented such that their failure could prevent the satisfactory accomplishment of a safety-related function associated with a safety-related system, structure, or component.

The evaluation boundary for the Heater and Moisture Separator Drains System components subject to aging management review includes non-safety-related components with a spatial orientation near a safety-related system, structure, or component located in the Turbine Building.

USAR Reference

Additional details of the Heater and Moisture Separator Drains System can be found in the USAR, Section 10.2.2, Table B.2-1, and Figure 10.2-5.

License Renewal Drawings

The license renewal drawings for the Heater and Moisture Separator Drains System are listed below:

LRM-202-3
LRM-203
LRM-204
LRM-206
LRM-207
LRM-211
LRM-219
LRM-436

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.4-9, Heater and Moisture Separator Drains.

The aging management review results for these components are provided in Table 3.4.2-9: Steam and Power Conversion System - Heater and Moisture Separator Drains - Aging Management Evaluation.

2.3.4.10 HEATING STEAM SYSTEM

System Description

The Heating Steam System supplies steam and/or hot water to various plant areas for heating. Heating steam is supplied to unit heaters and to reheat and preheat coils of several ventilation systems. Process steam is also condensed in four converters to generate hot water for heating several plant areas.

The Heating Steam System is in the scope of license renewal since the system has intended functions that meet the criteria stated in 10CFR54.4(a). The Heating Steam System meets 10CFR54.4(a)(2) because the system contains 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 system, structure, or component. Additionally, system piping provides control room pressure boundary integrity.

The evaluation boundary for the Heating Steam System components subject to aging management review includes non-safety-related components with a spatial orientation near a safety-related system, structure, or component located in the Turbine Building, Auxiliary Building, or Screenhouse.

USAR Reference

Additional details of the Heating Steam System can be found in the USAR, Sections 9.6.4, 10.1.4, 10A.1.2, and Table B.2-1.

License Renewal Drawings

The license renewal drawings for the Heating Steam System are listed below:

LRM-203
LRM-206
LRM-215
LRM-216
LRM-219
LRM-384
LRM-603

LRM-605-1

LRM-605-2

LRXK-100-38

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.4-10, Heating Steam.

The aging management review results for these components are provided in Table 3.4.2-10: Steam and Power Conversion System - Heating Steam - Aging Management Evaluation.

2.3.4.11 MAIN GENERATOR (MECHANICAL) AND AUXILIARIES SYSTEM

System Description

The purpose of the Main Generator (Mechanical) and Auxiliaries System is to support operation of the main generator in the production of electricity. The main generator supplies plant auxiliary electrical power during normal operation. The function of the main generator is to convert the rotational mechanical energy supplied by the turbine into electrical energy. Main generator hydrogen cooling is provided by four heat exchangers (hydrogen coolers) located inside the generator housing. The hydrogen coolers reject heat from inside the generator housing to the Service Water System. The seal oil equipment provides oil at a pressure greater than main generator hydrogen pressure to glands at each end of the main generator shaft. The oil ensures that hydrogen does not leak from the main generator and that air does not enter the main generator. Isophase bus duct cooling removes heat losses from the generator output bus work. Two isophase bus duct heat exchangers are provided to reject heat to the Service Water System. The exciter air cooler removes heat from the air inside the exciter housing. The heat is rejected to the Service Water System.

The Main Generator (Mechanical) and Auxiliaries System is in the scope of license renewal since the system has intended functions that meet the criteria stated in 10CFR54.4(a). The system meets 10CFR54.4(a)(2) because the system contains 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 system, structure, or component.

The evaluation boundary for the Main Generator (Mechanical) and Auxiliaries System components subject to aging management review includes non-safety-related components with a spatial orientation near a safety-related system, structure, or component located in the Turbine Building.

USAR Reference

Additional details of the Main Generator (Mechanical) and Auxiliaries System can be found in the USAR, Sections 10.2.2 and Table B.2-1.

License Renewal Drawings

The license renewal drawings for the Main Generator (Mechanical) and Auxiliaries System are listed below:

LRM-202-3
LRXK-101-64

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.4-11, Main Generator (Mechanical) and Auxiliaries.

The aging management review results for these components are provided in Table 3.4.2-11: Steam and Power Conversion System - Main Generator (Mechanical) and Auxiliaries - Aging Management Evaluation.

2.3.4.12 SECONDARY SAMPLING SYSTEM

System Description

The Secondary Sampling System monitors the water purity and chemical concentrations of the Condensate, Feedwater, Main Steam and Steam Dump, Steam Generator Blowdown Treatment, and Heating Steam Systems. Samples from these various systems can be obtained from the Analytical Instrumentation Panel or at local sample points. The Secondary Sampling System Analytical Instrumentation Panel provides a record of the analyses performed on samples taken from various points. Analytical records of grab samples are also retained.

Samples from the various systems are sent through first and/or second stage sample cooling coils, except for hotwell samples, and subsequently into the Analytical Instrumentation Panel. Grab sample points are provided at the Analytical

Instrumentation Panel and at other locations along the sample lines. The Analytical Instrumentation Panel refrigeration unit is used to cool the samples in the first and second stage coolers. Feedwater samples are cooled by the feedwater line sample chiller.

The Secondary Sampling System is in the scope of license renewal since the system has intended functions that meet the criteria stated in 10CFR54.4(a). The Secondary Sampling System meets 10CFR54.4(a)(2) because the system contains non-safety-related components spatially oriented such that their failure could prevent the satisfactory accomplishment of a safety-related function associated with a safety-related system, structure, or component. The system also contains non-safety-related piping that is attached to safety-related piping and that is seismically designed and supported up to and including the first structural anchor point beyond the safety-related/non-safety-related boundary.

The evaluation boundary for the Secondary Sampling System components subject to aging management review includes the majority of the system pressure boundary piping, valves, and components. Included in the evaluation boundary are non-safety-related components with a spatial orientation near a safety-related system, structure, or component located in the Turbine Building. The evaluation boundary includes components that are relied upon to provide structural seismic support.

USAR Reference

Additional details of the Secondary Sampling System can be found in the USAR, Section 10.2 and Figure 10.2-9.

License Renewal Drawings

The license renewal drawings for the Secondary Sampling System are listed below:

LRM-204
LRM-219
LRM-219-1
LRM-436
LRM-605-2

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.4-12, Secondary Sampling.

The aging management review results for these components are provided in Table 3.4.2-12: Steam and Power Conversion System - Secondary Sampling - Aging Management Evaluation.

2.3.4.13 TURBINE OIL PURIFICATION SYSTEM

System Description

The Turbine Oil Purification System is designed to remove water and particulate contaminants from the turbine oil in the turbine oil reservoir with a turbine oil conditioner unit. The turbine oil conditioner unit is designed to remove free water and solid particles from the turbine oil and then polish the oil by stripping it of all moisture or cloud vapor. The removed free water is discharged to the sump located in the Turbine Building basement.

The Turbine Oil Purification System is in the scope of license renewal since the system has intended functions that meet the criteria stated in 10CFR54.4(a). The Turbine Oil Purification System meets 10CFR54.4(a)(2) because the system contains non-safety-related components spatially oriented such that their failure could prevent the satisfactory accomplishment of a safety-related function associated with a safety-related system, structure, or component.

The evaluation boundary for the Turbine Oil Purification System components subject to aging management review includes non-safety-related components with a spatial orientation near a safety-related system, structure, or component located in the Turbine Building.

USAR Reference

Additional details of the Turbine Oil Purification System can be found in the USAR, Section 10.2.2 and Table B.2-1.

License Renewal Drawings

The license renewal drawings for the Turbine Oil Purification System are listed below:

LRM-210

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.4-13, Turbine Oil Purification.

The aging management review results for these components are provided in Table 3.4.2-13: Steam and Power Conversion System - Turbine Oil Purification - Aging Management Evaluation.

2.3.4.14 TURBINE ROOM TRAPS AND DRAINS SYSTEM

System Description

The Turbine Room Traps and Drains System collects condensate from steam piping and turbine casing drain piping and returns it to the condenser for reuse. The drain connections drain accumulations of water, which are potentially damaging to equipment.

The Turbine Room Traps and Drains System is in the scope of license renewal since the system has intended functions that meet the criteria stated in 10CFR54.4(a). The Turbine Room Traps and Drains System meets 10CFR54.4(a)(2) because the system contains non-safety-related components spatially oriented such that their failure could prevent the satisfactory accomplishment of a safety-related function associated with a safety-related system, structure, or component. The system also contains non-safety-related piping that is attached to safety-related piping and that is seismically designed and supported up to and including the first structural anchor point beyond the safety-related/non-safety-related boundary.

The evaluation boundary for the Turbine Room Traps and Drains System components subject to aging management review includes non-safety-related components with a spatial orientation near a safety-related system, structure, or component located in the Turbine Building. The evaluation boundary also includes components that are relied upon to provide structural seismic support.

USAR Reference

Additional details of the Turbine Room Traps and Drains System can be found in the USAR, Section 10.2 and Figure 10.2-8.

License Renewal Drawings

The license renewal drawings for the Turbine Room Traps and Drains System are listed below:

LRM-202-3
LRM-203
LRM-211

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.4-14, Turbine Room Traps and Drains.

The aging management review results for these components are provided in Table 3.4.2-14: Steam and Power Conversion System - Turbine Room Traps and Drains - Aging Management Evaluation.

Screening Results Tables: Steam and Power Conversion Systems

Table 2.3.4-1 Turbine

Component Type	Intended Function(s)
Accumulators	Pressure Boundary
Bolting	Pressure Boundary
Electro Hydraulic Control System Oil Coolers	Pressure Boundary
Filter Housings	Pressure Boundary
Pipe	Pressure Boundary
Pumps	Pressure Boundary
Reservoir	Pressure Boundary
Sight Glasses	Pressure Boundary
Tubing	Pressure Boundary
Turbine Casings	Pressure Boundary
Turbine Exhaust Hoods	Pressure Boundary
Turbine Gland Steam Condenser	Pressure Boundary
Turbine Oil Coolers	Pressure Boundary
Valves	Pressure Boundary

See Table 2.0-1 for definition of intended function.

Table 2.3.4-2 Main Steam and Steam Dump

Component Type	Intended Function(s)
Bolting	Pressure Boundary
Condensing Chambers	Pressure Boundary
Flex Connections	Pressure Boundary
Flow Elements	Pressure Boundary, Restricts Flow
Flow Orifices	Pressure Boundary
Moisture Separator	Pressure Boundary
Pipe	Pressure Boundary
Piping Sleeves	EQ Barrier, Jet Impingement Shield, Pressure Boundary
Rupture Discs	Pressure Boundary
Strainer Housings	Pressure Boundary
Traps	Pressure Boundary
Tubing	Pressure Boundary
Valves	Pressure Boundary

See Table 2.0-1 for definition of intended function.

Table 2.3.4-3 Bleed Steam

Component Type	Intended Function(s)
Bolting	Pressure Boundary
Expansion Joints	Pressure Boundary
Flow Elements	Pressure Boundary
Moisture Separators/Reheaters	Pressure Boundary
Pipe	Pressure Boundary
Restricting Orifices	Pressure Boundary
Tubing	Pressure Boundary
Valves	Pressure Boundary

See Table 2.0-1 for definition of intended function.

Table 2.3.4-4 Feedwater

Component Type	Intended Function(s)
Bolting	Pressure Boundary
Breakdown Orifices	Pressure Boundary
Feedwater Heaters	Pressure Boundary
Feedwater Pumps	Pressure Boundary
Feedwater Pumps Oil Coolers	Pressure Boundary
Filter Housings	Pressure Boundary
Flow Elements/Nozzles	Pressure Boundary
Oil Pumps	Pressure Boundary
Oil Reservoirs	Pressure Boundary
Pipe	Pressure Boundary
Piping Sleeves	EQ Barrier, Jet Impingement Shield, Pressure Boundary
Straightening Vanes	Pressure Boundary
Tubing	Pressure Boundary
Valves	Pressure Boundary

See Table 2.0-1 for definition of intended function.

Table 2.3.4-5 Condensate

Component Type	Intended Function(s)
Bolting	Pressure Boundary
Condensate Storage Tanks	Pressure Boundary
Feedwater Heaters	Pressure Boundary
Feedwater Seal Water Startup Filter Housings	Pressure Boundary
Flow Elements	Pressure Boundary
Flow Switches	Pressure Boundary
Pipe	Pressure Boundary
Strainer Housings	Pressure Boundary
Tubing	Pressure Boundary
Valves	Pressure Boundary

See Table 2.0-1 for definition of intended function.

Table 2.3.4-6 Steam Generator Blowdown Treatment

Component Type	Intended Function(s)
Bolting	Pressure Boundary
Filter Housings	Pressure Boundary
Flow Indicators	Pressure Boundary
Pipe	Pressure Boundary
Resin Trap	Pressure Boundary
Rupture Disk	Pressure Boundary
SGBT Recovery Ion Exchangers	Pressure Boundary
SGBT Standpipe	Pressure Boundary
Steam Generator Blowdown Heat Exchangers	Pressure Boundary
Steam Generator Blowdown Tank	Pressure Boundary
Tubing	Pressure Boundary
Valves	Pressure Boundary

See Table 2.0-1 for definition of intended function.

Table 2.3.4-7 Auxiliary Feedwater

Component Type	Intended Function(s)
AFW Pump Oil Coolers	Heat Transfer, Pressure Boundary
AFW Pump Oil Pumps[1]	Pressure Boundary
AFW Pump Oil Reservoir[1]	Pressure Boundary
Bolting	Pressure Boundary
Breakdown Orifices	Pressure Boundary, Restricts Flow
Filter Elements[1],[2]	Filtration
Filter Housings[1]	Pressure Boundary
Flow Elements	Pressure Boundary
Level Glass[1]	Pressure Boundary
Motor Driven Auxiliary Feedwater Pumps	Pressure Boundary
Pipe	Pressure Boundary
Tubing	Pressure Boundary
Turbine Driven AFW Pump Turbine Bearing Coolers	Heat Transfer, Pressure Boundary
Turbine Driven Auxiliary Feedwater Pump	Pressure Boundary
Valves	Pressure Boundary

1. This component is not shown on the Auxiliary Feedwater System license renewal drawings.
2. This component is short-lived.

See Table 2.0-1 for definition of intended function.

Table 2.3.4-8 Air Removal

Component Type	Intended Function(s)
Air Ejector After Condensers	Pressure Boundary
Air Ejector Inter Condensers	Pressure Boundary
Air Ejectors	Pressure Boundary
Bolting	Pressure Boundary
Damper Housings	Pressure Boundary
Gland Steam Condenser Air Exhauster	Pressure Boundary
Hogging Jet	Pressure Boundary
Pipe	Pressure Boundary
Sight Glass[1]	Pressure Boundary
Strainer Housing[1]	Pressure Boundary
Traps	Pressure Boundary
Tubing	Pressure Boundary
Valves	Pressure Boundary

1. This component is not shown on the Air Removal System license renewal drawings.

See Table 2.0-1 for definition of intended function.

Table 2.3.4-9 Heater and Moisture Separator Drains

Component Type	Intended Function(s)
Bolting	Pressure Boundary
Constant Head Chamber	Pressure Boundary
Expansion Joints	Pressure Boundary
Flow Elements	Pressure Boundary
Heater Drain Pumps	Pressure Boundary
Heater Drain Tank	Pressure Boundary
Level Glass	Pressure Boundary
Pipe	Pressure Boundary
Reheater Drain Tanks	Pressure Boundary
Standpipes	Pressure Boundary
Strainer Housings	Pressure Boundary
Tubing	Pressure Boundary
Valves	Pressure Boundary

See Table 2.0-1 for definition of intended function.

Table 2.3.4-10 Heating Steam

Component Type	Intended Function(s)
Bolting	Pressure Boundary
Boric Acid Evaporator Condensate Return Tank	Pressure Boundary
Boric Acid Evaporator Condensate Return Unit Heat Exchanger	Pressure Boundary
Condensate Return Pumps	Pressure Boundary
Condenser Water Box Priming Ejector	Pressure Boundary
Control Room A/C HW Pump	Pressure Boundary
Control Room A/C Steam Humidifier	Pressure Boundary
Control Room Humidification Steam Boiler	Pressure Boundary
Heating Coils	Pressure Boundary
Heating System Condensate Drain Tank	Pressure Boundary
Pipe	Pressure Boundary
Sight Glasses	Pressure Boundary
Strainer Housings	Pressure Boundary
Traps	Pressure Boundary
Tubing	Pressure Boundary
Valves	Pressure Boundary

See Table 2.0-1 for definition of intended function.

Table 2.3.4-11 Main Generator (Mechanical) and Auxiliaries

Component Type	Intended Function(s)
Air Side Seal Oil Backup Pump	Pressure Boundary
Air Side Seal Oil Cooler	Pressure Boundary
Air Side Seal Oil Pump	Pressure Boundary
Bolting	Pressure Boundary
Defoaming Tanks	Pressure Boundary
Filter Housings	Pressure Boundary
Generator Bearing Oil Drain Line Loop Seal	Pressure Boundary
Generator Hydrogen Coolers	Pressure Boundary
Hydrogen Side Drain Regulator	Pressure Boundary
Hydrogen Side Seal Oil Cooler	Pressure Boundary
Hydrogen Side Seal Oil Pump	Pressure Boundary
Oil Level Gauge	Pressure Boundary
Pipe	Pressure Boundary
Tubing	Pressure Boundary
Valves	Pressure Boundary

See Table 2.0-1 for definition of intended function.

Table 2.3.4-12 Secondary Sampling

Component Type	Intended Function(s)
Bolting	Pressure Boundary
Cation Conductivity Electrodes	Pressure Boundary
Cooler Units	Pressure Boundary
Coolers	Pressure Boundary
Filter Housings	Pressure Boundary
Flow Indicators	Pressure Boundary
FW Sample Line Chiller	Pressure Boundary
pH Electrodes	Pressure Boundary
Pipe	Pressure Boundary
Recirculation Pumps	Pressure Boundary
Refrigeration Unit Chiller Condenser	Pressure Boundary
Refrigeration Unit Chiller Evaporator	Pressure Boundary
Sodium Analyzer Elements	Pressure Boundary
Specific Conductivity Electrodes	Pressure Boundary
Storage Tank	Pressure Boundary
Tubing	Pressure Boundary
Valves	Pressure Boundary

See Table 2.0-1 for definition of intended function.

Table 2.3.4-13 Turbine Oil Purification

Component Type	Intended Function(s)
Bolting	Pressure Boundary
Pipe	Pressure Boundary
Tubing	Pressure Boundary
Turbine Oil Circulating and Transfer Pump	Pressure Boundary
Valves	Pressure Boundary

See Table 2.0-1 for definition of intended function.

Table 2.3.4-14 Turbine Room Traps and Drains

Component Type	Intended Function(s)
Bolting	Pressure Boundary
Pipe	Pressure Boundary
Steam Traps	Pressure Boundary
Tubing	Pressure Boundary
Valves	Pressure Boundary

See Table 2.0-1 for definition of intended function.

2.4 SCOPING AND SCREENING RESULTS: STRUCTURES

Structures, systems, and components classifications are defined in USAR Section B.2.1, Definition of Nuclear Safety Design Classifications.

A listing of the abbreviations used in this section is provided in Section 1.4.

2.4.1 REACTOR CONTAINMENT VESSEL

Description

The Reactor Containment Vessel is a Class I cylindrical steel structure with hemispherical dome and ellipsoidal bottom, which houses the reactor pressure vessel, NSSS equipment, and various safety related and non-safety related components. The Reactor Containment Vessel is completely enclosed by the Shield Building. An annular space is provided between the Reactor Containment Vessel and the Shield Building except at the lower portion that is embedded in the concrete fill. Both the Reactor Containment Vessel and the Shield Building are supported on a common concrete foundation basemat. The common foundation basemat is supported on soil. The Reactor Containment Vessel is supported directly on a grout base with concrete fill placed between the Reactor Containment Vessel's ellipsoidal bottom and the common foundation basemat. Above the grout at the air gap between the steel shell and the concrete, the steel surface has been sandblasted, primed and coated with a rust inhibitive, high temperature paint, and is caulked with a sealant (moisture barrier) to assure the moisture will not penetrate into the air gap. Additionally, the top of the concrete in the annular space has been provided with sumps and a concrete curb to keep the moisture away from the air gap. At the intersection of the internal concrete floor and the steel shell, a sealant (moisture barrier) is also provided to prevent moisture from penetrating the inside joint. A protective coating is used on the inner surface of the Reactor Containment Vessel shell to protect from the liner surface corrosion. However, this evaluation does not rely on the protective coating to manage the effects of aging of the Reactor Containment Vessel shell.

The Reactor Containment Vessel evaluation includes penetrations and internal concrete and steel structures.

Piping Penetrations

Piping penetration assemblies typically consist of a Reactor Containment Vessel penetration nozzle, a process pipe, a Shield Building penetration sleeve, and a Shield Building flexible seal. In the case of a cold penetration, the Reactor Containment Vessel penetration nozzle is an integral part of the process pipe. For hot penetrations, a multiple-flued head becomes an integral part of the process pipe, and is used to attach a guard pipe, impingement ring, and expansion joint bellows. The expansion joint bellows are welded to the Reactor Containment Vessel penetration nozzle. The multiple-flued head with its associated guard pipe and expansion joint bellows provides a leak-tight seal for the extension of the containment boundary where the hot penetration assembly traverses the Shield Building annulus. The guard pipe is located concentric to the process pipe and extends past the Reactor Containment Vessel penetration nozzle into the vessel. An impingement ring is mounted on the extended guard pipe to protect expansion joint bellows from jet forces that might result from a pipe rupture inside the Reactor Containment Vessel.

Electrical Penetrations

The electrical penetration assemblies are welded to the end of the Reactor Containment Vessel penetration nozzle. Each penetration assembly is provided with a single connection to allow pressure testing for leaks. Spare penetration nozzles are sealed with a welded cap.

Heating and Ventilation Penetrations

The ventilation purge duct and make-up duct penetrations are welded directly to the penetration nozzles in a manner similar to the cold piping penetration. They are provided with isolation valves.

Equipment Hatch, and Personnel and Emergency Airlocks

The equipment hatch, and personnel and emergency airlocks are supported entirely by the Reactor Containment Vessel. The equipment hatch is fabricated from welded steel and furnished with a double-gasketed flange and a bolted dished door.

The personnel and emergency airlocks are a double-door welded steel assembly. Quick-acting type equalizing valves are provided to equalize pressure in the airlock when entering or leaving the Reactor Containment Vessel.

Fuel Transfer Tube Penetration

The fuel transfer tube penetration is provided for fuel movement between the refueling cavity in the Reactor Containment Vessel and the spent fuel pool. This penetration consists of a 20-inch stainless steel pipe installed inside a 24-inch stainless steel pipe that is welded to the Reactor Containment Vessel. The inner pipe acts as the transfer tube and is fitted with a testable double-gasketed blind flange in the refueling cavity, which provides containment integrity. The fuel transfer tube is supported on the refueling pool floor and the spent fuel pool floor. A normally closed gate valve is also provided in the spent fuel pool canal to isolate the refueling cavity from the spent fuel pool. This arrangement prevents leakage through the fuel transfer tube in the event of an accident. Expansion bellows are provided between the two pipes to accommodate any differential movement.

Reactor Containment Vessel Internal Structures

The Reactor Containment Vessel internal structures consist of reinforced concrete and steel components. The internal structures are supported on concrete placed at the bottom of the Reactor Containment Vessel.

The major concrete components are the reactor cavity shield wall, refueling pool, compartment vaults, and the floors at various elevations. The reactor cavity shield wall is a concrete structure that surrounds the reactor vessel and all its nozzles and immediate piping and provides biological shielding and structural support. The top of the shield wall forms the refueling cavity pool. The shield wall also acts as a missile barrier. The steam generator and reactor coolant pump compartment vaults consist of walls and floors that support the steam generators and the reactor coolant pumps. The walls and floors also provide biological shielding and are designed for jet impingement forces resulting from pipe rupture. The floors, beams, missile shield cover, columns, walls, and equipment pads are constructed of reinforced concrete. The reactor cavity sump, Reactor Containment Vessel sump, and residual heat removal sump are provided to collect leakage from various sources. Masonry block walls are installed to provide enclosure for equipment.

The major steel components are NSSS and component supports, structural steel, and miscellaneous steel. A stainless steel liner plate is used in the reactor cavity in the areas of the nuclear core, and a carbon steel liner plate is used above and below the core area. The reactor vessel flange is sealed to the bottom of the refueling cavity by a reactor cavity seal ring that prevents leakage of refueling water into the reactor cavity. A removable missile shield cover, constructed of a concrete slab enclosed by steel plates, is located above the reactor vessel head. The reactor cavity, refueling pool, and the Reactor Containment Vessel sump (Sump A) are lined with stainless steel liner plates. All the liner plates are welded to the structural shapes that are embedded and anchored in the reinforced concrete walls and floors. Sand plugs constructed of steel boxes with a stainless steel cover, are installed to protect safety-related components located in the recessed areas of the refueling pool floor. Radiation shields constructed of steel are provided at the fuel transfer tube penetration to protect personnel.

The Reactor Containment Vessel is in the scope of license renewal since the structure has intended functions that meet the criteria stated in 10CFR54.4(a). The structure meets 10CFR54.4(a)(1) because it is a Class I structure. The structure meets 10CFR54.4(a)(2) because it provides support to non-safety-related systems and components whose failure could affect the function of safety-related systems, structures and components. The structure also meets 10CFR54.4(a)(3) because it houses EQ equipment and supports fire protection.

The evaluation boundary for the Reactor Containment Vessel structural members subject to aging management review includes structural members of the Reactor Containment Vessel structure, including basemat, internal structural members, and penetrations (personnel and emergency airlocks and equipment hatch, piping penetrations, electrical penetrations, heating and ventilation penetration, and the fuel transfer tube penetration). The refueling pool liner, reactor cavity liner, and the reactor cavity seal ring are also included in the Reactor Containment Vessel evaluation boundary.

The evaluation boundary for penetrations includes vessel nozzles, expansion joint bellows, guard pipes, and jet impingement rings. Multiple flued heads (considered an integral part of the piping) and isolation valves are evaluated with the host system. For electrical penetrations, the evaluation boundary includes only the vessel nozzle. The electrical penetration assemblies are evaluated with electrical components in Section 2.5. Fuel transfer tube supports are evaluated as a commodity with the Structures and Component Supports. The strainer assembly installed to prevent debris from entering the residual heat removal sump is evaluated for aging management with the Safety Injection System.

The evaluation of the Shield Building will also include the common foundation basemat for the Reactor Containment Vessel and the Shield Building, the annulus floor (including sumps and curbs), penetration sleeves, and flexible seals.

USAR Reference

Additional details of the Reactor Containment Vessel can be found in the USAR, Section 1.2.1, Chapter 5, and Figure 1.2-2, Figure 1.2-4, Figure 1.2-6, Figure 1.2-8, Figure 1.2-10, and Table B.2-1.

License Renewal Drawings

The license renewal drawing for the Reactor Containment Vessel is listed below:

LR-A-202-1

Components Subject to AMR

The Reactor Containment Vessel structural members that require aging management review are indicated in Table 2.4.1-1, Reactor Containment Vessel.

The aging management review results for these structural members are provided in Table 3.5.2-1: Structures and Component Supports - Reactor Containment Vessel - Aging Management Evaluation.

2.4.2 STRUCTURES AND COMPONENT SUPPORTS

2.4.2.1 SHIELD BUILDING

Description

The Shield Building is a Class I reinforced concrete cylindrical shell structure with a shallow dome roof, which completely encloses the Reactor Containment Vessel. An annular space is provided between the Reactor Containment Vessel shell and the wall of the Shield Building. The Shield Building protects the Reactor Containment Vessel from external missiles, provides biological shielding, releases annulus atmosphere under accident conditions, and provides environmental protection for the Reactor Containment Vessel. Both the Shield Building and the Reactor Containment Vessel are supported on a common concrete foundation basemat. The common foundation basemat is supported on soil. Structures adjacent and exterior to the Shield Building walls are designed with provision for the movements of the Shield

Building during an earthquake. Flexible expansion joints are provided at the separation spaces in the adjacent and exterior walls and floors.

The Shield Building evaluation includes access openings and penetrations, and annulus concrete and steel structures.

Access Openings and Penetrations

The Shield Building contains two personnel access openings and one equipment access opening. Each personnel access opening is provided with double-interlocked doors that are located in the Auxiliary Building. The equipment opening has a bolted, sealed door constructed of concrete panels, supported by steel framing.

Penetrations are provided in the Shield Building for the fuel transfer tube, piping, ducts, and electrical cables. The penetration assemblies consist of a Reactor Containment Vessel penetration nozzle, a process line, a Shield Building penetration sleeve, which is embedded in the Shield Building, and a seal to prevent leakage and to provide a fire barrier. The penetration seals are flexible seals, expansion bellows seals, and plate seals. Capped spare penetrations are also provided for future use.

A penetration with a weather cap is provided at the Shield Building dome for venting the annulus atmosphere during an accident condition. The weather cap is attached to the embedded sleeve with stainless steel wire mesh and straps.

Annulus Concrete and Steel Structures

The Shield Building consists of a concrete floor at Elevation 606’-0” with annulus sumps, trenches and concrete curb to keep the moisture away from the air gap between the concrete and the Reactor Containment Vessel. Radiation shielding is provided for the fuel transfer tube penetration by a concrete enclosure with a steel gate at the access opening. Major steel components within the Shield Building include component supports, platforms, gratings, ladders and stairs.

The Shield Building is in the scope of license renewal since the structure has intended functions that meet the criteria stated in 10CFR54.4(a). The structure meets 10CFR54.4(a)(1) because it is a Class I structure. The structure meets 10CFR54.4(a)(2) because the structure provides support to non-safety-related systems and components whose failure could affect the function of safety-related systems, structures, and components. The structure also meets 10CFR54.4(a)(3) because it houses EQ equipment and supports fire protection.

The evaluation boundary for the Shield Building structural members subject to aging management review includes the Shield Building shell structure, the common foundation basemat, annulus concrete and steel structures, and access openings and penetrations.

The expansion joints between the Shield Building and the adjacent buildings, and the double interlocked doors for the Shield Building access openings are evaluated for aging management review with Miscellaneous Structural Commodities.

USAR Reference

Additional details of the Shield Building structure can be found in the USAR, Sections 1.2.1, 5.2.2, and Figure 1.2-2, Figure 1.2-4, Figure 1.2-6, Figure 1.2-8, Figure 1.2-10, and Table B.2-1.

License Renewal Drawings

The license renewal drawing for the Shield Building is listed below:

LR-A-202-1

Components Subject to AMR

The Shield Building structural members that require aging management review are indicated in Table 2.4.2-1, Shield Building.

The aging management review results for these structural members are provided in Table 3.5.2-2: Structures and Component Supports - Shield Building - Aging Management Evaluation.

2.4.2.2 ADMINISTRATION BUILDING

Description

The Administration Building is a multistory structure that interfaces with the Turbine Building. The basement of the Administration Building houses emergency diesel generator rooms 1A and 1B. The upper levels of the Administration Building are provided for use of office personnel. The air intake structures for rooms 1A and 1B, and the air outlet structure for room 1B are located outside, adjacent to the Administration Building. The air outlet for room 1A is through the Screenhouse Access Tunnel. Power cables for two of the service water pumps and a fire pump are routed through an underground duct bank entrance area located at the southeast corner of the Administration Building.

The basement of the Administration Building is classified as Class I. The remaining areas are Class III. The Administration Building foundation is a reinforced concrete basemat founded on soil. Doors and a trench are provided to protect safety-related equipment from internal flooding due to a pipe break. Masonry walls are provided to prevent the spread of a fire.

The air intake structures for the emergency diesel generator rooms 1A and 1B are enclosed underground reinforced concrete structures that are soil supported. A bird screen is placed at the inlet of each air intake structure. A concrete slab, which is supported on concrete columns and spread footings on soil, is located above the air inlet to provide missile protection for the air intake structure.

The air outlet structure for the emergency diesel generator room 1B is an enclosed reinforced concrete structure that is partly underground and partly above ground. A steel grating floor is placed at the outlet. A louver housing is located on the top of the outlet structure.

The Administration Building is in the scope of license renewal since the structure has intended functions that meet the criteria stated in 10CFR54.4(a). The structure meets 10CFR54.4(a)(1) because the basement, the air intake structures, and the air outlet structure are classified as Class I. The structure meets 10CFR54.4(a)(2) because the structure provides support to non-safety-related systems and components whose failure could affect the function of safety-related systems, structures, and components. The structure also meets 10CFR54.4(a)(3) because it supports fire protection, station blackout, and anticipated transients without scram.

The evaluation boundary for the Administration Building structural members subject to aging management review consists of only the basement including the ceiling slab, the air intake structures, and the air outlet structure.

USAR Reference

Additional details of the Administration Building can be found in the USAR, Sections 1.2.1, B.2, B.9.3, Figure 1.2-1, Figure 1.2-3, Figure 1.2-5, and Table B.2-1.

License Renewal Drawings

The license renewal drawing for the Administrative Building is listed below:

LR-A-202-1

Components Subject to AMR

The Administrative Building structural members that require aging management review are indicated in Table 2.4.2-2, Administration Building.

The aging management review results for these structural members are provided in Table 3.5.2-3: Structures and Component Supports - Administration Building - Aging Management Evaluation.

2.4.2.3 AUXILIARY BUILDING

Description

The Auxiliary Building is a concrete and steel multistory structure that interfaces with the Shield Building and Turbine Building. The Auxiliary Building and the Shield Building share a common concrete foundation basemat, which is founded on soil. The Auxiliary Building, up to and including the mezzanine floor, is monolithic with the Shield Building. Above the mezzanine floor, flexible expansion joints are provided between the Auxiliary Building and Shield Building exterior walls for lateral movements of the buildings during a seismic event.

The Auxiliary Building is a Class I structure, except for two areas, the tank storage enclosure and the cask handling area located on the south and west side of the Auxiliary Building, respectively. These areas are Class III* structures, which support SBO and fire protection. A steel frame structure, which supports the Auxiliary Building crane and roof decking above the spent fuel pool, is designed as Class I*.

The Zone SV area of the Auxiliary Building provides a medium-leakage boundary, which confines leakage that could conceivably bypass the Shield Building annulus. The Zone SV area also includes the steam exclusion area. The concrete walls, ceilings, floors, and masonry walls are provided with sealed joints where required. A negative pressure within the Zone SV is maintained to ensure leak-tight integrity. The doors and penetration seals are provided to protect equipment from high energy line breaks.

Encapsulation sleeves and jet impingement shields are also used to protect equipment from jet impingement from high-energy-line piping rupture. Flood barriers, sumps, and trenches are provided to protect safety-related equipment from internal flooding. Hatch covers are provided on the roof and floors as missile protection for safety-related equipment. Fixed louvers with bird screens are provided to prevent debris from entering and damaging the pneumatic operated louvers. Missile shields are installed to protect Service Water System piping from tornado generated missiles.

The spent fuel pool receives spent fuel from the Reactor Containment Vessel through the fuel transfer tube. The penetration sleeve for the fuel transfer tube is embedded in the fuel transfer canal wall. The spent fuel pool, including the fuel transfer canal, is constructed of concrete with a stainless steel liner.

New fuel storage is located in a dry pit adjacent to the spent fuel pool. The structure for the new fuel storage racks has concrete walls and a raised floor. The top of the structure is provided with a stainless steel cover.

The Auxiliary Building is in the scope of license renewal since the structure has intended functions that meet the criteria stated in 10CFR54.4(a). The structure meets 10CFR54.4(a)(1) because a portion of the building is a Class I structure. The structure meets 10CFR54.4(a)(2) because the structure provides support to non-safety-related systems and components whose failure could affect the function of safety-related systems, structures, and components. The structure also meets 10CFR54.4(a)(3) because it houses EQ equipment and supports fire protection, station blackout, and anticipated transient without scram.

The evaluation boundary for the Auxiliary Building structural members subject to aging management review includes structural members for the Class I, Class I* and Class III* areas. The New Fuel Storage Racks and Spent Fuel Storage Racks are evaluated in Section 2.3.3.1 and Section 2.3.3.2, respectively.

USAR Reference

Additional details of the Auxiliary Building can be found in the USAR, Sections 1.2.1, 1.3.1, 5.7.3, 9.5.2, 10A.8, Figure 1.2-2, Figure 1.2-4, Figure 1.2-6, Figure 1.2-7, Figure 1.2-8, Figure 1.2-10, Figure 9.5-2, Table B.2-1.

License Renewal Drawings

The license renewal drawing for the Auxiliary Building is listed below:

LR-A-202-1

Components Subject to AMR

The Auxiliary Building structural members that require aging management review are indicated in Table 2.4.2-3, Auxiliary Building.

The aging management review results for these structural members are provided in Table 3.5.2-4: Structures and Component Supports - Auxiliary Building - Aging Management Evaluation.

2.4.2.4 SCREENHOUSE ACCESS TUNNEL

Description

The Screenhouse Access Tunnel is a Class I reinforced concrete rectangular tunnel located below grade between the Screenhouse and the Administration Building. It is founded on soil and provides support and shelter for two service water supply headers and a fire supply header. The Screenhouse Access Tunnel also provides support and shelter for cables that provide power to two of the safety-related service water pumps and to one of the fire pumps located in the Screenhouse. Additionally, the Screenhouse Access Tunnel serves as an air outlet for emergency diesel generator room 1A of the Administration Building.

The Screenhouse Access Tunnel is in the scope of license renewal since the structure has intended functions that meet the criteria stated in 10CFR54.4(a). The structure meets 10CFR54.4(a)(1) because it is a Class I structure. The structure meets 10CFR54.4(a)(2) because the structure provides support to non-safety-related systems and components whose failure could affect the function of safety-related systems, structures and components. The structure meets 10CFR54.4(a)(3) because the structure supports fire protection.

The evaluation boundary for the Screenhouse Access Tunnel structural members subject to aging management review begins at the Screenhouse and ends at the Administration Building.

USAR Reference

Additional details of the Screenhouse Access Tunnel can be found in the USAR, Sections 2.6.2, 2.6.3, 6.2.2, 8.2.3, 9.6.2, and Table B.2-1.

License Renewal Drawings

The license renewal drawing for the Screenhouse Access Tunnel is listed below:

LR-A-202-1

Components Subject to AMR

The Screenhouse Access Tunnel structural members that require aging management review are indicated in Table 2.4.2-4, Screenhouse Access Tunnel.

The aging management review results for these structural members are provided in Table 3.5.2-5: Structures and Component Supports - Screenhouse Access Tunnel - Aging Management Evaluation.

2.4.2.5 TECHNICAL SUPPORT CENTER

Description

The TSC is located adjacent to the Turbine and Auxiliary Buildings and separated by a seismic gap to prevent interactions during a seismic event. The TSC basement is classified as a Class I structure. The first and second floors are classified as a Class III* structure.

The TSC is supported on a reinforced concrete mat foundation that is founded on soil. The basement level exterior walls are constructed of reinforced concrete. The first and second levels have exterior walls constructed of concrete masonry block. The exposed masonry block walls have attached metal siding; however, the metal siding does not provide a license renewal intended function and is not in scope for license renewal. The first and second floors and the roof are constructed of reinforced concrete slab supported by steel decking and structural steel columns and beams.

The TSC basement level contains safety-related cables that are required for safe shutdown. Additionally, it houses other administrative facilities.

The TSC first floor includes the TSC diesel generator room and associated electrical equipment and battery rooms. The TSC diesel generator is used as the TSC standby generator and additionally for SBO. The battery room also contains batteries and chargers that are required for fire protection. The TSC first floor also houses other equipment rooms and administrative offices.

The TSC second floor level provides offices and working space for office personnel. The roof provides support for a heat exchanger (remote radiator) and an exhaust muffler for the TSC diesel generator.

The TSC is in the scope of license renewal since the structure has intended functions that meet the criteria stated in 10CFR54.4(a). The structure meets 10CFR54.4(a)(1) because the basement is a Class I structure. The structure meets 10CFR54.4(a)(2) because the structure provides support to non-safety-related systems and components whose failure could affect the function of safety-related systems, structures and components. The structure meets 10CFR54.4(a)(3) because the structure supports fire protection and station blackout.

The evaluation boundary of the TSC structural members subject to aging management review includes the Class I basement level, and areas of the building that are non-safety related whose failure could affect safety-related systems, structures and components, and areas that support components associated with fire protection and SBO. The non-safety areas of the building, which are the first and second floors structural frame, could potentially affect safety-related systems, structures and components that are located in the basement. The areas of the building that support fire protection and SBO components include the concrete floor slab in the battery, electrical equipment, and diesel generator rooms and the roof slab, which supports the diesel generator radiator and exhaust muffler.

USAR Reference

Additional details for the Technical Support Center can be found in the USAR, Sections 1.2.1, 8.2.4, and Figure 1.2-11 and Table B.2-1.

License Renewal Drawings

The license renewal drawing for the Technical Support Center is listed below:

LR-A-202-1

Components Subject to AMR

The Technical Support Center structural members that require aging management review are indicated in Table 2.4.2-5, Technical Support Center.

The aging management review results for these structural members are provided in Table 3.5.2-6: Structures and Component Supports - Technical Support Center - Aging Management Evaluation.

2.4.2.6 TURBINE BUILDING

Description

The Turbine Building is a multistory steel structure that interfaces with the Auxiliary Building, Administration Building, outdoor transformer bays, and Technical Support Center. The Turbine Building is separated from the outdoor transformer bays and Technical Support Center by seismic gaps. The Turbine Building foundation is a reinforced concrete basemat, which is founded on soil.

The Turbine Building is a Class III* structure except for two Class I areas. The areas housing safeguard batteries, safety features 480- volt switchgear, a station air compressor, and the auxiliary feedwater pumps are classified as Class I. The support system for the Turbine Building crane is Class I*.

Blow in/out panels are used in the roof decking and the siding to vent the building from tornado pressure. Flood barriers, a sump, and a trench are provided to protect safety-related equipment from internal flooding. Masonry walls are provided for fire protection. The exhaust piping for the two emergency diesel generators is routed through the Turbine Building and their vents are located on the roof.

The Turbine Building is in the scope of license renewal since the structure has intended functions that meet the criteria stated in 10CFR54.4(a). The structure meets 10CFR54.4(a)(1) because portions of the building are Class I. The structure meets 10CFR54.4(a)(2) because the structure provides support to non-safety-related systems and components whose failure could affect the function of safety-related systems, structures, and components. The structure meets 10CFR54.4(a)(3) because the structure supports fire protection, station blackout, and anticipated transients without scram.

The evaluation boundary for the Turbine Building structural members subject to aging management review includes structural members for the Class I and Class III* areas, and the Class I* support structure.

USAR Reference

Additional details of the Turbine Building can be found in the USAR, Sections 1.2.1, 1.3.1, 10A.3, 10A.4, B.2, B.9.3, B.9.4, Figure 1.2-1, Figure 1.2-3, Figure 1.2-5, and Table B.2-1.

License Renewal Drawings

The license renewal drawing for the Turbine Building is listed below:

LR-A-202-1

Components Subject to AMR

The Turbine Building structural members that require aging management review are indicated in Table 2.4.2-6, Turbine Building.

The aging management review results for these structural members are provided in Table 3.5.2-7: Structures and Component Supports - Turbine Building - Aging Management Evaluation.

2.4.2.7 YARD STRUCTURES

Description

The following yard structures, which are located throughout the yard and substation/switchyard area, are within the scope of license renewal:

- Duct Banks
- Emergency Diesel Generator Fuel Oil Storage Tanks Foundation
- Fire Hose Houses
- Lighting Poles (P2, P4, P5)
- Manholes
- Outdoor Transformer Bays
- Substation/Switchyard Structures
- Transmission Towers

Duct Banks

Duct banks are provided to route electrical cables underground. The duct banks in the scope of license renewal are constructed of reinforced concrete and are soil supported.

The duct banks are in the scope of license renewal since the structures have intended functions that meet the criteria stated in 10CFR54.4(a). The structures meet 10CFR54.4(a)(1) because the structures support and protect electrical cables for safety-related equipment. The structures meet 10CFR54.4(a)(3) because the structures support station blackout and fire protection.

The evaluation boundary for duct banks structural members subject to aging management review includes the reinforced concrete structure.

Emergency Diesel Generator Fuel Oil Storage Tanks Foundation

Two underground EDG fuel oil storage tanks rest on compacted backfill material that is located between the tanks and a common concrete mat foundation. Steel bar straps, which completely wrap around each tank, are installed and anchored into the concrete mat foundation. The bar straps and foundation resist any uplift forces from buoyancy that could occur with the tanks.

The EDG fuel oil storage tanks foundation is in the scope of license renewal since the structure has intended functions that meet the criteria stated in 10CFR54.4(a). The structure meets 10CFR54.4(a)(1) because the structure provides support and anchorage to the Class I EDG fuel oil storage tanks. The structure meets 10CFR54.4(a)(3) because the structure supports fire protection.

The evaluation boundary for the EDG fuel oil storage tanks foundation structural members subject to aging management review includes the concrete mat foundation and the steel bar straps.

Fire Hose Houses

Fire hose houses, which are small steel structures, are provided at various locations throughout the yard area. These structures house fire protection equipment and are supported on a concrete slab.

The fire hose houses are in the scope of license renewal since the structures have intended functions that meet the criteria stated in 10CFR54.4(a). The structures meet 10CFR54.4(a)(3) because the structures support fire protection.

The evaluation boundary for the fire hose houses structural members subject to aging management review includes the steel structure and the supporting concrete slab.

Lighting Poles

Three lighting poles (Poles 2, 4, and 5), which provide security lighting in the yard area, are within the scope of license renewal. These lighting poles are constructed of steel and supported by a reinforced concrete caisson foundation.

The lighting poles (Poles 2, 4, and 5) are in the scope of license renewal since the structures have intended functions that meet the criteria stated in 10CFR54.4(a). The structures meet 10CFR54.4(a)(2) because failure of these poles could affect safety-related systems, structures and components.

The evaluation boundary for the lighting poles structural members subject to aging management review includes the steel pole structure and the supporting concrete caisson foundation.

Manholes

There are four manholes in the scope of license renewal. One manhole is in the scope of license renewal because it supports electrical cable required for the restoration of offsite power for station blackout. This manhole is an enclosed underground reinforced concrete structure that is soil supported and is located near the Tertiary Auxiliary Transformer. The remaining three manholes provide access to underground fuel oil storage tanks. Two access manholes are provided for the emergency diesel generator fuel oil storage tanks and one for the Technical Support Center diesel generator fuel oil storage tank. These manholes are reinforced concrete structures that rest directly on the tanks.

The manholes are in the scope of license renewal since the structures have intended functions that meet the criteria stated in 10CFR54.4(a). The structures meet 10CFR54.4(a)(3) because the structures support fire protection and station blackout.

The evaluation boundary for the manholes structural members subject to aging management review includes the reinforced concrete structures and the access covers.

Outdoor Transformer Bays

There are seven outdoor transformer bays located adjacent to the south and east sides of the Turbine Building. Each transformer bay, formed with firewalls, has an automatic water spray system to extinguish and prevent the spread of fires. The side walls of all the bays are constructed of reinforced concrete and are supported by a spread footing foundation. The back wall of all the bays is the exterior wall of the Turbine Building. Each bay has a reinforced concrete floor slab founded on soil. The transformers located within the bays are supported on a concrete mat foundation that is isolated by a construction joint from the concrete bay floor. The Reserve Auxiliary Transformer and the Tertiary Auxiliary Transformer have two reinforced rectangular column sections located at the base of the mat foundation, which are utilized in transferring the loads to a lower underground reinforced concrete mat foundation.

The outdoor transformer bays are in the scope of license renewal since the structures have intended functions that meet the criteria stated in 10CFR54.4(a). The structures meet 10CFR54.4(a)(3) because the structures support station blackout and fire protection.

The evaluation boundary for the outdoor transformer bays structural members subject to aging management review includes all of the bays since they support an automatic water spray system required for fire protection.

However, only the foundations that support the RAT and TAT are in scope for license renewal because these two transformers are required for the restoration of offsite power for station blackout. The back wall of all the bays is within the scope of license renewal but is evaluated for aging management with the Turbine Building structure.

Substation/Switchyard Structures

The substation/switchyard structural members associated with the in-scope electrical equipment required for the restoration of offsite power for station blackout includes the steel structures and associated foundations for the 138 kV take-off tower, 13.8 kV take-off structure, and the 138 kV and 13.8 kV disconnect switches. The 13.8 kV take-off concrete structure and the concrete foundations for the 138 kV and 13.8 kV oil circuit breakers are also included.

The substation/switchyard structures are in the scope of license renewal since the structures have intended functions that meet the criteria stated in 10CFR54.4(a). The structures meet 10CFR54.4(a)(3) because the structures support station blackout.

The evaluation boundary for the substation/switchyard structures structural members subject to aging management review includes the identified steel support structures and the supporting concrete foundations. The evaluation boundary also includes the foundation for the oil circuit breakers and the concrete take-off structure provided to route the 13.8 kV cables underground to a duct bank.

Transmission Towers

Three steel transmission towers (Towers 1, 3, and 4), which support the transmission line required for the restoration of offsite power for SBO, are installed from outside the substation/switchyard to the RAT. These towers are single pole steel structures that support the 138 kV RAT circuit on one side and the main transformer 345 kV circuit on the other side. The steel poles are supported by a reinforced concrete caisson foundation.

The transmission towers are in the scope of license renewal since the structures have intended functions that meet the criteria stated in 10CFR54.4(a). The structures meet 10CFR54.4(a)(3) because the structures support station blackout.

The evaluation boundary for the transmission towers structural members subject to aging management review includes the steel pole structure and the supporting concrete caisson foundation.

USAR Reference

Additional details for the Yard Structures can be found in the USAR Table B.2-1.

License Renewal Drawings

The license renewal drawing for the Yard Structures is listed below:

LR-A-202-1

Components Subject to AMR

The Yard Structures structural members that require aging management review are indicated in Table 2.4.2-7, Yard Structures.

The aging management review results for these structural members are provided in Table 3.5.2-8: Structures and Component Supports - Yard Structures - Aging Management Evaluation.

2.4.2.8 DISCHARGE STRUCTURE

Description

The Discharge Structure is a Class I reinforced concrete (onshore) structure that discharges at the shoreline of Lake Michigan. The Discharge Structure provides the termination for the circulating water discharge pipe that enters the discharge structure below lake level, a transition from the pipe to the open discharge bay, and the outlet to the lake.

The Discharge Structure has reinforced concrete floor, walls, and roof as well as a concrete baffle that is provided to help dissipate the exit velocity and spread the discharge water into the open discharge basin. The near-shore portion of the basin is paved with riprap stones and is formed with steel sheet pilings along both sides. The floor of the offshore portion of the basin slopes up to reach the natural lake bottom. Riprap stones are also provided outside the sheet-pile walls. There is an interconnecting pipe between the Discharge Structure and the Screenhouse forebay. This pipe, which penetrates the sheet pile wall, provides an alternate source of service water as well as warm recirculation water that helps dissipate the formation of frazil ice on the traveling water screens.

The Discharge Structure is in the scope of license renewal since the structure has intended functions that meet the criteria stated in 10CFR54.4(a). The structure meets 10CFR54.4(a)(1) because it is a Class I structure.

The evaluation boundary for the Discharge Structure structural members subject to aging management review begins where the discharge pipe enters the Discharge Structure and includes the steel sheet pilings around the discharge basin. The riprap stones paving the near-shore portion of the basin help serve the function of exit velocity dissipation and therefore do not serve a license renewal intended function. The interconnecting pipe between the Discharge Structure and the Screenhouse forebay is evaluated for aging management with the Circulating Water System.

USAR Reference

Additional details of the Discharge Structure can be found in the USAR, Sections 2.6.2, 9.6.2, and 10.2.2, Appendix A, and Figure 1.2-9 and Figure 10.2-10.

License Renewal Drawings

The license renewal drawings for the Discharge Structure are listed below

LR-A-202-1
LRM-215

Components Subject to AMR

The Discharge Structure structural members that require aging management review are indicated in Table 2.4.2-8, Discharge Structure.

The aging management review results for these structural members are provided in Table 3.5.2-9: Structures and Component Supports - Discharge Structure - Aging Management Evaluation.

2.4.2.9 DISCHARGE TUNNEL AND PIPE

Description

The Discharge Tunnel and Pipe are classified as Class III. The Discharge Tunnel and Pipe route discharge water from the condenser outlets, drainage, and service water discharges to the Discharge Structure. The Discharge Tunnel and Pipe are founded on soil and buried for the entire length. The Discharge Tunnel located beneath the Turbine Building at the condenser discharge, is a reinforced concrete structure. The Discharge Pipe consists of sections that are concrete encased steel pipe (underneath the Turbine Building and buried Y-section in the yard). The remaining sections are reinforced concrete pipe.

The Discharge Tunnel and Pipe are in the scope of license renewal since the structures have intended functions that meet the criteria stated in 10CFR54.4(a). The structures meet 10CFR54.4(a)(2) because failure of this structure could affect the discharge path of the safety-related Service Water System.

The evaluation boundary for the Discharge Tunnel and Pipe structural members subject to aging management review begins at the condenser discharge and ends where the pipe enters the Discharge Structure.

USAR Reference

Additional details of the Discharge Tunnel and Pipe can be found in the USAR, Section 10.2.2, Figure 1.2-9, Figure 10.2-10 and Table B.2-1.

License Renewal Drawings

The license renewal drawings for the Discharge Tunnel and Pipe are listed below:

LR-A-202-1
LRM-215

Components Subject to AMR

The Discharge Tunnel and Pipe structural members that require aging management review are indicated in Table 2.4.2-9, Discharge Tunnel and Pipe.

The aging management review results for these structural members are provided in Table 3.5.2-10: Structures and Component Supports - Discharge Tunnel & Pipe - Aging Management Evaluation.

2.4.2.10 INTAKE STRUCTURE

Description

The Intake Structure, which is a Class I structure, is designed to provide a reliable source of lake water to the suction of two circulating water pumps, four service water pumps, and two fire pumps. The structure is located approximately 1,600 feet from the shore of Lake Michigan in a water depth of 15 feet. The Intake Structure consists of a submerged cluster of three vertical 22-foot diameter steel inlet cones, outlet pipes, and trash grilles. The three vertical inlet cones are located with their tops one foot above the lake bottom and are buried 12 ft. 6 in. below the lakebed. The inlet cones discharge their water through 6-foot diameter outlet pipes into a 10-foot diameter steel intake pipe.

The Intake Structure's perimeter is surrounded by granular backfill and riprap. The buried portion of the inlet cones is completely surrounded from top to bottom with a layer of granular backfill. Trash grilles, which are located at the top of each cone, are anchored to a reinforced concrete ring foundation that is supported by the riprap laid below the lakebed.

The Intake Structure is in the scope of license renewal since the structure has intended functions that meet the criteria stated in 10CFR54.4(a). The structure meets 10CFR54.4(a)(1) because it is a Class I structure. The structure meets 10CFR54.4(a)(3) because the structure supports fire protection.

The evaluation boundary of the Intake Structure structural members subject to aging management review begins with the trash grilles and ends at the connection with the 10-foot diameter steel intake pipe. Not included in the boundary of the Intake Structure evaluation is the 10-foot diameter steel intake pipe, which is evaluated for aging management with the Circulating Water System.

USAR Reference

Additional details of the Intake Structure can be found in the USAR, Sections 2.6.2 and 10.2.2, and Figure 10.2-10.

License Renewal Drawings

The license renewal drawing for the Intake Structure is listed below:

LR-A-202-1

Components Subject to AMR

The Intake Structure structural members that require aging management review are indicated in Table 2.4.2-10, Intake Structure.

The aging management review results for these structural members are provided in Table 3.5.2-11: Structures and Component Supports - Intake Structure - Aging Management Evaluation

2.4.2.11 SCREENHOUSE

Description

The Screenhouse structure is a reinforced concrete structure, located approximately 180 feet from the normal shoreline, that houses two circulating water pumps, four service water pumps, two fire pumps, and related auxiliaries. The structure, which is mostly buried underground, has a reinforced concrete roof deck located approximately 2 foot 6 inches above grade. Power cables for two of the service water pumps and a fire pump are routed through an underground duct bank entrance area located at the southwest corner of the Screenhouse. The Screenhouse structure is soil-supported on a reinforced concrete mat foundation. The Screenhouse (areas housing service water facilities, equipment, and piping) is a Class I structure.

The Screenhouse structure includes a forebay area, which is an open concrete structure with an overflow weir that allows overflow back into the lake in case of a water surge caused by tripping or starting of the circulating water pumps. Lake water is transported to the forebay area from the Intake Structure through a buried 10-foot diameter steel intake pipe and poured-in-place reinforced concrete water conduit inlets. From the forebay area, water passes through traveling water screens to pumps located within the Screenhouse. A 30-inch steel slotted pipe is installed in the forebay area that provides warm water from the circulating water discharge structure to the traveling screen inlet to prevent frazil ice formation during cold weather operation. This line can also provide an alternate supply of service water if all other intakes are blocked.

The following features were incorporated into the Screenhouse structure to prevent damage to safety-related equipment from external flooding due to the calculated maximum lake water level: 1) two exterior bulkhead doors, which are located on the east side of the Screenhouse and serve as access doors, 2) bolted down screenhouse floor covers and manholes covers, 3) lower interior bulkhead door located at the screen wash discharge shaft, 4) gasketed traveling water screen fiberglass covers were sealed and strengthened, 5) a 4-inch high ramp across the Screenhouse access tunnel to prevent seepage water from reaching the diesel generator room, and 6) a gap between the service water pump head and the service water pump mounting plate was sealed.

The Screenhouse is in the scope of license renewal since the structure has intended functions that meet the criteria stated in 10CFR54.4(a). The structure meets 10CFR54.4(a)(1) because a portion of the Screenhouse is a Class I structure. The structure meets 10CFR54.4(a)(2) because the structure provides support to non-safety-related systems and components whose failure could affect the function of safety-related systems, structures and components. The structure meets 10CFR54.4(a)(3) because the structure supports fire protection.

The evaluation boundary of the Screenhouse structural members subject to aging management review begins at the end of the 10-foot diameter steel intake pipe, includes the reinforced concrete water conduit inlets, and ends at the interface of the Screenhouse structure with the Screenhouse access tunnel. The fiberglass covers for the traveling water screens and external steel frame are included in the boundary of the Screenhouse structure because they provide protection from external flooding for safety-related equipment within the Screenhouse. The traveling water screen support frame is also included in the boundary of the Screenhouse structure because it supports the screen and functions as a seismic anchor for in-scope piping. Not included in the boundary of the Screehouse structure is the 30-inch steel slotted pipe that can be used to provide warm water to the traveling water screens to prevent frazil ice formation during cold weather operation or an alternate supply of service water. The recirculating line (30-inch steel slotted pipe) is evaluated for aging management with the Circulating Water System. The traveling water screens are evaluated for aging management with the Service Water System.

USAR Reference

Additional details of the Screenhouse structure can be found in the USAR, Sections 2.6.2, 9.6.2, 10.2.2, Figure 10.2-10, and Appendix B, Table B.2-1.

License Renewal Drawings

The license renewal drawing for the Screenhouse is listed below:

LR-A-202-1

Components Subject to AMR

The Screenhouse structural members that require aging management review are indicated in Table 2.4.2-11, Screenhouse.

The aging management review results for these structural members are provided in Table 3.5.2-12: Structures and Component Supports - Screenhouse - Aging Management Evaluation.

2.4.3 COMPONENT SUPPORTS

Description

Structural supports for mechanical and electrical components are an integral part of all plant 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 of mechanical and electrical components are evaluated as commodities across system boundaries.

The commodity evaluation applies to structural supports within structures that are identified as being within the scope of license renewal. The following structural supports for mechanical and electrical components are addressed:

- Supports for piping and components.

- Supports for cable trays, conduit, HVAC ducts, tubing track, and instrument tubing.
- Supports for mechanical equipment (diesel generators including exhaust system, HVAC system components, pumps, tanks, fans, heat exchangers, Reactor Containment Vessel sump strainers, etc.).
- Supports for miscellaneous components [pipe whip restraints, seismic (masonry walls), fire hose stations, tool boxes, ladders, etc.]
- Supports for electrical and I & C (racks, cabinets, panels, junction boxes, enclosures, etc.)

In addition to the structural supports for the components listed above, cable trays, electrical conduits, and battery racks are also included in this evaluation. Also, some equipment is restrained or supported to prevent interaction with safety-related equipment. Although this equipment may not be included within the scope of license renewal, the structural supports for the equipment are included in-scope and are subject to aging management review.

Structural supports are in the scope of license renewal since they have intended functions that meet the criteria stated in 10CFR54.4(a). The supports meet 10CFR54.4(a)(1) because they support safety-related equipment. The supports meet 10CFR54.4(a)(2) because they prevent interaction between safety-related and non-safety-related components. The supports meet 10CFR54.4(a)(3) because they provide support for components credited for EQ of electrical equipment, fire protection, anticipated transient without scram, and station blackout.

The evaluation boundary for mechanical and electrical structural supports subject to aging management review lies between the equipment or component being supported and the building supporting structure (concrete or structural steel). Steel attachment plates embedded in concrete are not included in the evaluation boundary since they are considered part of the building and are evaluated for aging management with the associated building. However, the exposed portion of embedded steel (e.g., the end portion of the threaded anchor and nut) is included in the evaluation boundary. Integral attachments and welds to pressure retaining components are considered part of the component and are evaluated for aging management with the specific component.

USAR Reference

None.

License Renewal Drawings

The license renewal drawing for the Component Supports is listed below:

None.

Components Subject to AMR

The Component Supports component types/structural members that require aging management review are indicated in Table 2.4.2-12, Component Supports.

The aging management review results for these component types/structural members are provided in Table 3.5.2-13: Structures and Component Supports - Component Supports - Aging Management Evaluation.

2.4.4 MISCELLANEOUS STRUCTURAL COMMODITIES

Description

Miscellaneous Structural Commodities subject to aging management review are commodity groups that perform or support intended functions of in-scope systems, structures and components. The miscellaneous structural commodity groups include:

- Fire barriers
- Flood barrier
- Expansion joint/seismic gap materials
- Insulation
- Electrical enclosure commodities

Fire barriers

Fire barriers are located in safety-related and non-safety-related structures to protect safety-related and non-safety affecting safety-related equipment from fire and harsh environments. Fire barriers consist of concrete walls, floors, ceilings, masonry walls, doors, penetration seals, radiant energy shields, firewalls, etc.

The fire barrier concrete walls, floors, ceilings, and masonry walls are evaluated for aging management with the associated structures.

Fire barriers are in the scope of license renewal since they have intended functions that meet the criteria stated in 10CFR54.4(a). The Fire barriers meet 10CFR54.4(a)(1) because they protect safety-related equipment. The fire barriers meet 10CFR54.4(a)(2) because failure of these fire barriers could affect satisfactory accomplishment of a safety-related function associated with a safety-related system, structure, or component. The fire barriers also meet 10CFR54.4(a)(3) because they support EQ and fire protection.

Flood barrier

Flood barriers which are constructed with a steel framing that is bolted to the floor and wall adjacent to certain doors are provided to protect equipment from internal flooding. All connections to existing walls and floors are sealed with a gasket and/or sealant.

Flood barriers are in the scope of license renewal since they have intended functions that meet the criteria stated in 10 CFR 54.4(a). The flood barriers meet 10CFR54.4(a)(2) because failure of these flood barriers could affect satisfactory accomplishment of a safety-related function associated with a safety-related system, structure, or component.

Expansion joint/seismic gap materials

Expansion joint/seismic gaps are provided between adjacent buildings/structures to allow for relative motion between the structures. A compressible filler material is used to prevent the intrusion of foreign materials into these gaps, which could impede the motion relative to the adjacent structure. The expansion joint/seismic gaps in the fire-rated walls are filled with a filler material that provides protection from fire.

Expansion joint/seismic gaps are in the scope of license renewal since they have intended functions that meet the criteria stated in 10 CFR 54.4(a). The expansion joint/seismic gaps meet 10 CFR 54.4(a)(2) because failure of the expansion joint/seismic gaps could affect satisfactory accomplishment of a safety-related function associated with a safety-related system, structure, or component. The expansion joint/seismic gaps also meet 10CFR54.4(a)(3) because they support fire protection.

Insulation

Insulation is installed for high temperature piping, ductwork, hot piping penetrations, etc. to prevent excessive heat transmission to the surrounding structures. In addition, insulation installed on some Service Water System piping also serves as a spray shield in those locations where electrical equipment is susceptible to water spray.

Insulation is in the scope of license renewal since it has intended functions that meet the criteria stated in 10 CFR 54.4(a). The insulation meets 10 CFR 54.4(a)(2) because failure of the insulation could affect satisfactory accomplishment of a safety-related function associated with a safety-related system, structure, or component.

Electrical enclosure commodities

Electrical enclosure commodities include electrical panels and cabinets; junction, terminal, and pull boxes, cable tray covers, and metal enclosed bus - enclosure assemblies.

Electrical enclosure commodities are in the scope of license renewal since they have intended functions that meet the criteria stated in 10CFR54.4(a). The electrical enclosure commodities meet 10CFR54.4(a)(1) because they house and support safety-related equipment. The electrical enclosure commodities meet 10CFR54.4(a)(2) because they provide support for non-safety-related systems and components whose failure could affect satisfactory accomplishment of a safety-related function associated with a safety-related system, structure, or component. The electrical enclosure commodities also meet 10CFR54.4(a)(3) because they support fire protection, EQ equipment, anticipated transient without scram, and station blackout.

The evaluation boundary for the Miscellaneous Structural Commodities structural members subject to aging management review includes in-scope miscellaneous structural commodity groups located within buildings and structures within the scope of license renewal as defined in Table 2.2-3, Structures Within the Scope of License Renewal.

USAR Reference

None.

License Renewal Drawings

The license renewal drawing for the Miscellaneous Structural Commodities is listed below:

None.

Components Subject to AMR

The Miscellaneous Structural Commodities commodity groups that require aging management review are indicated in Table 2.4.2-13, Miscellaneous Structural Commodities.

The aging management review results for these commodity groups are provided in Table 3.5.2-14: Structures and Component Supports - Miscellaneous Structural Commodities - Aging Management Evaluation.

2.4.5 NSSS SUPPORTS

Description

The NSSS equipment supports, within the scope of license renewal, are the plant structures and components that support and restrain the following reactor coolant system equipment:

- Reactor vessel
- Reactor coolant pumps
- Steam generators
- Pressurizer

Reactor Vessel Supports

The reactor vessel is supported by six vertical steel H-columns embedded in concrete. The tops of these columns are furnished with ventilated support pad structures to provide for a suitable temperature gradient between the heated parts of the reactor vessel coming in contact with the supports and the supporting steel columns and surrounding concrete below. Fitted key slot blocks, which are furnished with the reactor and bolted to the ventilated support pads, provide for the free radial thermal expansion of the reactor vessel. Machined keys, which are integral with the reactor vessel nozzles and support lugs are shimmed for sliding fits in the key slots and restrain the reactor vessel from movement in any horizontal direction. The tops of the steel H-Columns are connected together by means of a structural tee horizontal bracing system that is welded to a continuous outer steel band. This entire bracing system is embedded in concrete to provide a rigid anchorage.

Reactor Coolant Pumps Supports

The two reactor coolant pumps are each supported by three vertical steel H-columns hinged at each end for vertical support and uplift while providing unrestrained movement laterally in the direction of thermal expansion during heatup and cooldown. The connection between the top of the support columns and the pump support brackets is by a high-strength steel threaded rod. Also, located between the support bracket and the top of the column, are three high-strength tie bars with slotted holes at each end to accommodate the thermal expansion of the pump loop. The tie bars are anchored to the compartment walls to prevent whipping of the pump in the event of a pipe rupture and/or a seismic event.

Steam Generators Supports

The two steam generators are each supported by four steel vertical H-Columns hinged at each end to provide for unrestrained movement in the direction of thermal expansion. The column ends are bolted into the steam generator support lugs and anchored by embedded bolts at the base to provide for uplift forces. Two lateral levels of supports are provided for the lateral seismic and pipe rupture loads. The lower lateral support consists of bumper-pedestals that are mounted on the compartment walls and on horizontal girders that span between compartment walls. The upper lateral support system consists of a horizontal ring girder that is fitted and shimmed to the contour of the steam generator shell with clearance allowance for the thermal expansion of the girder-shell system. The upper lateral support girder provides restraint in four directions by means of three attached bumper-pedestal plates that come in close clearance contact with wall mounted bumper plates in the hot position of the generator. The fourth side of the girder is provided with a hydraulic suppressor. The suppressor is attached to the girder and the compartment wall by means of pivoted linkage brackets to allow for vertical thermal displacement of the girder. The reactions of jet forces in the main steam line at the top of the steam generator are restrained by means of two cable anchors that are fitted with yokes welded to the pipe bends.

Pressurizer Support

The pressurizer is supported by a support skirt welded to the pressurizer and anchored to the pressurizer vault concrete floor by means of 24 embedded anchor bolts equally spaced on the circumference of the support skirt.

The NSSS equipment supports are in the scope of license renewal since they have intended functions that meet the criteria stated in 10CFR54.4(a). The NSSS equipment supports meet 10CFR54.4(a)(1) because they support safety-related equipment.

The evaluation boundary for the NSSS supports structural members subject to aging management review includes:

- Pins, bolting, and other removable hardware that are part of the connection to the NSSS equipment integral attachment are evaluated with the NSSS equipment supports.
- Exposed portions of the embedded components (i.e., end portion of threaded anchor and nut) are evaluated with the NSSS equipment supports.
- The passive hardware of the steam generator hydraulic compressor (extension pieces, clevises, pins, etc.).

Other support elements not included in the NSSS evaluation boundary are evaluated as follows:

- Concrete supporting structures (including the embedded portion of threaded anchors) are evaluated for aging management with the associated structure.
- Integral attachments for the NSSS equipment are evaluated for aging management with the specific NSSS equipment.
- The pressurizer support skirt is evaluated for aging management with the Reactor Coolant System.

USAR Reference

Additional details for the NSSS equipment supports can be found in the USAR, Sections 4.2.2, 5.9.2, Figure 5.9-7, Figure 5.9-8, Figure 5.9-10, Figure 5.9-11, and Table B.2-1.

License Renewal Drawings

The license renewal drawing for the NSSS Supports is listed below:

None.

Components Subject to AMR

The NSSS Supports structural members that require aging management review are indicated in Table 2.4.2-14, NSSS Supports.

The aging management review results for these structural members are provided in Table 3.5.2-15: Structures and Component Supports - NSSS Supports - Aging Management Evaluation.

Screening Results Tables: Containment, Structures and Component Supports

Table 2.4.1-1 Reactor Containment Vessel

Structural Member	Intended Function(s)
Reactor Containment Vessel	Enclosure Protection, EQ Barrier, Fire Barrier, Pressure Boundary, Structural Support
Reactor Containment Vessel basemat	Structural Support
Electrical penetration nozzles	EQ Barrier, Fire Barrier, Pressure Boundary, Structural Support
Equipment pads / grout	Structural Support
Fuel transfer tube	Pressure Boundary, Structural Support
Fuel transfer tube expansion bellows	Pressure Boundary
Fuel transfer tube expansion bellows cover	Enclosure Protection, Pressure Boundary
Fuel transfer tube blind flange	Pressure Boundary
Fuel transfer tube gate valve	Pressure Boundary, Structural Support
Fuel transfer tube penetration	EQ Barrier, Fire Barrier, Pressure Boundary, Structural Support
Gaskets (for emergency, equipment and personnel airlocks)	Pressure Boundary, Structural Support
Gaskets (fuel transfer tube blind flange)	Pressure Boundary, Structural Support
Guard pipes and Impingement rings	Jet Impingement Shield, Pressure Boundary, Structural Support
Heating and ventilation penetrations	EQ Barrier, Fire Barrier, Pressure Boundary, Structural Support

See Table 2.0-1 for definition of intended function.

Table 2.4.1-1 Reactor Containment Vessel

Structural Member	Intended Function(s)
Hinges, Latches, and closure mechanisms for airlocks	Pressure Boundary, Structural Support
Masonry block walls	Structural Support
Miscellaneous Steel [brackets, embedded steel exposed surfaces (shapes, plates, unistrut, etc.) ladders, platforms, gratings, checkered plates, stairs, handrails]	Structural Support
Missile shield cover	Missile Barrier
Moisture barrier	Enclosure Protection
Personnel and Emergency airlocks, equipment hatch, and equalizing valves for airlocks	EQ Barrier, Fire Barrier, Pressure Boundary, Structural Support
Piping penetrations (including expansion joint bellows)	EQ Barrier, Fire Barrier, Pressure Boundary, Structural Support
Radiation shield	Enclosure Protection
Reactor cavity liner	Structural Support
Reactor cavity seal ring	Enclosure Protection, Pressure Boundary
Reactor cavity shield wall	Enclosure Protection, Jet Impingement Shield, Missile Barrier, Structural Support
Refueling pool liner	Pressure Boundary, Structural Support
Sand plugs	Enclosure Protection, Structural Support

See Table 2.0-1 for definition of intended function.

Table 2.4.1-1 Reactor Containment Vessel

Structural Member	Intended Function(s)
Spare penetrations	EQ Barrier, Fire Barrier, Pressure Boundary, Structural Support
Structural Reinforced Concrete (floor slab, walls, beams, columns, missile shield cover)	Enclosure Protection, EQ Barrier, Jet Impingement Shield, Missile Barrier, Pressure Boundary, Structural Support
Structural Steel (beams, bracing, columns and baseplates, concrete floor framing)	Structural Support
Sumps	Pressure Boundary, Structural Support

See Table 2.0-1 for definition of intended function.

Table 2.4.2-1 Shield Building

Structural Member	Intended Function(s)
Annulus sumps and trenches	Structural Support
Dome vent penetration sleeve and weather cap	Pressure Boundary, Structural Support
Equipment opening door and support framing	EQ Barrier, Pressure Boundary, Structural Support
Equipment opening door seals	EQ Barrier, Pressure Boundary, Structural Support
Equipment pads/grout	Structural Support
Fuel transfer tube enclosure and enclosure access gate	Enclosure Protection, Structural Support
Miscellaneous Steel [embedded steel exposed surfaces (shapes, plates, unistrut, etc.) ladders, gratings, checkered plates, stairs, handrails]	Structural Support
Penetration seals (flexible seals, bellows seals, plates seals)	EQ Barrier, Fire Barrier, Pressure Boundary, Structural Support
Penetration sleeves	EQ Barrier, Fire Barrier, Pressure Boundary, Structural Support
Shield Building foundation basemat	Structural Support
Shield Building shell structure (cylindrical wall above and below grade, and dome)	Enclosure Protection, EQ Barrier, Fire Barrier, Missile Barrier, Pressure Boundary, Structural Support
Structural Reinforced Concrete (slab and curb)	Enclosure Protection, Structural Support

See Table 2.0-1 for definition of intended function.

Table 2.4.2-1 Shield Building

Structural Member	Intended Function(s)
Structural Steel (beams, bracing, platform framings, trolley supports)	Structural Support

See Table 2.0-1 for definition of intended function.

Table 2.4.2-2 Administration Building

Structural Member	Intended Function(s)
Air intake structures (walls, slabs, columns, spread footings, and birdscreen)	Missile Barrier, Structural Support
Air outlet structure (walls, slabs, louver housing, and grating)	Missile Barrier, Structural Support
Duct bank entrance area	Enclosure Protection, Structural Support
Equipment pads/grout	Structural Support
Foundation Basemat	Structural Support
Masonry block walls	Fire Barrier, Structural Support
Miscellaneous Steel [embedded steel exposed surfaces (plates, unistrut, etc.) ladders, gratings, handrails, plates]	Structural Support
Structural Reinforced Concrete (slab and walls)	Enclosure Protection, Fire Barrier, Missile Barrier, Structural Support
Structural Steel (beams, posts)	Structural Support
Trench	Flood Barrier, Structural Support

See Table 2.0-1 for definition of intended function.

Table 2.4.2-3 Auxiliary Building

Structural Member	Intended Function(s)
Cask wear plate	Structural Support
Control room ceiling and supports	Structural Support
Missile hood and bird screen	Missile Barrier, Structural Support
Equipment pads/grout	Structural Support
Exhaust Vent Stack, missile cover, and screen	Missile Barrier, Structural Support
Fixed louvers with bird screens	Structural Support
Floor and roof hatch covers	Enclosure Protection, Fire Barrier, Missile Barrier, Structural Support
Foundation basemat	Structural Support
Fuel transfer tube shield	Enclosure Protection, Structural Support
Fuel transfer tube sleeve	Structural Support
Jet impingement shields	Jet Impingement Shield, Structural Support
Masonry block walls	Fire Barrier, Structural Support
Metal siding blow in/out panels and fasteners	Enclosure Protection, Structural Support
Miscellaneous Steel [embedded steel exposed surfaces (shapes, plates, unistrut, etc.) ladders, gratings, checkered plates, stairs, handrails]	Structural Support

See Table 2.0-1 for definition of intended function.

Table 2.4.2-3 Auxiliary Building

Structural Member	Intended Function(s)
New fuel storage structure including planking and cover	Structural Support
Refueling water storage tank shield wall	Enclosure Protection, Missile Barrier, Structural Support
Roof deck release panels and fasteners	Enclosure Protection, Structural Support
Spent fuel pool gate	Enclosure Protection, Pressure Boundary, Structural Support
Spent fuel pool gate seal	Enclosure Protection, Pressure Boundary, Structural Support
Spent fuel pool liner	Enclosure Protection, Pressure Boundary, Structural Support
Structural Reinforced Concrete (slabs, beams, columns, roof slabs, walls, panels, shielding, trenches, cubicles for airlocks and special ventilation)	Enclosure Protection, EQ Barrier, Fire Barrier, Flood Barrier, Jet Impingement Shield, Missile Barrier, Pressure Boundary, Structural Support
Structural Steel (beams, bracing, columns, crane girders, concrete floor framing and decking, truss, roof framing and decking)	Structural Support
Sumps and trenches	Flood Barrier, Structural Support
Tank storage enclosure footings and tank foundation rings	Structural Support

See Table 2.0-1 for definition of intended function.

Table 2.4.2-4 Screenhouse Access Tunnel

Structural Member	Intended Function(s)
Flood Ramp	Flood Barrier
Miscellaneous Steel [Embedded Steel-Exposed Surfaces (shapes and plates)]	Structural Support
Structural Reinforced Concrete (foundation mat slab, walls, roof slab)	Enclosure Protection, Fire Barrier, Structural Support

See Table 2.0-1 for definition of intended function.

Table 2.4.2-5 Technical Support Center

Structural Member	Intended Function(s)
Equipment pads / grout	Structural Support
Louvers and bird screens	Structural Support
Masonry block walls	Enclosure Protection, Fire Barrier, Structural Support
Miscellaneous Steel [Embedded Steel-Exposed Surfaces (shapes and plates)]	Structural Support
Structural Reinforced Concrete (foundation mat slab, floor slabs, walls, roof slab)	Enclosure Protection, Fire Barrier, Structural Support
Structural Steel (beams, bracing, columns, baseplates, floor framing and decking, roof framing and decking)	Structural Support

See Table 2.0-1 for definition of intended function.

Table 2.4.2-6 Turbine Building

Structural Member	Intended Function(s)
Equipment pads/grout	Structural Support
Foundation Basemat	Structural Support
Masonry block walls	Fire Barrier, Structural Support
Metal siding blow in/out panels and fasteners	Enclosure Protection, Structural Support
Miscellaneous Steel [embedded steel exposed surfaces (shapes, plates, unistrut, etc.) ladders, gratings, checkered plates, stairs, handrails]	Structural Support
Roof deck release panels and fasteners	Enclosure Protection, Structural Support
Steam exclusion plate	EQ Barrier, Structural Support
Structural Reinforced Concrete (slabs, beams, columns, and walls)	Enclosure Protection, EQ Barrier, Fire Barrier, Flood Barrier, Missile Barrier, Structural Support
Structural Steel (beams, bracing, columns, crane girders, concrete floor framing and decking, truss, roof framing and decking)	Structural Support
Sump and trench	Flood Barrier, Structural Support

See Table 2.0-1 for definition of intended function.

Table 2.4.2-7 Yard Structures

Structural Member	Intended Function(s)
Duct Banks	Enclosure Protection, Structural Support
Fire Hose Houses	Enclosure Protection, Structural Support
Foundations (EDG fuel oil storage tanks, lighting poles, fire hose houses, outdoor transformer walls, RAT & TAT transformers, substation/switchyard structures, transmission towers)	Structural Support
Lighting Poles	Structural Support
Manhole Access Covers	Enclosure Protection, Structural Support
Manholes	Enclosure Protection, Structural Support
Outdoor RAT Bay Miscellaneous Steel [embedded steel exposed surfaces (shapes, plates)]	Structural Support
Outdoor Transformer Bays Structural Reinforced Concrete (beams, columns, walls, floor, curbs)	Fire Barrier, Structural Support
Steel Bar Straps (EDG fuel oil storage tanks)	Structural Support
Substation/Switchyard Concrete Structure (13.8 kV take-off structure)	Structural Support
Substation/Switchyard Steel Structures (138 kV take-off tower, supports for 138 kV & 13.8 kV disconnect switches, 13.8 kV take-off structure)	Structural Support
Transmission Towers	Structural Support

See Table 2.0-1 for definition of intended function.

Table 2.4.2-8 Discharge Structure

Structural Member	Intended Function(s)
Structural Reinforced Concrete (foundation floor slab, walls, beams, roof slabs)	Pressure Boundary, Structural Support
Structural Steel (sheet piling)	Structural Support

See Table 2.0-1 for definition of intended function.

Table 2.4.2-9 Discharge Tunnel and Pipe

Structural Member	Intended Function(s)
Concrete Pipe - Structural Reinforced Concrete	Pressure Boundary, Structural Support
Steel Pipe - Concrete Encased	Pressure Boundary, Structural Support
Tunnel - Structural Reinforced Concrete (foundation mat slab, walls, roof slabs)	Pressure Boundary, Structural Support

See Table 2.0-1 for definition of intended function.

Table 2.4.2-10 Intake Structure

Structural Member	Intended Function(s)
Inlet Cones	Source of Cooling, Structural Support
Ring Foundation	Structural Support
Trash Grilles	Source of Cooling, Structural Support
Trash Grilles Anchorage	Structural Support

See Table 2.0-1 for definition of intended function.

Table 2.4.2-11 Screenhouse

Structural Member	Intended Function(s)
Duct bank entrance area	Enclosure Protection, Structural Support
Equipment pads / grout	Structural Support
Exterior bulkhead doors	Flood Barrier
Floor cover plates	Flood Barrier
Gaskets and Seals	Flood Barrier
Hatches	Fire Barrier, Missile Barrier, Structural Support
Lower interior bulkhead door	Flood Barrier
Manhole covers	Flood Barrier
Miscellaneous Steel [Embedded Steel-Exposed Steel Surfaces (shapes, plates, unistrut, etc.)]	Structural Support
Penthouse air intake covers	Structural Support
Penthouse air intakes	Missile Barrier, Structural Support
Steel frame (traveling water screen covers)	Flood Barrier, Structural Support
Structural Reinforced Concrete (Foundation mat, walls, beams, columns, floor slabs, roof slab)	Enclosure Protection, Fire Barrier, Flood Barrier, Missile Barrier, Structural Support

See Table 2.0-1 for definition of intended function.

Table 2.4.2-11 Screenhouse

Structural Member	Intended Function(s)
Traveling water screen covers	Flood Barrier
Traveling water screen support frame	Structural Support
Water conduit inlets	Structural Support

See Table 2.0-1 for definition of intended function.

Table 2.4.2-12 Component Supports

Component Type/Structural Member	Intended Function(s)
Battery Racks	Structural Support
Cable Trays and Electrical Conduit	Structural Support
Supports for cable trays, conduit, HVAC ducts, Tube Track and Instrument Tubing	Structural Support
Supports for Electrical and I &C (racks, cabinets, panels, junction boxes, enclosures, etc.)	Structural Support
Supports for Mechanical Equipment (diesel generators including exhaust system, HVAC system components, pumps, fans, heat exchangers, RCV sump strainers, etc.)	Structural Support
Supports for Miscellaneous Components [pipe whip restraints, seismic (masonry block walls), fire hose stations, ladders, tool boxes, etc.]	Structural Support
Supports for Piping & Components (plates and structural shapes, spring hangers, sliding surfaces, welds, bolted connections, etc.)	Structural Support

See Table 2.0-1 for definition of intended function.

Table 2.4.2-13 Miscellaneous Structural Commodities

Commodity Group	Intended Function(s)
Metal enclosed bus - enclosure assemblies	Enclosure Protection
Cable tray covers	Fire Barrier, Structural Support
Control room cabinet covers	Enclosure Protection, Fire Barrier
Doors (fire, rolling fire, Steam Exclusion, Special Ventilation, Control Room Environmental Zone, plant access and flood)	Enclosure Protection, EQ Barrier, Fire Barrier, Flood Barrier, Pressure Boundary, Structural Support
Electrical component supports within panels and cabinets	Structural Support
Expansion Joint/Seismic gap material (fire rated walls)	Fire Barrier, Structural Support
Expansion Joint/Seismic gap sealant material (between adjacent buildings/structures)	Structural Support
Fire barrier Penetration seals assemblies	Enclosure Protection, EQ Barrier, Fire Barrier, Pressure Boundary
Fire boots	Fire Barrier
Fire rated steel coating (pyrocrete)	Fire Barrier
Firewalls (gypsum)	Fire Barrier, Structural Support
Flood barriers and gaskets/sealant	Flood Barrier, Structural Support
Gaskets/seals in junction, terminal, pull boxes	Enclosure Protection

See Table 2.0-1 for definition of intended function.

Table 2.4.2-13 Miscellaneous Structural Commodities

Commodity Group	Intended Function(s)
Insulation	Structural Support
Junction, terminal, and pull boxes	Enclosure Protection
Panels and cabinets	Enclosure Protection, Structural Support
Radient energy shields (3M Interam wraps)	Fire Barrier

See Table 2.0-1 for definition of intended function.

Table 2.4.2-14 NSSS Supports

Structural Member	Intended Function(s)
Pressurizer Support: Bolting	Structural Support
Reactor Coolant Pumps Support: Plates and Structural Shapes (columns, brackets, tie bars, bolting, etc.)	Structural Support
Reactor Vessel Support: Plates and Structural Shapes (columns, beams, bracing, band ring, bolting, etc.)	Structural Support
Reactor Vessel Support: Plates and Structural Shapes (ventilated support pads, vendor supplied support shoes and shim plates, bolting)	Structural Support
Steam Generator Support: Plates and Structural Shapes (columns, lower lateral support system, upper lateral support system, bolting, attachments for hydraulic suppressor, spring hangers, cable restraints and anchors)	Structural Support

See Table 2.0-1 for definition of intended function.

2.5 SCOPING AND SCREENING RESULTS: ELECTRICAL AND INSTRUMENTATION AND CONTROLS SYSTEMS

A listing of the abbreviations used in this section is provided in Section 1.4.

As stated in Section 2.1.5.5, Electrical/I&C Screening, the electrical and I&C components have been screened and evaluated on a plant-wide basis as commodities rather than on a system basis. Section 2.1.5.5 identifies the following electrical/I&C components as performing a passive electrical function in support of system intended functions:

- Cables and Connections (Section 2.5.1)
- Fuse Holders (Section 2.5.2)
- Metal Enclosed Bus (includes switchyard buses) (Section 2.5.3)
- Reactor Containment Vessel electrical penetrations

All Reactor Containment Vessel electrical penetration assemblies are within the scope of the EQ Program and the subject of a TLAA as described in Section 4.4, Environmental Qualification of Electric Equipment. As such, they have not been included in the aging management review of Electrical and Instrumentation and Controls Systems.

2.5.1 CABLES AND CONNECTIONS

Description

Cables and connections are a part of all plant systems, but are not typically identified as specific components for each system. Hence, cables and connections, including stored cables, are evaluated as a plant-wide commodity. Cables can be either bare metallic current carrying conductors (such as overhead transmission lines) or insulated cables that have metallic conductors covered with insulation to separate phases, isolate from ground potential, and provide personnel safety. Cable connections are the junction points of cables to equipment or cables through splices, terminal blocks, or bolted lugs. The metallic conductor and the insulation components of the following non-EQ cable and termination applications are included in this commodity evaluation:

- High-voltage power (above 35kV)
- Medium-voltage power (2kV to 35kV)

- Low-voltage power (below 2kV)
- Control
- Instrumentation

Cables provide electrical connections to specified sections of an electrical circuit to deliver voltage, current, or signals. Cables and connections in the scope of license renewal support equipment that meet the criteria stated in 10CFR54.4(a)(1), 10CFR54.4(a)(2), or 10CFR54.4(a)(3).

The evaluation boundary for cables and connections subject to aging management review extends from each end of the field run or scheduled cables to where connections are made to the active components.

USAR Reference

Additional details of the cables and connections can be found in the USAR, Sections 7.2 and 8.2.

Components Subject to AMR

The commodity groups/component types that require aging management review are indicated in Table 2.5.1-1, Cables and Connections.

The aging management review results for these commodity groups/component types are provided in Table 3.6.2-1: Electrical Components - Cables and Connections - Aging Management Evaluation.

2.5.2 FUSE HOLDERS

Description

A fuse holder is an electrical connection device that is used to secure a fuse in a circuit. A fuse holder consists of an insulating base with two fixed metallic termination devices. Each termination device (metallic clamp) provides a means of cable conductor attachment and holds one end of the fuse. The inserted fuse completes the circuit. The metallic clamps can be either spring-loaded clips to insert the fuse ends or bolt lugs to bolt the fuse ends.

NUREG-1801 states that fuse holders that are not part of a larger assembly require evaluation. Screening of fuses determined that two panels contain fuses that perform an intended function in accordance with 10 CFR 54.4(a) and are not part of a larger assembly. The associated fuse holders (metallic clamps) meet 10CFR54.4(a)(1) by providing power and protection to safety-related radiation monitor circuits.

The evaluation boundary for fuse holders that are subject to aging management review includes the metallic clamps holding the fuse and the cable conductor attachments at the ends of the fuse holder.

The non-metallic fuse base, which serves as an electrical insulating material, is evaluated with Cables and Connections in Section 2.5.1.

USAR Reference

None

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.5.2-1, Fuse Holders.

The results of the aging management review of these components are provided in Table 3.6.2-2: Electrical Components - Fuse Holders - Aging Management Evaluation.

2.5.3 METAL ENCLOSED BUS

Description

Metal enclosed buses are electrical buses installed on electrically insulated supports and are constructed with each phase conductor enclosed in a separate metal enclosure or all conductors enclosed in a common metal enclosure. The MEBs are used in power systems to connect various elements in electric power circuits such as switchgear, transformers, main generator, and diesel generators. The four types of buses classified as MEBs are isolated phase, segregated phase, non-segregated phase, and switchyard bus (bare non-enclosed bus). The 13.8kV and 138kV switchyard bus and 4.16kV non-segregated phase bus that provide paths for the recovery of off-site power during an SBO event are the only MEBs within the scope of license renewal. The 13.8Kv switchyard bus consists of angle bus that is supported on porcelain post type insulators and provides connection between the disconnect switch associated with Oil Circuit Breaker TA-199 (10) to the underground cable that supplies power to the TAT. The TAT provides power via cables to 4.16kV Emergency Bus 1-6 during normal operation. The 138kV switchyard bus consists of tubular bus supported on porcelain post type insulators used to connect 138kV Oil Circuit Breakers RA-199E (3E) and RA-199W (3W) to their associated disconnect switches and the overhead transmission line that provides power to the RAT. The RAT powers two secondary 4.16kV windings (RX and RY) that are connected to non-segregated MEBs. Only the MEB of the RX winding is in the scope of license renewal since it is the off-site power source for 4.16kV Emergency Bus 1-6. See Figure 2.1-2 for a schematic of the electrical components that support the recovery of offsite power after an SBO event.

The MEB is in the scope of license renewal since the commodity has intended functions that meet the criteria stated in 10CFR54.4(a). The above MEBs meet 10CFR 54.4(a)(3) because they support the restoration of off-site power following a SBO event.

The evaluation boundaries for the components subject to aging management review are from the non-segregated MEB or switchyard bus to where connection has been made to equipment or to cables. This includes the 138kV switchyard bus connections of the overhead transmission conductors supplying the RAT and the 13.8kV switchyard bus connections to the underground cables supplying the TAT, which are evaluated for aging management with Cables and Connections.

The 4.16kV MEB enclosures (including expansion joints, sealants, and exterior enclosure supports) and the switchyard post insulator supports are considered structural components and are discussed in Section 2.4.2, Miscellaneous Structural Commodities (Electrical enclosure commodities) and Section 2.4.2.7, Yard Structures (Substation/Switchyard Structures and Transmission Towers).

<u>USAR Reference</u>

None

<u>Components Subject to AMR</u>

The component types that require aging management review are indicated in Table 2.5.3-1, Metal Enclosed Bus.

The results of the aging management review of these components are provided in Table 3.6.2-3: Electrical Components - Metal Enclosed Bus - Aging Management Evaluation.

Screening Results Tables: Electrical and Instrumentation and Controls Systems

Table 2.5.1-1 Cables and Connections

Commodity Group / Component Type	Intended Function(s)
Cable Connections (Metallic Parts)	Conducts Electricity
Conductor insulation for electrical cables and connections	Insulate
Conductor insulation for electrical cables and connections used in sensitive instrumentation circuits	Insulate
Conductor insulation for inaccessible medium voltage (2kV to 35kV) cables	Insulate
Electrical equipment subject to 10 CFR 50.49 EQ requirements	Conducts Electricity, Insulate
Fuse Holders insulation	Insulate
Transmission conductors and connections	Conducts Electricity

See Table 2.0-1 for definition of intended function.

Table 2.5.2-1 Fuse Holders

Component Type	Intended Function(s)
Fuse holders (Not Part of a Larger Assembly) Metallic Clamp	Conducts Electricity

See Table 2.0-1 for definition of intended function.

Table 2.5.3-1 Metal Enclosed Bus

Component Type	Intended Function(s)
Conductor Insulation, MEB	Insulate
Metallic Conductor, MEB	Conducts Electricity
Metallic Conductor, Switchyard Bus	Conducts Electricity
Support Insulation, High Voltage	Insulate, Structural Support
Support Insulation, MEB	Insulate, Structural Support

See Table 2.0-1 for definition of intended function.

3.0 AGING MANAGEMENT REVIEW RESULTS

The aging management review for most component types and structural members was performed on a system-by-system or structure-by-structure basis. However, the aging management review for some component types and structural members that are common to many systems or structures was performed on a plant-wide basis. For this situation, each component type or structural member evaluated was referred to as a "commodity group".

The accuracy of the aging management reviews are dependent upon the appropriate selection and application of the materials of construction and the environments for the structural members, component types and commodities under review.

NUREG-1801 identifies numerous materials, which are similar in description and meaning. The aging management reviews were based on a distinct set of generalized materials that were developed from a review of plant data and grouped accordingly (e.g., steel includes carbon steel, low-alloy steels, and cast iron; and stainless steel includes wrought and forged stainless steels and cast austenitic stainless steel).

Descriptions of the service environments, which were used in the aging management review to determine aging effects requiring management, are included in Table 3.0-1, Service Environments.

This section provides the results of the aging management review for those structures and components identified in Section 2.0 as being subject to aging management review. Organization of this section is based on Tables 1 through 6 of Volume 1 of NUREG-1801, Generic Aging Lessons Learned (GALL), Revision 1, 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.

This section is organized as follows:

Section 3.1, Aging Management of Reactor Vessel, Internals, and Reactor Coolant System

Section 3.2, Aging Management of Engineered Safety Features Systems

Section 3.3, Aging Management of Auxiliary Systems

Section 3.4, Aging Management of Steam and Power Conversion System

Section 3.5, Aging Management of Containment, Structures and Component Supports

Section 3.6, Aging Management of Electrical and Instrumentation and Controls

Aging management review results information in Section 3 is presented in the following two table types (Table 1 and Table 2):

Table 3.x.1 - where:

- '**3**' indicates the LRA section number
- '**x**' indicates the subsection number from NUREG-1801, Volume 1, and
- '**1**' indicates that this is the first table type in Section 3.

For example, in the Reactor Coolant System subsection, this is table 3.1.1, in the Engineered Safety Features subsection, this is table 3.2.1, and so on. For ease of discussion, these tables are typically referred to as "Table 1." These tables are derived from the corresponding tables in NUREG-1801, Volume 1; and present summary information from the AMRs.

Table 3.x.2-y - where:

- '**3**' indicates the LRA section number
- '**x**' indicates the subsection number from NUREG-1801, Volume 1, and
- '**2**' indicates that this is the second table type in Section 3; and '**y**' indicates the system table number.

For example, within the Reactor Coolant System subsection, the AMR results for the reactor vessel are presented in Table 3.1.2-1, and the results for the reactor vessel internals are presented in Table 3.1.2-2. In the Engineered Safety Features subsection, the Containment Vessel Internal Spray System results are presented in Table 3.2.2-1, and the Safety Injection System results are presented in Table 3.2.2-2. For ease of discussion, these tables are typically referred to as "Table 2." These tables present the results of the AMRs.

<u>TABLE DESCRIPTION</u>

NUREG-1801, "Generic Aging Lessons Learned (GALL) Report," contains the staff's generic evaluation of the 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 period of extended 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 (Refer to Sample Table 1 below)

Sample Table 1

Table 3.x.1 Summary of Aging Management Programs for __ Evaluated in Chapter __ of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-01					
3.1.1-02					
3.1.1-03					

The purpose of Table 1 is to provide a summary comparison of how this application 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 “ID” column has been renamed to "Item Number" and used to number the rows. Also, the "Type" column has been removed and the "Related Generic Item” and “Unique Item” columns have been replaced by a "Discussion" column.

The "Item Number" column provides the reviewer with a means to cross-reference from Table 2 to Table 1.

The "Discussion" column is used to provide clarifying/amplifying information. The following are examples of information that might be contained within this column:

- "Further Evaluation Recommended" information or reference to where that information is located (including a hyperlink to the program in this application)
- The name of a plant specific program being used (including a hyperlink to the program in this application)
- Exceptions to the NUREG-1801 assumptions

- A discussion of how the line is consistent with the corresponding line item in NUREG-1801, Volume 1, when that may not be intuitively obvious
- 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 checking consistency.

Table 2 (Refer to Sample Table 2 below)

Sample Table 2

Table 3.x.2-y Section 3 Title - Plant Specific System - Summary of Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect / Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes

Table 2 provides the detailed results of the aging management reviews for those components identified in LRA Section 2 as being subject to aging management review. There will be a Table 2 for each of the subsystems within a "system" grouping. For example, for a PWR, the Engineered Safety Features System contains tables specific to Containment Vessel Internal Spray, Safety Injection, Residual Heat Removal, etc.

Table 2 consists of the following nine columns:

- Component Type / Commodity Group / Structural Member / Subcomponent
- Intended Function(s)
- Material
- Environment
- Aging Effect/Mechanism Requiring Management

- Aging Management Programs
- NUREG-1801 Volume 2 Reference
- Table 1 Item
- Notes

Component Type

The first column identifies all of the component types / commodity groups / structural members / subcomponents from Section 2 of the LRA that are subject to aging management review.

Intended Function(s)

The second column contains the license renewal intended functions (including abbreviations where applicable) for the listed component types. Definitions and abbreviations of intended functions are contained within the Intended Functions table of LRA Section 2, Table 2.0-1, Intended Functions: Abbreviations & Descriptions.

Material

The third column lists the particular material group for the component type.

Environment

The fourth column lists the environment to which the component types are exposed. A list of these environments is provided in Table 3.0-1, Service Environments.

Aging Effect/Mechanism Requiring Management

As part of the aging management review process, aging effects/mechanisms requiring management are determined for the material and environment combination in order to maintain the intended function of the component type. These aging effects/mechanisms requiring management are listed in the fifth column.

Aging Management Programs

The aging management programs used to manage the aging effects requiring management are listed in sixth column of Table 2.

NUREG-1801 Vol. 2 Reference

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 considerations given to the industry standard notes, to identify consistencies. When corresponding items are identified, they are documented by noting the appropriate NUREG-1801, Volume 2 related generic item (hyperlink provided to related generic items table for unique item cross-reference) or unique item number in the seventh column of Table 2. If there is no corresponding item number in NUREG-1801, Volume 2, this row in the seventh column is left blank. 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 the eighth column of Table 2. If there is no corresponding item in NUREG-1801, Volume 1, this row in the eighth column 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, it is necessary to identify how the information in Table 2 aligns with the information in NUREG-1801, Volume 2. This is accomplished through a series of notes. All note references with letters are industry standard notes that will be the same from application to application. Any notes that are required in addition to the industry standard notes will be identified with a number and deemed plant standard or system specific.

NUREG-1801 is a good repository of industry aging data; however, it does not address all the material and environment aging combinations necessary to complete an aging management review for the plant-specific SSCs. As evidenced by the large percentage of industry footnotes "A" through "E" reflected throughout this section, the information afforded by NUREG-1801 was utilized to the extent practical in the aging management reviews. During the aging management review process, the definition of plant-specific material and environment aging was updated as necessary to accommodate newly identified material and environment combinations and any related aging concerns. These plant-specific aging combinations are reflected using only industry standard note "H". Therefore, industry standard notes F, G, I, and J are not used in this application.

TABLE USAGE

Table 1

The reviewer evaluates each row in Table 1 by moving from left to right across the table. Since the Component, 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 aging management 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 for further information (including hyper links where possible/practical).

Table 2

Table 2 contains all of the Aging Management Review information for the SSCs evaluated during the aging management reviews. Each row within the table contains the material, environment, aging effect requiring management, and aging management program (MEAP) combination for a particular component type. If there is a correlation between the MEAP combination in Table 2 and a MEAP combination in NUREG-1801, Volume 2, the seventh column contains a NUREG-1801 Volume 2 Reference. There are two types of NUREG-1801 Volume 2 References that can appear in the seventh column; a unique item or a related generic item.

When the MEAP for a component type within a specified system matches the NUREG-1801, Volume 2 Section associated with that system, a unique item is referenced. For example, if the MEAP for a Feedwater System component has a corresponding MEAP from Section D1 (Feedwater System - PWR) in NUREG-1801, Volume 2, Chapter VIII, then the unique item from Section VIII.D1 (i.e. VIII.D1-07) is shown in Table 2.

Conversely, when the MEAP for a component type within a specified system does not match a MEAP from the designated system's section in NUREG-1801, Volume 2, a related generic item is referenced. For example, if the MEAP for a Feedwater System component has a corresponding MEAP from Section VIII.E1 (Condensate System), then the related generic item from Section VIII.E1 (i.e. S-019) is shown in Table 2 with a hyperlink to a table that cross-references each related item with the unique item(s). Again, if there is no appropriate corresponding MEAP in NUREG-1801, Volume 2, the seventh column is left blank.

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 link directly to 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 components subject to AMR in LRA Section 2 all the way through the evaluation of the programs that will be used to manage the effects of aging of those components.

A listing of the abbreviations used in this section is provided in Section 1.4.

Table 3.0-1 Service Environments

Environment[1]	Description
Adverse localized environment	A condition in a limited plant area that is significantly more severe than the specified service environment for cables (power, control, and instrumentation) and connections. The environment may be caused by heat, radiation, oxygen, moisture in the presence of oxygen, exposure to moisture and/or voltage or > 60-year service limiting temperature.
Air - dried	The oil-free, moisture-free environment associated with the internals of compressed air system components, which are located downstream of dryers.
Air - moist	The air environment associated with component internal surfaces, except compressed air system components downstream of air dryers. This environment also applies to component internals exposed to CO_2 and Halon. The air - moist environment contains sufficient moisture to facilitate loss of material in susceptible materials. Moist air in the absence of condensation is also potentially aggressive.
Air - indoor controlled	Air-conditioned plant areas where the temperature and humidity levels are controlled. Condensation does not typically occur in an air-indoor controlled environment.
Air - indoor uncontrolled	Plant areas where humidity is not controlled. Condensation may occur in an air - indoor uncontrolled environment. - The Reactor Containment Vessel air environment is bounded by a bulk average temperature of 40°F to 120°F, with the exception of the pressurizer vault. The 60-year normal radiation dose ranges between 2.7 x 10^6 and 2.7 x 10^7 rads. - With the exception of a limited number of locations, the air environment for locations inside structures other than the Reactor Containment Vessel is essentially at atmospheric pressure and bounded by a bulk average air temperature range of 60°F to 120°F and a 60-year maximum ionizing dose of less than 1 x 10^6 rads.

Table 3.0-1 Service Environments

Environment[1]	Description
Air - outdoor	Includes precipitation, ultraviolet radiation, ozone, and wind. The outside air environment is bounded by an air temperature range of -25°F to 105°F.
Borated Water Leakage	The borated water leakage environment is applicable to all plant areas that contain borated water systems. The following buildings and locations contain borated water systems: > Reactor Containment Vessel > Shield Building > Auxiliary Building: - Radiologically controlled area (all elevations - excluding the new fuel storage area) - Steam generator blowdown treatment tank room - Bus 1 and 2 room
Concrete	The environment for components embedded in concrete.
Diesel exhaust	High-temperature environment consisting of gases, particulate, and moisture.
Fuel oil	Environment for components exposed to diesel fuel oil. Moisture and water pooling are assumed in a fuel oil environment.
Gas - inert	Environment for components exposed to inert or non-reactive gases. Gas-inert environment does not include CO_2 and Halon.
Hydraulic oil	Oil used primarily in valve actuators (e.g. turbine control valves). Moisture and water pooling are not assumed in a hydraulic oil environment.
Lube oil	Oil used for engine, bearing, and gear lubrication. Moisture and water pooling are assumed in a lube oil environment.

Table 3.0-1 Service Environments

Environment[1]	Description
Raw Water	Raw water has not been demineralized or chemically treated to any significant extent, and includes intake water from Lake Michigan. Other designations of raw water include treated water that leaks from plant systems into floor drains and sumps. Ground water is not considered raw water, but is included under the definition of soil.
Soil	Soil consists of glacial till and glacial lacustrine deposits, which are primarily stiff to hard silty clays that contain variable amounts of sand, gravel, and seams of sand and silt. Ground water is included in the soil environment.
Treated water and/or steam - secondary	Water that is initially treated and maintained at a quality suitable for use in the plant secondary steam cycle.
Treated water - closed cycle cooling	Water that is initially treated for use in plant closed cycle cooling systems.
Treated water - primary	Water that is initially treated and maintained at a quality suitable for use in the plant primary systems. Steam generated in the pressurizer is included in this category.

1 Service Environments may be internal or external environments depending on the physical form and function of the component/commodity being considered. Whether an environment is internal or external is identified in the aging management review tables for the system under review.

3.1 AGING MANAGEMENT OF REACTOR VESSEL, INTERNALS, AND REACTOR COOLANT SYSTEM

3.1.1 INTRODUCTION

This section provides the results of the aging management review for those components identified in Section 2.3.1, Reactor Coolant System, as being subject to aging management review. The following are addressed in this section and are described in the indicated sections.

- Reactor Vessel (Section 2.3.1.1)
- Reactor Vessel Internals (Section 2.3.1.2)
- Reactor Coolant System (Section 2.3.1.3)
- Steam Generator (Section 2.3.1.4)

Table 3.1.1, Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of NUREG-1801, provides the summary of the programs evaluated in NUREG-1801 for the Reactor Vessel, Internals, and Reactor Coolant System components that are relied on for license renewal.

This table uses the format described in Section 3.0 above.

3.1.2 RESULTS

The following tables summarize the results of the aging management review for the Reactor Vessel, Internals, and Reactor Coolant System group.

Table 3.1.2-1, Reactor Vessel - Aging Management Evaluation

Table 3.1.2-2, Reactor Vessel Internals - Aging Management Evaluation

Table 3.1.2-3, Reactor Coolant - Aging Management Evaluation

Table 3.1.2-4, Steam Generator - Aging Management Evaluation

The materials from which components are fabricated, the environments to which components 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 major components and the Reactor Coolant System in the following subsections of Section 3.1.2.1, Materials, Environment, Aging Effects Requiring Management and Aging Management Programs:

Section 3.1.2.1.1, Reactor Vessel

Section 3.1.2.1.2, Reactor Vessel Internals

Section 3.1.2.1.3, Reactor Coolant System

Section 3.1.2.1.4, Steam Generator

3.1.2.1 MATERIALS, ENVIRONMENT, AGING EFFECTS REQUIRING MANAGEMENT AND AGING MANAGEMENT PROGRAMS

3.1.2.1.1 Reactor Vessel

Materials

The materials of construction for the reactor vessel subcomponents are:

- Nickel Alloys
- Stainless Steel
- Steel

Environment

The reactor vessel subcomponents are exposed to the following environments:

- Air-indoor uncontrolled
- Borated water leakage
- Treated water-primary

Aging Effects Requiring Management

The following aging effects, associated with the reactor vessel subcomponents, require management:

- Crack growth
- Cracking
- Cumulative fatigue damage
- Loss of fracture toughness
- Loss of material

Aging Management Programs

The following aging management programs manage the aging effects for the reactor vessel subcomponents:

- Alloy 600 Inspections
- ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD
- Boric Acid Corrosion
- Primary Water Chemistry
- Reactor Head Closure Studs
- Reactor Vessel Surveillance
- Work Control Process

3.1.2.1.2 Reactor Vessel Internals

Materials

The materials of construction for the reactor vessel internals subcomponents are:

- Nickel Alloys
- Stainless Steel

Environment

The reactor vessel internals subcomponents are exposed to the following environments:

- Air-indoor uncontrolled
- Treated water-primary

Aging Effects Requiring Management

The following aging effects, associated with the reactor vessel internals subcomponents, 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 internals subcomponents:

- ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD
- Flux Thimble Tube Inspection
- Primary Water Chemistry

3.1.2.1.3 Reactor Coolant System

Materials

The materials of construction for the Reactor Coolant System component types are:

- Copper Alloys
- Nickel Alloys
- Stainless Steel
- Steel

Environment

The Reactor Coolant System component types are exposed to the following environments:

- Air-indoor uncontrolled
- Borated water leakage
- Lube oil
- Treated water-closed cycle cooling
- Treated water-primary

Aging Effects Requiring Management

The following aging effects, associated with the Reactor Coolant System, require management:

- Cracking
- Cumulative fatigue damage
- 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
- Bolting Integrity
- Boric Acid Corrosion
- Closed-Cycle Cooling Water System
- External Surfaces Monitoring
- Lubricating Oil Analysis
- Primary Water Chemistry
- Work Control Process

3.1.2.1.4 Steam Generator

Materials

The materials of construction for the steam generator subcomponents are:

- Nickel Alloys
- Stainless Steel
- Steel

Environment

The steam generator subcomponents are exposed to the following environments:

- Air-indoor uncontrolled
- Borated water leakage
- Treated water and/or steam-secondary
- Treated water-primary

Aging Effects Requiring Management

The following aging effects, associated with the steam generator subcomponents, require management:

- Cracking
- Cumulative fatigue damage
- Loss of material
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for the steam generator subcomponents:

- Alloy 600 Inspections
- ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD
- Bolting Integrity
- Boric Acid Corrosion
- Primary Water Chemistry
- Secondary Water Chemistry
- Steam Generator Tube Integrity

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 in the license renewal application. For the Reactor Vessel, Internals, and Reactor Coolant System, including the steam generator, those programs are addressed in the following sections.

3.1.2.2.1 Cumulative Fatigue Damage (BWR/PWR)

Fatigue is a TLAA as defined in 10 CFR 54.3. TLAAs are required to be evaluated in accordance with 10 CFR 54.21(c)(1). The evaluation of this TLAA is addressed for the Class 1 pressure vessels (i.e., the reactor vessel, pressurizer, and steam generators) in Section 4.3, Metal Fatigue, except as discussed below.

The reactor vessel does not have a support skirt but is supported at six support pad locations; four on the bottom side of the primary nozzles and two on the vessel support brackets. These components are included as part of the reactor vessel fatigue analysis identified above. Structural supports are evaluated for aging management with NSSS Supports.

The reactor vessel was designed to the requirements of the ASME B&PV Code, Section III - 1968 and there were no requirements for a fatigue analysis of reactor vessel internals in this code edition. Consequently, there is no fatigue analysis for the reactor vessel internals, and therefore, there is no TLAA for this component.

The design code requirements for the pressurizer relief tank did not include a fatigue analysis for this component. Additionally, the tank operates at low pressure and temperature, and there is no concern for low-cycle or thermal fatigue. Therefore, there is no TLAA for the pressurizer relief tank.

3.1.2.2.2 Loss of Material due to General, Pitting and Crevice Corrosion

3.1.2.2.2.1 Loss of Material due to General, Pitting and Crevice Corrosion

This item is applicable to once through steam generators as found in Babcock & Wilcox pressurized water reactors. The installed steam generators are of the recirculating-type design supplied by Westinghouse as described in Section 2.3.1.4. Similar aging for recirculating-type steam generators is identified in Table 3.1.1 Item 3.1.1-16. Therefore, this item is not applicable.

3.1.2.2.2.2 Loss of Material due to General, Pitting and Crevice Corrosion

Applicable to BWR Only

3.1.2.2.2.3 Loss of Material due to General, Pitting and Crevice Corrosion

Applicable to BWR Only

3.1.2.2.2.4 Loss of Material due to General, Pitting and Crevice Corrosion

Loss of material due to general, pitting, and crevice corrosion could occur in the steel steam generator upper and lower shell and transition cone exposed to secondary feedwater and steam. Aging for the steam generator shell and transition cone is managed with a combination of the Secondary Water Chemistry program and the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program for Class 2 components. The Secondary Water Chemistry program provides for monitoring and controlling of water chemistry using site procedures and processes for the prevention or mitigation of the loss of material aging effect. The ASME Section XI Inservice Inspection, Subsections IWB, IWC, or IWD program has been shown to be effective in managing aging effects in Class 1, 2, or 3 components and their integral attachments in light-water cooled power plants.

Prior to the issuance of Information Notice 90-04, "Cracking Of Upper Shell-To-Transition Cone Girth Welds In Steam Generators", flaw indications were detected and reported in the girth weld between the upper shell and transition cone. Based on experience at other plants, uncertainties in the test techniques at that time, and the potential for significant service induced cracking, augmented volumetric inspections to confirm that the indications were not surface connected cracks were required. In 1992, based on a subsequent review of the related industry data, NDE methodology, augmented inspection results, and fracture analyses that showed no significant service growth, the NRC agreed with the conclusion that the indications were embedded slag or voids and approved a request to discontinue the augmented inspections.

In 2001, the original Westinghouse model 51 steam generators were replaced with Westinghouse model 54Fs. This was partly accomplished by replacing the lower portion of the steam generator. A cut was made in the middle of the transition cone. The upper original girth weld was inspected from the inside during that time. Previously identified indications were evaluated and determined that there had been no service growth.

Therefore, the augmented inspection recommended by Table 3.1.1 Item 3.1.1-16 has been completed and no further action is required beyond the inspections required by the ASME Section XI Inservice Inspection, Subsections IWB, IWC, or IWD program.

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

Certain aspects of neutron irradiation embrittlement are TLAAs as defined in 10 CFR 54.3. TLAAs are required to be evaluated in accordance with 10 CFR 54.21(c)(1). The evaluation of this TLAA is addressed in Section 4.2, Reactor Vessel Neutron Embrittlement.

3.1.2.2.3.2 Loss of Fracture Toughness due to Neutron Irradiation Embrittlement (BWR/PWR)

Loss of fracture toughness due to neutron irradiation embrittlement could occur in the reactor vessel beltline, shell, nozzle, and welds. The Reactor Vessel Surveillance program monitors neutron irradiation embrittlement of the reactor vessel. The materials outside of the traditional beltline region which are expected to receive fluence values greater than 10^{17} n/cm^2 were evaluated, and none of these materials were determined to be limiting.

3.1.2.2.4 Cracking due to Stress Corrosion Cracking (SCC) and Intergranular Stress Corrosion Cracking (IGSCC)

Applicable to BWR Only

3.1.2.2.4.1 Cracking due to Stress Corrosion Cracking (SCC) and Intergranular Stress Corrosion Cracking (IGSCC)

Applicable to BWR Only

3.1.2.2.4.2 Cracking due to Stress Corrosion Cracking (SCC) and Intergranular Stress Corrosion Cracking (IGSCC)

Applicable to BWR Only

3.1.2.2.5 Crack Growth due to Cyclic Loading

Reactor vessel underclad cracking is a TLAA as defined in 10 CFR 54.3. TLAAs are required to be evaluated in accordance with 10 CFR 54.21(c)(1). The evaluation of this TLAA is addressed in Section 4.7.4, Reactor Vessel Underclad Cracking.

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 could occur in stainless steel and nickel alloy reactor vessel internals components exposed to reactor coolant and neutron flux. Reactor vessel internals components are currently managed with the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program with inspections performed in accordance with ASME Section XI, Class 1, Examination Categories B-N-1, B-N-2, and B-N-3 for all accessible reactor vessel internals surfaces. An enhancement to the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program is identified in the USAR supplement as a commitment to: (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, submit an inspection plan for reactor internals to the NRC for review and approval to augment the current inspections.

This commitment is identified in Appendix A, Table A6.0-1, Item 1.

3.1.2.2.7 Cracking due to Stress Corrosion Cracking

3.1.2.2.7.1 Cracking due to Stress Corrosion Cracking

Cracking due to SCC could occur in stainless steel PWR reactor vessel flange leak detection lines and the BMI guide tubes. Cracking of the reactor vessel flange leak detection lines is managed by a combination of the Primary Water Chemistry program and the Work Control Process program. Cracking of the BMI guide tubes is managed by a combination of the Primary Water Chemistry program and the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program. The Primary Water Chemistry program provides for monitoring and controlling of water chemistry using site procedures and processes for the prevention or mitigation of the cracking aging effect. The ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program has been shown to be effective in managing aging effects in Class 1, 2, or 3 components and their integral attachments in light-water cooled power plants. The Work Control Process program is used to provide confirmation of the effectiveness of the Primary Water Chemistry program. The Work Control Process program provides the opportunity to visually inspect the internal surfaces of components constructed of typical system materials and exposed to typical system environments, including stagnant locations, during preventive and corrective maintenance activities on an ongoing basis. The Work Control Process program provides input to the Corrective Action Program if aging effects are identified. The Corrective Action Program would evaluate the cause and extent of condition and, if required, recommend enhancements to ensure continued effectiveness of the Primary Water Chemistry program.

3.1.2.2.7.2 Cracking due to Stress Corrosion Cracking

Cracking due to SCC could occur in Class 1 PWR CASS piping, piping components, and piping elements exposed to reactor coolant. Cracking due to SCC of the CASS Reactor Coolant System components is managed by a combination of the Primary Water Chemistry program together with the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program. The Primary Water Chemistry program monitors and controls primary water chemistry, in accordance with the guidelines in EPRI 1002884 (formerly TR-105714), to minimize the potential of SCC. The ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program has been shown to be effective in managing aging effects in Class 1, 2, or 3 components and their integral attachments in light-water cooled power plants.

3.1.2.2.8 Cracking due to Cyclic Loading

Applicable to BWR Only

3.1.2.2.8.1 Cracking due to Cyclic Loading

Applicable to BWR Only

3.1.2.2.8.2 Cracking due to Cyclic Loading

Applicable to BWR Only

3.1.2.2.9 Loss of Preload due to Stress Relaxation

Loss of preload due to stress relaxation could occur in stainless steel and nickel alloy PWR reactor vessel internals screws, bolts, and hold-down springs exposed to reactor coolant. Reactor vessel internals components are currently managed with the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program with inspections performed in accordance with ASME Section XI, Class 1, Examination Categories B-N-1, B-N-2, and B-N-3 for all accessible reactor vessel internals surfaces. An enhancement to the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program is identified related to the reactor vessel internals. This enhancement is a USAR Supplement commitment to: (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, submit an inspection plan for reactor internals to the NRC for review and approval to augment the current inspections.

This commitment is identified in Appendix A, Table A6.0-1, Item 1.

3.1.2.2.10 Loss of Material due to Erosion

The installed steam generators do not have feedwater impingement plates and associated supports. Therefore, this item is not applicable.

3.1.2.2.11 Cracking due to Flow-Induced Vibration

Applicable to BWR Only

3.1.2.2.12 Cracking due to Stress Corrosion Cracking and Irradiation-Assisted Stress Corrosion Cracking (IASCC)

Cracking due to SCC and IASCC could occur in PWR stainless steel reactor internals exposed to reactor coolant. The reactor vessel internals components are currently managed with the Primary Water Chemistry program and the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program with inspections performed in accordance with ASME Section XI, Class 1, Examination Categories B-N-1, B-N-2, and B-N-3 for all accessible reactor vessel internals surfaces. The Primary Water Chemistry program provides for monitoring and controlling of water chemistry using site procedures and processes for the prevention or mitigation of the cracking aging effect. An enhancement to the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program is identified in the USAR supplement as a commitment to: (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, submit an inspection plan for reactor internals to the NRC for review and approval to augment the current inspections.

This commitment is identified in Appendix A, Table A6.0-1, Item 1.

3.1.2.2.13 Cracking due to Primary Water Stress Corrosion Cracking (PWSCC)

Cracking due to PWSCC could occur in PWR components made with nickel alloy and steel with nickel alloy cladding exposed to reactor coolant. Cracking due to SCC (including PWSCC) of nickel alloy and low alloy steel with nickel alloy cladding, including reactor coolant pressure boundary components and penetrations inside the Reactor Coolant System such as nozzle safe ends, core support guides, and bottom head instrument tube penetrations is managed by a combination of the Primary Water Chemistry program, the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program, and the Alloy 600 Inspections program. The Primary Water Chemistry program provides for monitoring and controlling of water chemistry using site procedures and processes for the prevention or mitigation of the cracking aging effect. The ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program has been shown to be effective in managing aging effects in Class 1, 2, or 3 components and their integral attachments in light-water cooled power plants. The Alloy 600 Inspection program implements the recommendations of applicable (1) Bulletins and Generic Letters and (2) staff-accepted industry guidelines and meets the NUREG-1801 expectation to have a plant-specific program for managing nickel alloy materials to comply with the applicable NRC publications and industry guidelines.

3.1.2.2.14 Wall Thinning due to Flow-Accelerated Corrosion

In 2001, the original Westinghouse Model 51 steam generators were replaced with Westinghouse Model 54Fs. This was accomplished by replacing the lower portion of the steam generator and refurbishing the upper steam generator internals. The Model 54F steam generator incorporated a number of design improvements in response to operating experience with recirculating-type steam generators. Included in the upper internals refurbishment was the total redesign and replacement of the feedwater inlet ring and supports. Design improvements included the use of FAC-resistant materials, support system based on a detailed feedwater ring stress analysis, and top discharge through Alloy 690 J tubes.

Information Notice 91-19, “Steam Generator Feedwater Distribution Piping Damage”, describes the root cause as inadequate design of the feedring and feedring support system resulting from inadequate consideration of the potential for erosion and corrosion (FAC) and lack of a detailed stress analysis. These items have been addressed in the redesigned feedwater inlet ring and supports in the installed steam generators.

Based on the design and construction of the feedwater inlet ring and supports, wall thinning due to flow-accelerated corrosion is not expected to occur. Therefore, this item is not applicable.

3.1.2.2.15 Changes in Dimensions due to Void Swelling

Changes in dimensions due to void swelling could occur in stainless steel and nickel alloy PWR reactor internal components exposed to reactor coolant. Reactor vessel internals components are currently managed with the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program with inspections performed in accordance with ASME Section XI, Class 1, Examination Categories B-N-1, B-N-2, and B-N-3 for all accessible reactor vessel internals surfaces. An enhancement to the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program is identified in the USAR supplement, as a commitment to: (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, submit an inspection plan for reactor internals to the NRC for review and approval to augment the current inspections.

This commitment is identified in Appendix A, Table A6.0-1, Item 1.

3.1.2.2.16 Cracking due to Stress Corrosion Cracking and Primary Water Stress Corrosion Cracking

3.1.2.2.16.1 Cracking due to Stress Corrosion Cracking and Primary Water Stress Corrosion Cracking

This item is applicable to the stainless steel CRDM pressure housings. Additionally, since the closure head instrument tubes and spare CRDM penetrations, bottom head instrument tube penetrations, and closure head CRDM penetrations are constructed of stainless steel and nickel-based alloy materials, this discussion also applies to the stainless steel portion of those components. Cracking due to SCC is managed by the Primary Water Chemistry program in combination with the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program. The Primary Water Chemistry program provides for monitoring and controlling of water chemistry using site procedures and processes for the prevention or mitigation of the cracking aging effect. The ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program has been shown to be effective in managing aging effects in Class 1, 2, or 3 components and their integral attachments in light-water cooled power plants.

Nickel-based alloy materials are not addressed in this discussion. The nickel-based alloy portion of the bottom head instrument tube penetrations is addressed in Table 3.1.1 Item 3.1.1-31. Also, the nickel-based alloy portion of the closure head instrument tubes and spare CRDM penetrations and closure head CRDM penetrations is addressed in Table 3.1.1 Item 3.1.1-65.

The steam generator components that are associated with Table 3.1.1 Item 3.1.1-35 are applicable to a once-through steam generator as found in Babcock & Wilcox pressurized water reactors. The installed steam generators are of the recirculating-type design supplied by Westinghouse as described in Section 2.3.1.4. Therefore, this item is not applicable for the steam generators.

3.1.2.2.16.2 Cracking due to Stress Corrosion Cracking and Primary Water Stress Corrosion Cracking

The pressurizer spray head assembly does not perform an intended function in accordance with 10 CFR 54.4(a) and therefore, is not included in the scope of license renewal. Therefore, this item is not applicable.

3.1.2.2.17 Cracking due to Stress Corrosion Cracking, Primary Water Stress Corrosion Cracking, and Irradiation-Assisted Stress Corrosion Cracking

Cracking due to SCC, PWSCC, and IASCC could occur in PWR stainless steel and nickel alloy reactor vessel internals components. The reactor vessel internals stainless steel and nickel alloy components exposed to reactor coolant are currently managed with the Primary Water Chemistry program and the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program with inspections performed in accordance with ASME Section XI, Class 1, Examination Categories B-N-1, B-N-2, and B-N-3 for all accessible reactor vessel internals surfaces. The Primary Water Chemistry program provides for monitoring and controlling of water chemistry using site procedures and processes for the prevention or mitigation of the cracking aging effect. An enhancement to the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program is identified in the USAR supplement, as a commitment to: (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, submit an inspection plan for reactor internals to the NRC for review and approval to augment the current inspections.

This commitment is identified in Appendix A, Table A6.0-1, Item 1.

3.1.2.3 TIME-LIMITED AGING ANALYSIS

The TLAAs identified below are associated with the Reactor Vessel, Internals, and Reactor Coolant System components. The section of the LRA that contains the TLAA review results is indicated in parenthesis.

- Reactor Vessel Neutron Embrittlement (Section 4.2)
- Metal Fatigue (Section 4.3)
- Reactor Coolant Pump Flywheel (Section 4.7.2)
- Leak-before Break (Section 4.7.3)
- Reactor Vessel Underclad Cracking (Section 4.7.4)
- Reactor Coolant Loop Piping Flaw Tolerance Evaluation (Section 4.7.5)

3.1.3 CONCLUSION

The Reactor Vessel, Internals, and Reactor Coolant System components that are subject to aging management review have been identified in accordance with the requirements of 10 CFR 54.4. The aging management programs selected to manage aging effects for the Reactor Vessel, Internals, and Reactor Coolant System components are identified in the summary tables and Section 3.1.2.1.

A description of these aging management programs is provided in Appendix B, along with the demonstration that the identified aging effects will be managed for the period of extended operation.

Therefore, based on the programs provided in Appendix B, the effects of aging associated with the Reactor Vessel, Internals, and Reactor Coolant System components will be adequately managed so that there is reasonable assurance that the intended function(s) will be maintained consistent with the current licensing basis during the period of extended operation.

Results Tables: Reactor Vessel, Internals, and Reactor Coolant System

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	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	The evaluation of this TLAA is addressed in Section 4.3, Metal Fatigue. Further evaluation is documented in Subsection 3.1.2.2.1.
3.1.1-02	BWR Only				
3.1.1-03	BWR Only				
3.1.1-04	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	There is no TLAA for the reactor vessel internals. Further evaluation is documented 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	The evaluation of this TLAA is addressed in Section 4.3, Metal Fatigue. Further evaluation is documented in Subsection 3.1.2.2.1.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	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	The evaluation of this TLAA is addressed in Section 4.3, Metal Fatigue. There is no TLAA for the pressurizer relief tank components. Further evaluation is documented 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	The evaluation of this TLAA is addressed in Section 4.3, Metal Fatigue. Further evaluation is documented in Subsection 3.1.2.2.1.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	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	The evaluation of this TLAA is addressed in Section 4.3, Metal Fatigue. Further evaluation is documented 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	The evaluation of this TLAA is addressed in Section 4.3, Metal Fatigue. Further evaluation is documented in Subsection 3.1.2.2.1.
3.1.1-11	BWR Only				

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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 and One-Time Inspection	Yes, detection of aging effects is to be evaluated	NUREG-1801 item is not applicable. This item is not applicable since it is associated with a once-through steam generator as found in Babcock & Wilcox pressurized water reactors. The installed steam generators are recirculating-type steam generators supplied by Westinghouse. Further evaluation is documented in Subsection 3.1.2.2.2.1.
3.1.1-13	BWR Only				
3.1.1-14	BWR Only				
3.1.1-15	BWR Only				

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	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), and Water Chemistry 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, detection of aging effects is to be evaluated	Consistent with NUREG-1801. Loss of material due to general, pitting and crevice corrosion is managed by the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program, which takes exception to the NUREG-1801 AMP, and the Secondary Water Chemistry program. Additional inspections were developed and performed for the steam generator shell. Further evaluation is documented in Subsection 3.1.2.2.2.4.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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 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	Further evaluation is documented in Subsection 3.1.2.2.3.1.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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	Yes, plant specific	Consistent with NUREG-1801. Loss of fracture toughness due to neutron irradiation embrittlement is managed by the Reactor Vessel Surveillance program, except for the safety injection nozzle which is not exposed to greater than 10^{17} n/cm^2 during the period of extended operation. The Reactor Vessel Surveillance program takes exception to the NUREG-1801 AMP. Further evaluation is documented in Subsection 3.1.2.2.3.2.
3.1.1-19	BWR Only				
3.1.1-20	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	Further evaluation is documented in Subsection 3.1.2.2.5

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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 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.	No, but licensee commitment to be confirmed	Consistent with NUREG-1801. An enhancement to the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program related to the reactor vessel internals is identified in the USAR Supplement commitment provided in Appendix A, Table A6.0-1, Item 1. Further evaluation is documented in Subsection 3.1.2.2.6.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	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, plant specific	Consistent with NUREG-1801 Cracking for the stainless steel reactor vessel closure head flange leak detection line is managed by the Work Control Process program, which is a plant specific program, and the Primary Water Chemistry program. Cracking for the stainless steel bottom-mounted instrument guide tubes is managed by the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program, which takes exception to the NUREG-1801 AMP, and the Primary Water Chemistry program. Further evaluation is documented in Subsection 3.1.2.2.7.1.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	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 and, for CASS components that do not meet the NUREG-0313 guidelines, a plant specific aging management program	Yes, plant specific	Consistent with NUREG-1801. Cracking due to SCC of CASS RCS piping, piping components, and piping elements is managed by the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program, which takes exception to the NUREG-1801 AMP, and the Primary Water Chemistry program. Further evaluation is documented in Subsection 3.1.2.2.7.2.
3.1.1-25	BWR Only				
3.1.1-26	BWR Only				

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	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.	No, but licensee commitment to be confirmed	An enhancement to the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program related to the reactor vessel internals is identified in the USAR Supplement commitment provided in Appendix A, Table A6.0-1, Item 1. Further evaluation is documented 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, plant specific	NUREG-1801 item is not applicable. The steam generators do not have feedwater impingement plates and associated supports. Further evaluation is documented in Subsection 3.1.2.2.10.
3.1.1-29	BWR Only				

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	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 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.	No, but licensee commitment needs to be confirmed	Consistent with NUREG-1801. Cracking due to SCC and IASCC for the stainless steel reactor vessel internal components is managed by the Primary Water Chemistry program. Additionally, an enhancement to the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program related to the reactor vessel internals is identified in the USAR Supplement commitment provided in Appendix A, Table A6.0-1, Item 1. Further evaluation is documented in Subsection 3.1.2.2.12.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	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) and Water Chemistry and FSAR supp commitment to implement applicable plant commitments to (1) NRC Orders, Bulletins, and Generic Letters associated with nickel alloys and (2) staff-accepted industry guidelines.	No, but licensee commitment needs to be confirmed	Consistent with NUREG-1801. Cracking due to PWSCC for nickel alloy components is managed by the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program, which takes exception to the NUREG-1801 AMP, the Alloy 600 Inspections program, which is a plant-specific program, and the Primary Water Chemistry program. The Alloy 600 Inspections program is a plant-specific program that encompasses the recommendations of NUREG-1801, Section XI.M11A, Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactors (PWRs Only). Further evaluation is documented in Subsection 3.1.2.2.13

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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, plant specific	NUREG-1801 item is not applicable. Further evaluation is documented in Subsection 3.1.2.2.14.
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.	No, but licensee commitment to be confirmed	Consistent with NUREG-1801. An enhancement to the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program related to the reactor vessel internals is identified in the USAR Supplement commitment provided in Appendix A, Table A6.0-1, Item 1. Further evaluation is documented in Subsection 3.1.2.2.15.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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) and Water Chemistry and for nickel alloy, FSAR supplement commitment to implement applicable plant commitments to (1) NRC Orders, Bulletins and Generic Letters associated with nickel alloys and (2) staff-accepted industry guidelines.	No, but licensee commitment needs to be confirmed	Consistent with NUREG-1801. Cracking due to SCC for the stainless steel CRDM pressure housings and the stainless steel portion of the closure head instrument tubes and spare CRDM penetrations, bottom head instrument tube penetrations, and closure head CRDM penetrations is managed by the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program, which takes exception to the NUREG-1801 AMP, and the Primary Water Chemistry program. Nickel-based alloy materials are not addressed in this discussion. Further evaluation is documented in Subsection 3.1.2.2.16.1.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	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) and Water Chemistry and for nickel alloy, FSAR supplement commitment to implement applicable plant commitments to (1) NRC Orders, Bulletins and Generic Letters associated with nickel alloys and (2) staff-accepted industry guidelines.	No, but licensee commitment needs to be confirmed	NUREG-1801 item is not applicable. This item is not applicable since it is associated with a once-through steam generator as found in Babcock & Wilcox pressurized water reactors. The installed steam generators are recirculating-type steam generators supplied by Westinghouse. Further evaluation is documented in Subsection 3.1.2.2.16.1.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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 and One-Time Inspection and, for nickel alloy welded spray heads, provide commitment in FSAR supplement to submit AMP delineating commitments to Orders, Bulletins, or Generic Letters that inspect stipulated components for cracking of wetted surfaces.	No, unless licensee commitment needs to be confirmed	NUREG-1801 item is not applicable. The pressurizer spray head assembly does not perform an intended function in accordance with 10 CFR 54.4(a) and therefore, is not included in the scope of license renewal. Further evaluation is documented in Subsection 3.1.2.2.16.2.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	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 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.	No, but licensee commitment needs to be confirmed	Consistent with NUREG-1801. Cracking due to SCC, PWSCC, and IASCC, for the stainless steel and nickel alloy reactor vessel internals components is managed by the Primary Water Chemistry program. Additionally, an enhancement to the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program related to the reactor vessel internals is identified in the USAR Supplement commitment provided in Appendix A, Table A6.0-1, Item 1. Further evaluation is documented in Subsection 3.1.2.2.17.
3.1.1-38	BWR Only				
3.1.1-39	BWR Only				
3.1.1-40	BWR Only				

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-41	BWR Only				
3.1.1-42	BWR Only				
3.1.1-43	BWR Only				
3.1.1-44	BWR Only				
3.1.1-45	BWR Only				
3.1.1-46	BWR Only				
3.1.1-47	BWR Only				
3.1.1-48	BWR Only				
3.1.1-49	BWR Only				
3.1.1-50	BWR Only				
3.1.1-51	BWR Only				

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	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	No	Consistent with NUREG-1801. Cracking due to SCC and loss of preload due to thermal effects, gasket creep, and self-loosening for steel and stainless steel reactor coolant pressure boundary and steam generator manway bolting is managed by the Bolting Integrity program.
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	No	Consistent with NUREG-1801. Loss of material due to general, pitting and crevice corrosion for steel components exposed to closed cycle cooling water is managed by the Closed-Cycle Cooling Water System program, which takes exception to the NUREG-1801 AMP, and the Work Control Process program, which is a plant-specific program.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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	No	Consistent with NUREG-1801. Loss of material due to general, pitting and crevice corrosion for copper alloy components exposed to closed cycle cooling water is managed by the Closed-Cycle Cooling Water System program, which takes exception to the NUREG-1801 AMP, and the Work Control Process program, which is a plant-specific program.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	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). 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. Loss of fracture toughness due to thermal aging embrittlement for cast austenitic stainless steel Class 1 pump casings, and valves exposed to reactor coolant >250°C is managed by the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program, which takes exception to the NUREG-1801 AMP.
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	No	NUREG-1801 item is not applicable. There are no Reactor Coolant System copper alloy >15% Zn piping, piping components, and piping elements exposed to closed cycle cooling water.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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	The stainless steel Class 1 Reactor Coolant System loop piping has been evaluated for the effects of aging and found to be not susceptible to thermal aging embrittlement as discussed in Section 4.7.5, Reactor Coolant Loop Piping Flaw Tolerance Evaluation. This item is not applicable for the control rod drive pressure housings since they are fabricated from stainless steel forgings and not castings.
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	No	Consistent with NUREG-1801. Loss of material due to boric acid corrosion for the external steel surfaces of the reactor coolant pressure boundary components exposed to air with borated water leakage is managed by the Boric Acid Corrosion program.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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	No	NUREG-1801 item is not applicable. In 2001, the original Westinghouse Model 51 steam generators were replaced with Westinghouse Model 54F. This was accomplished by replacing the lower portion of the steam generator and refurbishing the upper steam generator internals. Included in the upper internals refurbishment was the installation of a FAC-resistant nickel-alloy welded thermal sleeve in the feedwater nozzle that isolates the carbon steel nozzle from the fluid flow. Additionally, a steam flow limiting device was installed in the existing steam nozzle. The steam flow limiting device isolates the steam flow from the carbon steel steam nozzle. The surfaces of the steam flow limiting device that are exposed to steam flow are constructed of a FAC-resistant nickel-alloy material.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-60	Stainless steel flux thimble tubes (with or without chrome plating)	Loss of material due to Wear	Flux Thimble Tube Inspection	No	Consistent with NUREG-1801. Loss of material due to wear for the stainless steel flux thimble tubes is managed by the Flux Thimble Tube Inspection program.
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)	No	Consistent with NUREG-1801. Cracking due to cyclic loading for the steel pressurizer integral support is managed by the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program, which takes exception to the NUREG-1801 AMP.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	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)	No	Consistent with NUREG-1801. Cracking due to cyclic loading for the stainless steel Reactor Coolant System piping exposed to reactor coolant is managed by the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program, which takes exception to the NUREG-1801 AMP.
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)	No	Consistent with NUREG-1801. Loss of material due to wear for the steel reactor vessel flange, stainless steel radial support keys and upper core plate alignment pins, and nickel-alloy clevis inserts is managed by the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program, which takes exception to the NUREG-1801 AMP.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	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) and Water Chemistry	No	Consistent with NUREG-1801. Cracking due to SCC for the pressurizer shell is managed by the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program, which takes exception to the NUREG-1801 AMP, and the Primary Water Chemistry program.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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) and Water Chemistry and Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactors	No	Consistent with NUREG-1801. Cracking due to PWSCC for the nickel alloy reactor vessel closure head penetrations is managed by the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program, which takes exception to the NUREG-1801 AMP, the Alloy 600 Inspections program, which is a plant-specific program, and the Primary Water Chemistry program. The Alloy 600 Inspections program is a plant-specific program that encompasses the recommendations of NUREG-1801, Section XI.M11A, Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactors (PWRs Only).

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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	No	NUREG-1801 item is not applicable. This item is not applicable since it is associated with a once-through steam generator as found in Babcock & Wilcox pressurized water reactors. The installed steam generators are recirculating-type steam generators supplied by Westinghouse.
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), and Water Chemistry	No	Consistent with NUREG-1801. Cracking due to cyclic loading of the pressurizer shell is managed by the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program, which takes exception to the NUREG-1801 AMP, and the Primary Water Chemistry program.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	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), and Water Chemistry	No	Consistent with NUREG-1801. Cracking due to SCC for stainless steel Reactor Coolant System components is managed by the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program, which takes exception to the NUREG-1801 AMP, and the Primary Water Chemistry program. For the RxCP thermal barriers heat exchanger, pressurizer manway insert, and Reactor coolant system thermal sleeves, cracking due to SCC for stainless steel is managed by the Primary Water Chemistry program.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	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), and Water Chemistry	No	Consistent with NUREG-1801. Cracking due to SCC and PWSCC for stainless steel safe ends and nickel buttering is managed by the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program, which takes exception to the NUREG-1801 AMP and the Primary Water Chemistry program. The nickel-alloy buttering is also managed by the Alloy 600 Inspections program.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	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), Water chemistry, and One-Time Inspection of ASME Code Class 1 Small-bore Piping	No	Consistent with NUREG-1801. Cracking due to SCC and thermal and mechanical loading for Class 1 piping, fittings and branch connections < NPS 4 is managed by the Primary Water Chemistry program and the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program, which takes exception to the NUREG-1801 AMP. The ASME Class 1 Small-bore piping inspections are performed by the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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	No	Consistent with NUREG-1801. Cracking due to SCC and loss of material due to wear for the closure head stud assembly is managed by the Reactor Head Closure Studs program, which takes exception to the NUREG-1801 AMP.
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 and Water Chemistry	No	Consistent with NUREG-1801. Cracking due to OD SCC and intergranular attack and loss of material due to fretting and wear for the nickel alloy steam generator tubes is managed by the Steam Generator Tube Integrity program, which takes exception to the NUREG-1801 AMP, and the Secondary Water Chemistry program.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	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 and Water Chemistry	No	Consistent with NUREG-1801. Cracking due to PWSCC for the nickel alloy steam generator tubes exposed to reactor coolant is managed by the Steam Generator Tube Integrity program, which takes exception to the NUREG-1801 AMP, and the Primary Water Chemistry program.
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 and Water Chemistry	No	Consistent with NUREG-1801. Cracking due to SCC and loss of material due to crevice corrosion and fretting for the stainless steel anti-vibration bars and other secondary-side steam generator components is managed by the Steam Generator Tube Integrity program, which takes exception to the NUREG-1801 AMP, and/or the Secondary Water Chemistry program.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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 and Water Chemistry	No	NUREG-1801 item is not applicable. This item is not applicable since it is associated with a once-through steam generator as found in Babcock & Wilcox pressurized water reactors. The installed steam generators are recirculating-type steam generators supplied by Westinghouse.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	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 and Water Chemistry	No	Consistent with NUREG-1801. Loss of material due to erosion, general, pitting, and crevice corrosion for the steel tube bundle wrapper is managed by the by the Steam Generator Tube Integrity program, which takes exception to the NUREG-1801 AMP, and the Secondary Water Chemistry program. Ligament cracking due to corrosion for the tube support plates is not applicable since the tube support plates are made of stainless steel.
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 and Water Chemistry	No	NUREG-1801 item is not applicable. Phosphate chemistry is 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 and Water Chemistry	No	NUREG-1801 item is not applicable. The steam generators do not contain tube support lattice bars.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	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; Water Chemistry 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	NUREG-1801 item is not applicable. The steam generator tube support plates are made of stainless steel.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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	Consistent with NUREG-1801. As identified in the USAR supplement, a commitment is provided in Appendix A, Table A6.0-1, Item 2, to enhance the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program to include the recommendations of NUREG-1801, Chapter XI.M13, "Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS)" following participation in the industry programs for investigating and managing aging effects on reactor internals.
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	No	Consistent with NUREG-1801. Cracking due to PWSCC for the nickel alloy divider plate is managed by the Primary Water Chemistry program.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-82	Stainless steel steam generator primary side divider plate exposed to reactor coolant	Cracking due to stress corrosion cracking	Water Chemistry	No	The steam generator divider plate is fabricated from nickel-alloy and is evaluated in Table 3.1.1 Item 3.1.1-81. However, cracking due to SCC for the steam generator manway cover diaphragm, which is adjacent to the divider plate inside the channel head, is managed by the Primary Water Chemistry program.
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	No	Consistent with NUREG-1801. Loss of material due to pitting and crevice corrosion for the reactor vessel internals and reactor coolant pressure boundary stainless steel and nickel-alloy components, exposed to reactor coolant is managed by the Primary Water Chemistry program.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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 and One-Time Inspection or Inservice Inspection (IWB, IWC, and IWD).	No	NUREG-1801 item is not applicable. This item is not applicable since it is associated with a once-through steam generator as found in Babcock & Wilcox pressurized water reactors. The installed steam generators are recirculating-type steam generators supplied by Westinghouse.
3.1.1-85	Nickel alloy piping, piping components, and piping elements exposed to air – indoor uncontrolled (external)	None	None	NA - No AEM or AMP	Consistent with NUREG-1801. There are no aging effects associated with nickel alloy piping, piping components, and piping elements exposed to air-indoor uncontrolled.

Table 3.1.1 Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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 - No AEM or AMP	Consistent with NUREG-1801. There are no aging effects associated with stainless steel, piping, piping components, and piping elements exposed to air-indoor uncontrolled, air with borated water leakage, concrete, or gas.
3.1.1-87	Steel piping, piping components, and piping elements in concrete	None	None	NA - No AEM or AMP	NUREG-1801 item is not applicable. There are no Reactor Vessel, Internals, and Reactor Coolant System components within the scope of license renewal in concrete.

Results Tables: Reactor Vessel, Internals, and Reactor Coolant System AMR Results

Table 3.1.2-1: Reactor Vessel, Internals, and Reactor Coolant System - Reactor Vessel - Aging Management Evaluation

Subcomponent	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
BMI Guide Tubes and Seal Table	PB; SS	Stainless Steel	(E) Air-indoor uncontrolled	None	None	IV.E-02	3.1.1-86	A
			(E) Borated water leakage	None	None	IV.E-03	3.1.1-86	A
			(I) Treated water-primary	Cracking/stress corrosion cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.A2-01	3.1.1-23	E
					Primary Water Chemistry	IV.A2-01	3.1.1-23	E
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	IV.A2-14	3.1.1-83	A
Bottom Head (and cladding)	PB; SS	Stainless Steel	(I) Treated water-primary	Cracking/stress corrosion cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	R-007	3.1.1-68	D
					Primary Water Chemistry	R-007	3.1.1-68	C
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	IV.A2-14	3.1.1-83	A
		Steel	(E) Air-indoor uncontrolled	None	None			H, 4
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	IV.A2-13	3.1.1-58	A
			(I) Treated water-primary	Cumulative fatigue damage/fatigue	TLAA	IV.A2-21	3.1.1-09	A, 5

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.1.2-1: Reactor Vessel, Internals, and Reactor Coolant System - Reactor Vessel - Aging Management Evaluation

Subcomponent	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Bottom Head Instrument Tube Penetrations	PB; SS	Nickel Alloys	(E) Air-indoor uncontrolled	None	None	IV.E-01	3.1.1-85	A, 3
			(E) Borated water leakage	None	None			H, 3
			(I) Treated water-primary	Cracking/primary water stress corrosion cracking	Alloy 600 Inspections	IV.A2-19	3.1.1-31	E, 3
					ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.A2-19	3.1.1-31	B, 3
					Primary Water Chemistry	IV.A2-19	3.1.1-31	A, 3
				Cumulative fatigue damage/fatigue	TLAA	IV.A2-21	3.1.1-09	A, 3
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	IV.A2-14	3.1.1-83	A, 3

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.1.2-1: Reactor Vessel, Internals, and Reactor Coolant System - Reactor Vessel - Aging Management Evaluation

Subcomponent	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Bottom Head Instrument Tube Penetrations	PB; SS	Stainless Steel	(E) Air-indoor uncontrolled	None	None	IV.E-02	3.1.1-86	A, 3
			(E) Borated water leakage	None	None	IV.E-03	3.1.1-86	A, 3
			(I) Treated water-primary	Cracking/stress corrosion cracking, primary water stress corrosion cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.A2-11	3.1.1-34	D, 1, 3
					Primary Water Chemistry	IV.A2-11	3.1.1-34	C, 1, 3
				Cumulative fatigue damage/fatigue	TLAA	IV.A2-21	3.1.1-09	A, 3
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	IV.A2-14	3.1.1-83	A, 3

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.1.2-1: Reactor Vessel, Internals, and Reactor Coolant System - Reactor Vessel - Aging Management Evaluation

Subcomponent	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Closure Head (and cladding)	PB; SS	Stainless Steel	(I) Treated water-primary	Cracking/stress corrosion cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	R-007	3.1.1-68	D
					Primary Water Chemistry	R-007	3.1.1-68	C
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	IV.A2-14	3.1.1-83	A
		Steel	(E) Air-indoor uncontrolled	None	None			H, 4
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	IV.A2-13	3.1.1-58	A
			(I) Treated water-primary	Cumulative fatigue damage/fatigue	TLAA	IV.A2-21	3.1.1-09	A, 5

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.1.2-1: Reactor Vessel, Internals, and Reactor Coolant System - Reactor Vessel - Aging Management Evaluation

Subcomponent	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Closure Head CRDM Head Penetrations	PB; SS	Nickel Alloys	(E) Air-indoor uncontrolled	None	None	IV.E-01	3.1.1-85	A, 3
			(E) Borated water leakage	None	None			H, 3
			(I) Treated water-primary	Cracking/primary water stress corrosion cracking	Alloy 600 Inspections	IV.A2-09	3.1.1-65	E, 3
					ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.A2-09	3.1.1-65	B, 3
					Primary Water Chemistry	IV.A2-09	3.1.1-65	A, 3
				Cumulative fatigue damage/fatigue	TLAA	IV.A2-21	3.1.1-09	A, 3
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	IV.A2-14	3.1.1-83	A, 3

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.1.2-1: Reactor Vessel, Internals, and Reactor Coolant System - Reactor Vessel - Aging Management Evaluation

Subcomponent	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Closure Head CRDM Head Penetrations	PB; SS	Stainless Steel	(E) Air-indoor uncontrolled	None	None	IV.E-02	3.1.1-86	A, 3
			(E) Borated water leakage	None	None	IV.E-03	3.1.1-86	A, 3
			(I) Treated water-primary	Cracking/stress corrosion cracking, primary water stress corrosion cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.A2-11	3.1.1-34	D, 1, 3
					Primary Water Chemistry	IV.A2-11	3.1.1-34	C, 1, 3
				Cumulative fatigue damage/fatigue	TLAA	IV.A2-21	3.1.1-09	A, 3
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	IV.A2-14	3.1.1-83	A, 3

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.1.2-1: Reactor Vessel, Internals, and Reactor Coolant System - Reactor Vessel - Aging Management Evaluation

Subcomponent	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Closure Head Instrument Tube and Spare CRDM Penetrations	PB; SS	Nickel Alloys	(E) Air-indoor uncontrolled	None	None	IV.E-01	3.1.1-85	A, 3
			(E) Borated water leakage	None	None			H, 3
			(I) Treated water-primary	Cracking/primary water stress corrosion cracking	Alloy 600 Inspections	IV.A2-18	3.1.1-65	E, 3
					ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.A2-18	3.1.1-65	B, 3
					Primary Water Chemistry	IV.A2-18	3.1.1-65	A, 3
				Cumulative fatigue damage/fatigue	TLAA	IV.A2-21	3.1.1-09	A, 3
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	IV.A2-14	3.1.1-83	A, 3

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.1.2-1: Reactor Vessel, Internals, and Reactor Coolant System - Reactor Vessel - Aging Management Evaluation

Subcomponent	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Closure Head Instrument Tube and Spare CRDM Penetrations	PB; SS	Stainless Steel	(E) Air-indoor uncontrolled	None	None	IV.E-02	3.1.1-86	A, 3
			(E) Borated water leakage	None	None	IV.E-03	3.1.1-86	A, 3
			(I) Treated water-primary	Cracking/stress corrosion cracking, primary water stress corrosion cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.A2-11	3.1.1-34	D, 1, 3
					Primary Water Chemistry	IV.A2-11	3.1.1-34	C, 1, 3
				Cumulative fatigue damage/fatigue	TLAA	IV.A2-21	3.1.1-09	A, 3
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	IV.A2-14	3.1.1-83	A, 3
Closure Head Lifting Lugs and Ventilation Shroud Support Structure	SS	Steel	(E) Air-indoor uncontrolled	None	None			H, 4
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	IV.A2-13	3.1.1-58	A
Closure Head Stud Assembly Including Nuts and Washers	PB	Steel	(E) Air-indoor uncontrolled	Cracking/stress corrosion cracking	Reactor Head Closure Studs	IV.A2-02	3.1.1-71	B
				Cumulative fatigue damage/fatigue	TLAA	IV.A2-04	3.1.1-07	A
				Loss of material/wear	Reactor Head Closure Studs	IV.A2-03	3.1.1-71	B, 4
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	IV.A2-13	3.1.1-58	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.1.2-1: Reactor Vessel, Internals, and Reactor Coolant System - Reactor Vessel - Aging Management Evaluation

Subcomponent	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Closure Head Vent and RVLIS Head Penetrations	PB; SS	Nickel Alloys	(E) Air-indoor uncontrolled	None	None	IV.E-01	3.1.1-85	A
			(E) Borated water leakage	None	None			H
			(I) Treated water-primary	Cracking/primary water stress corrosion cracking	Alloy 600 Inspections	IV.A2-18	3.1.1-65	E
					ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.A2-18	3.1.1-65	B
					Primary Water Chemistry	IV.A2-18	3.1.1-65	A
				Cumulative fatigue damage/fatigue	TLAA	IV.A2-21	3.1.1-09	A
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	IV.A2-14	3.1.1-83	A
Core Support Guides	SS	Nickel Alloys	(E) Treated water-primary	Cracking/primary water stress corrosion cracking	Alloy 600 Inspections	IV.A2-12	3.1.1-31	E
					ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.A2-12	3.1.1-31	B
					Primary Water Chemistry	IV.A2-12	3.1.1-31	A
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	IV.A2-14	3.1.1-83	C

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.1.2-1: Reactor Vessel, Internals, and Reactor Coolant System - Reactor Vessel - Aging Management Evaluation

Subcomponent	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
CRDM Pressure Housings	PB; SS	Stainless Steel	(E) Air-indoor uncontrolled	None	None	IV.E-02	3.1.1-86	A
			(E) Borated water leakage	None	None	IV.E-03	3.1.1-86	A
			(I) Treated water-primary	Cracking/stress corrosion cracking, primary water stress corrosion cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.A2-11	3.1.1-34	B, 1
					Primary Water Chemistry	IV.A2-11	3.1.1-34	A, 1
				Cumulative fatigue damage/fatigue	TLAA	IV.A2-21	3.1.1-09	A
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	IV.A2-14	3.1.1-83	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.1.2-1: Reactor Vessel, Internals, and Reactor Coolant System - Reactor Vessel - Aging Management Evaluation

Subcomponent	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Primary Nozzles (and cladding)	PB; SS	Stainless Steel	(I) Treated water-primary	Cracking/stress corrosion cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	R-007	3.1.1-68	B
					Primary Water Chemistry	R-007	3.1.1-68	A
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	IV.A2-14	3.1.1-83	A
		Steel	(E) Air-indoor uncontrolled	Cumulative fatigue damage/fatigue	TLAA	IV.A2-20	3.1.1-01	C
				Loss of fracture toughness/neutron irradiation embrittlement	Reactor Vessel Surveillance	IV.A2-17	3.1.1-18	B
					TLAA	IV.A2-16	3.1.1-17	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	IV.A2-13	3.1.1-58	A
			(I) Treated water-primary	Cumulative fatigue damage/fatigue	TLAA	IV.A2-21	3.1.1-09	A, 5

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.1.2-1: Reactor Vessel, Internals, and Reactor Coolant System - Reactor Vessel - Aging Management Evaluation

Subcomponent	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Primary Nozzles Safe End	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	IV.E-02	3.1.1-86	A
			(E) Borated water leakage	None	None	IV.E-03	3.1.1-86	A
			(I) Treated water-primary	Cracking/stress corrosion cracking, primary water stress corrosion cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.A2-15	3.1.1-69	B, 1
					Primary Water Chemistry	IV.A2-15	3.1.1-69	A, 1
				Cumulative fatigue damage/fatigue	TLAA	IV.A2-21	3.1.1-09	A
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	IV.A2-14	3.1.1-83	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.1.2-1: Reactor Vessel, Internals, and Reactor Coolant System - Reactor Vessel - Aging Management Evaluation

Subcomponent	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Safety Injection Nozzle (cladding and buttering)	PB	Nickel Alloys	(E) Air-indoor uncontrolled	None	None	IV.E-01	3.1.1-85	A
			(E) Borated water leakage	None	None			H
			(I) Treated water-primary	Cracking/stress corrosion cracking, primary water stress corrosion cracking	Alloy 600 Inspections	IV.A2-15	3.1.1-69	E, 2
					ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.A2-15	3.1.1-69	B, 2
					Primary Water Chemistry	IV.A2-15	3.1.1-69	A, 2
				Cumulative fatigue damage/fatigue	TLAA	IV.A2-21	3.1.1-09	A
		Stainless Steel	(I) Treated water-primary	Cracking/stress corrosion cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	R-007	3.1.1-68	B
					Primary Water Chemistry	R-007	3.1.1-68	A
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	IV.A2-14	3.1.1-83	A
		Steel	(E) Air-indoor uncontrolled	None	None			H, 4
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	IV.A2-13	3.1.1-58	A
			(I) Treated water-primary	Cumulative fatigue damage/fatigue	TLAA	IV.A2-21	3.1.1-09	A, 5

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.1.2-1: Reactor Vessel, Internals, and Reactor Coolant System - Reactor Vessel - Aging Management Evaluation

Subcomponent	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Upper, Intermediate and Lower Shell (and cladding)	PB	Stainless Steel	(I) Treated water-primary	Cracking/stress corrosion cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	R-007	3.1.1-68	D
					Primary Water Chemistry	R-007	3.1.1-68	C
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	IV.A2-14	3.1.1-83	A
		Steel	(E) Air-indoor uncontrolled	Loss of fracture toughness/neutron irradiation embrittlement	Reactor Vessel Surveillance	IV.A2-24	3.1.1-18	B
					TLAA	IV.A2-23	3.1.1-17	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	IV.A2-13	3.1.1-58	A
			(I) Treated water-primary	Crack growth/cyclic loading	TLAA	IV.A2-22	3.1.1-21	A, 5
				Cumulative fatigue damage/fatigue	TLAA	IV.A2-21	3.1.1-09	A, 5

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.1.2-1: Reactor Vessel, Internals, and Reactor Coolant System - Reactor Vessel - Aging Management Evaluation

Subcomponent	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Vessel Flange (and cladding)	PB; SS	Stainless Steel	(I) Treated water-primary	Cracking/stress corrosion cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	R-007	3.1.1-68	D
					Primary Water Chemistry	R-007	3.1.1-68	C
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	IV.A2-14	3.1.1-83	A
		Steel	(E) Air-indoor uncontrolled	Loss of material/wear	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.A2-25	3.1.1-63	B, 4
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	IV.A2-13	3.1.1-58	A
			(I) Treated water-primary	Cumulative fatigue damage/fatigue	TLAA	IV.A2-21	3.1.1-09	A, 5

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.1.2-1: Reactor Vessel, Internals, and Reactor Coolant System - Reactor Vessel - Aging Management Evaluation

Subcomponent	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Vessel Flange Leakage Monitor Lines	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	IV.E-02	3.1.1-86	A
			(E) Borated water leakage	None	None	IV.E-03	3.1.1-86	A
			(I) Treated water-primary	Cracking/stress corrosion cracking	Primary Water Chemistry	IV.A2-05	3.1.1-23	E
					Work Control Process	IV.A2-05	3.1.1-23	E
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	RP-023	3.1.1-83	A
Vessel Support Brackets	SS	Steel	(E) Air-indoor uncontrolled	Cumulative fatigue damage/fatigue	TLAA	IV.A2-20	3.1.1-01	C
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	IV.A2-13	3.1.1-58	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.1.2-1 Notes:

Plant Standard Notes

Note - The following plant standard notes have generic applicability, but may or may not be used for each SSC:

S1. Thermal embrittlement is only applicable to CASS components that are subject to temperatures in excess of 482°F.

S2. Cracking due to SCC is only applicable to stainless steel components exposed to temperatures greater than 140°F.

S3. Selective leaching is applicable to the material group 'Steel,' but only for gray cast iron components.

System Specific Notes

1. The referenced aging item is applicable for both stainless steel and nickel-based alloy materials. Since the identified material for this component is stainless steel, the applicable aging mechanism for this item is SCC and not PWSCC.

2. The referenced aging item is applicable for both stainless steel and nickel-based alloy materials. Since the identified material for this component is nickel-based alloy, the applicable aging mechanism for this item is PWSCC and not SCC.

3. The described subcomponent(s) is/are comprised of two materials; (a) nickel-based alloy, which penetrates the reactor vessel, and (b) stainless steel.

4. General corrosion is not an applicable aging mechanism for steel in an air-indoor uncontrolled environment when the normal operating temperature is greater than 212 degrees-F since condensation is not expected to occur.

5. The steel material for this component is clad with stainless steel and is not exposed directly to the treated water-primary environment.

Industry Standard Notes

See last page of Section 3.1 tables.

Table 3.1.2-2: Reactor Vessel, Internals, and Reactor Coolant System - Reactor Vessel Internals - Aging Management Evaluation

Subcomponent	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Baffle/former bolts	SS	Stainless Steel	(E) Treated water-primary	Changes in dimensions/void swelling	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-04	3.1.1-33	E
				Cracking/stress corrosion cracking, irradiation-assisted stress corrosion cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-10	3.1.1-30	E
					Primary Water Chemistry	IV.B2-10	3.1.1-30	A
				Loss of fracture toughness/neutron irradiation embrittlement, void swelling	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-06	3.1.1-22	E
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	IV.B2-32	3.1.1-83	A
				Loss of preload/stress relaxation	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-05	3.1.1-27	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.1.2-2: Reactor Vessel, Internals, and Reactor Coolant System - Reactor Vessel Internals - Aging Management Evaluation

Subcomponent	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Baffle/former plates	FD; SS	Stainless Steel	(E) Treated water-primary	Changes in dimensions/void swelling	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-01	3.1.1-33	E
				Cracking/stress corrosion cracking, irradiation-assisted stress corrosion cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-02	3.1.1-30	E
					Primary Water Chemistry	IV.B2-02	3.1.1-30	A
				Loss of fracture toughness/neutron irradiation embrittlement, void swelling	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-03	3.1.1-22	E
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	IV.B2-32	3.1.1-83	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.1.2-2: Reactor Vessel, Internals, and Reactor Coolant System - Reactor Vessel Internals - Aging Management Evaluation

Subcomponent	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
BMI Columns	SS	Stainless Steel	(E) Treated water-primary	Changes in dimensions/void swelling	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-11	3.1.1-33	E
				Cracking/stress corrosion cracking, irradiation-assisted stress corrosion cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-12	3.1.1-30	E
					Primary Water Chemistry	IV.B2-12	3.1.1-30	A
				Loss of fracture toughness/thermal aging and neutron irradiation embrittlement	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-21	3.1.1-80	E, 1
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	IV.B2-32	3.1.1-83	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.1.2-2: Reactor Vessel, Internals, and Reactor Coolant System - Reactor Vessel Internals - Aging Management Evaluation

Subcomponent	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Clevis insert bolts	SS	Nickel Alloys	(E) Treated water-primary	Changes in dimensions/void swelling	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-15	3.1.1-33	E
				Cracking/stress corrosion cracking, primary water stress corrosion cracking, irradiation-assisted stress corrosion cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-16	3.1.1-37	E, 6
					Primary Water Chemistry	IV.B2-16	3.1.1-37	A, 6
				Loss of fracture toughness/neutron irradiation embrittlement, void swelling	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-17	3.1.1-22	E
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	IV.B2-32	3.1.1-83	A
				Loss of preload/stress relaxation	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-14	3.1.1-27	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.1.2-2: Reactor Vessel, Internals, and Reactor Coolant System - Reactor Vessel Internals - Aging Management Evaluation

Subcomponent	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Clevis inserts	SS	Nickel Alloys	(E) Treated water-primary	Changes in dimensions/void swelling	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-19	3.1.1-33	E, 3
				Cracking/stress corrosion cracking, primary water stress corrosion cracking, irradiation-assisted stress corrosion cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-20	3.1.1-37	E, 3, 6
					Primary Water Chemistry	IV.B2-20	3.1.1-37	A, 3, 6
				Loss of fracture toughness/neutron irradiation embrittlement, void swelling	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-17	3.1.1-22	E, 3
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	IV.B2-32	3.1.1-83	A, 3
				Loss of material/wear	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-34	3.1.1-63	C, 3

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.1.2-2: Reactor Vessel, Internals, and Reactor Coolant System - Reactor Vessel Internals - Aging Management Evaluation

Subcomponent	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Core barrel	FD; SS	Stainless Steel	(E) Treated water-primary	Changes in dimensions/void swelling	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-07	3.1.1-33	E
				Cracking/stress corrosion cracking, irradiation-assisted stress corrosion cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-08	3.1.1-30	E
					Primary Water Chemistry	IV.B2-08	3.1.1-30	A
				Loss of fracture toughness/neutron irradiation embrittlement, void swelling	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-09	3.1.1-22	E
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	IV.B2-32	3.1.1-83	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.1.2-2: Reactor Vessel, Internals, and Reactor Coolant System - Reactor Vessel Internals - Aging Management Evaluation

Subcomponent	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Core barrel flange	SS	Stainless Steel	(E) Treated water-primary	Changes in dimensions/void swelling	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-07	3.1.1-33	E
				Cracking/stress corrosion cracking, irradiation-assisted stress corrosion cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-08	3.1.1-30	E
					Primary Water Chemistry	IV.B2-08	3.1.1-30	A
				Loss of fracture toughness/neutron irradiation embrittlement, void swelling	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-09	3.1.1-22	E
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	IV.B2-32	3.1.1-83	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.1.2-2: Reactor Vessel, Internals, and Reactor Coolant System - Reactor Vessel Internals - Aging Management Evaluation

Subcomponent	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Core barrel outlet nozzles	FD	Stainless Steel	(E) Treated water-primary	Changes in dimensions/void swelling	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-07	3.1.1-33	E
				Cracking/stress corrosion cracking, irradiation-assisted stress corrosion cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-08	3.1.1-30	E
					Primary Water Chemistry	IV.B2-08	3.1.1-30	A
				Loss of fracture toughness/neutron irradiation embrittlement, void swelling	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-09	3.1.1-22	E
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	IV.B2-32	3.1.1-83	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.1.2-2: Reactor Vessel, Internals, and Reactor Coolant System - Reactor Vessel Internals - Aging Management Evaluation

Subcomponent	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Flux thimble tubes	PB	Stainless Steel	(E) Treated water-primary	Changes in dimensions/void swelling	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-11	3.1.1-33	E
				Cracking/stress corrosion cracking, irradiation-assisted stress corrosion cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-12	3.1.1-30	E
					Primary Water Chemistry	IV.B2-12	3.1.1-30	C
				Loss of fracture toughness/neutron irradiation embrittlement, void swelling	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-22	3.1.1-22	E
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	IV.B2-32	3.1.1-83	A
				Loss of material/wear	Flux Thimble Tube Inspection	IV.B2-13	3.1.1-60	A
			(I) Air-indoor uncontrolled	None	None	IV.E-02	3.1.1-86	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.1.2-2: Reactor Vessel, Internals, and Reactor Coolant System - Reactor Vessel Internals - Aging Management Evaluation

Subcomponent	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Head and vessel alignment pins	SS	Stainless Steel	(E) Treated water-primary	Changes in dimensions/void swelling	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-07	3.1.1-33	E
				Cracking/stress corrosion cracking, irradiation-assisted stress corrosion cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-08	3.1.1-30	E
					Primary Water Chemistry	IV.B2-08	3.1.1-30	C
				Loss of fracture toughness/neutron irradiation embrittlement, void swelling	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-09	3.1.1-22	E
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	IV.B2-32	3.1.1-83	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.1.2-2: Reactor Vessel, Internals, and Reactor Coolant System - Reactor Vessel Internals - Aging Management Evaluation

Subcomponent	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Hold-down spring	SS	Stainless Steel	(E) Treated water-primary	Changes in dimensions/void swelling	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-41	3.1.1-33	E
				Cracking/stress corrosion cracking, irradiation-assisted stress corrosion cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-42	3.1.1-30	E
					Primary Water Chemistry	IV.B2-42	3.1.1-30	A
				Loss of fracture toughness/neutron irradiation embrittlement, void swelling	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-09	3.1.1-22	E
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	IV.B2-32	3.1.1-83	A
				Loss of preload/stress relaxation	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-33	3.1.1-27	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.1.2-2: Reactor Vessel, Internals, and Reactor Coolant System - Reactor Vessel Internals - Aging Management Evaluation

Subcomponent	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Lower core plate	FD; SS	Stainless Steel	(E) Treated water-primary	Changes in dimensions/void swelling	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-19	3.1.1-33	E
				Cracking/stress corrosion cracking, primary water stress corrosion cracking, irradiation-assisted stress corrosion cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-20	3.1.1-37	E, 5
					Primary Water Chemistry	IV.B2-20	3.1.1-37	A, 5
				Loss of fracture toughness/neutron irradiation embrittlement, void swelling	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-18	3.1.1-22	E
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	IV.B2-32	3.1.1-83	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.1.2-2: Reactor Vessel, Internals, and Reactor Coolant System - Reactor Vessel Internals - Aging Management Evaluation

Subcomponent	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Lower fuel alignment pins	SS	Stainless Steel	(E) Treated water-primary	Changes in dimensions/void swelling	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-15	3.1.1-33	E
				Cracking/stress corrosion cracking, primary water stress corrosion cracking, irradiation-assisted stress corrosion cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-16	3.1.1-37	E, 5
					Primary Water Chemistry	IV.B2-16	3.1.1-37	A, 5
				Loss of fracture toughness/neutron irradiation embrittlement, void swelling	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-17	3.1.1-22	E
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	IV.B2-32	3.1.1-83	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.1.2-2: Reactor Vessel, Internals, and Reactor Coolant System - Reactor Vessel Internals - Aging Management Evaluation

Subcomponent	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Lower support column bolts	SS	Stainless Steel	(E) Treated water-primary	Changes in dimensions/void swelling	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-15	3.1.1-33	E
				Cracking/stress corrosion cracking, primary water stress corrosion cracking, irradiation-assisted stress corrosion cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-16	3.1.1-37	E, 5
					Primary Water Chemistry	IV.B2-16	3.1.1-37	A, 5
				Loss of fracture toughness/neutron irradiation embrittlement, void swelling	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-17	3.1.1-22	E
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	IV.B2-32	3.1.1-83	A
				Loss of preload/stress relaxation	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-25	3.1.1-27	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.1.2-2: Reactor Vessel, Internals, and Reactor Coolant System - Reactor Vessel Internals - Aging Management Evaluation

Subcomponent	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Lower support columns	SS	Stainless Steel	(E) Treated water-primary	Changes in dimensions/void swelling	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-23	3.1.1-33	E
				Cracking/stress corrosion cracking, irradiation-assisted stress corrosion cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-24	3.1.1-30	E
					Primary Water Chemistry	IV.B2-24	3.1.1-30	A
				Loss of fracture toughness/neutron irradiation embrittlement, void swelling	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-22	3.1.1-22	E
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	IV.B2-32	3.1.1-83	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.1.2-2: Reactor Vessel, Internals, and Reactor Coolant System - Reactor Vessel Internals - Aging Management Evaluation

Subcomponent	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Lower support forging	FD; SS	Stainless Steel	(E) Treated water-primary	Changes in dimensions/void swelling	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-23	3.1.1-33	E
				Cracking/stress corrosion cracking, irradiation-assisted stress corrosion cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-24	3.1.1-30	E
					Primary Water Chemistry	IV.B2-24	3.1.1-30	A
				Loss of fracture toughness/neutron irradiation embrittlement, void swelling	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-22	3.1.1-22	E
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	IV.B2-32	3.1.1-83	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.1.2-2: Reactor Vessel, Internals, and Reactor Coolant System - Reactor Vessel Internals - Aging Management Evaluation

Subcomponent	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Radial support keys	SS	Stainless Steel	(E) Treated water-primary	Changes in dimensions/void swelling	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-19	3.1.1-33	E, 4
				Cracking/stress corrosion cracking, primary water stress corrosion cracking, irradiation-assisted stress corrosion cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-20	3.1.1-37	E, 4, 5
					Primary Water Chemistry	IV.B2-20	3.1.1-37	A, 4, 5
				Loss of fracture toughness/neutron irradiation embrittlement, void swelling	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-22	3.1.1-22	E, 4
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	IV.B2-32	3.1.1-83	A, 4
				Loss of material/wear	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-26	3.1.1-63	B, 4

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.1.2-2: Reactor Vessel, Internals, and Reactor Coolant System - Reactor Vessel Internals - Aging Management Evaluation

Subcomponent	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
RCCA guide tube bolts	SS	Stainless Steel	(E) Treated water-primary	Changes in dimensions/void swelling	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-27	3.1.1-33	E
				Cracking/stress corrosion cracking, primary water stress corrosion cracking, irradiation-assisted stress corrosion cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-28	3.1.1-37	E, 5
					Primary Water Chemistry	IV.B2-28	3.1.1-37	A, 5
				Loss of fracture toughness/neutron irradiation embrittlement, void swelling	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-09	3.1.1-22	E
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	IV.B2-32	3.1.1-83	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.1.2-2: Reactor Vessel, Internals, and Reactor Coolant System - Reactor Vessel Internals - Aging Management Evaluation

Subcomponent	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
RCCA guide tube support pins	SS	Stainless Steel	(E) Treated water-primary	Changes in dimensions/void swelling	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-27	3.1.1-33	E
				Cracking/stress corrosion cracking, primary water stress corrosion cracking, irradiation-assisted stress corrosion cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-28	3.1.1-37	E, 5
					Primary Water Chemistry	IV.B2-28	3.1.1-37	A, 5
				Loss of fracture toughness/neutron irradiation embrittlement, void swelling	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-09	3.1.1-22	E
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	IV.B2-32	3.1.1-83	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.1.2-2: Reactor Vessel, Internals, and Reactor Coolant System - Reactor Vessel Internals - Aging Management Evaluation

Subcomponent	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
RCCA guide tubes	SS	Stainless Steel	(E) Treated water-primary	Changes in dimensions/void swelling	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-29	3.1.1-33	E
				Cracking/stress corrosion cracking, irradiation-assisted stress corrosion cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-30	3.1.1-30	E
					Primary Water Chemistry	IV.B2-30	3.1.1-30	A
				Loss of fracture toughness/thermal aging and neutron irradiation embrittlement	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-37	3.1.1-80	E, 2
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	IV.B2-32	3.1.1-83	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.1.2-2: Reactor Vessel, Internals, and Reactor Coolant System - Reactor Vessel Internals - Aging Management Evaluation

Subcomponent	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Secondary core support assembly	SS	Stainless Steel	(E) Treated water-primary	Changes in dimensions/void swelling	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-23	3.1.1-33	E
				Cracking/stress corrosion cracking, irradiation-assisted stress corrosion cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-24	3.1.1-30	E
					Primary Water Chemistry	IV.B2-24	3.1.1-30	C
				Loss of fracture toughness/neutron irradiation embrittlement, void swelling	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-22	3.1.1-22	E
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	IV.B2-32	3.1.1-83	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.1.2-2: Reactor Vessel, Internals, and Reactor Coolant System - Reactor Vessel Internals - Aging Management Evaluation

Subcomponent	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Thermal shield	EN; SS	Stainless Steel	(E) Treated water-primary	Changes in dimensions/void swelling	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-07	3.1.1-33	E
				Cracking/stress corrosion cracking, irradiation-assisted stress corrosion cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-08	3.1.1-30	E
					Primary Water Chemistry	IV.B2-08	3.1.1-30	A
				Loss of fracture toughness/neutron irradiation embrittlement, void swelling	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-09	3.1.1-22	E
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	IV.B2-32	3.1.1-83	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.1.2-2: Reactor Vessel, Internals, and Reactor Coolant System - Reactor Vessel Internals - Aging Management Evaluation

Subcomponent	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Upper core plate	FD; SS	Stainless Steel	(E) Treated water-primary	Changes in dimensions/void swelling	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-41	3.1.1-33	E
				Cracking/stress corrosion cracking, irradiation-assisted stress corrosion cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-42	3.1.1-30	E
					Primary Water Chemistry	IV.B2-42	3.1.1-30	A
				Loss of fracture toughness/neutron irradiation embrittlement, void swelling	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-09	3.1.1-22	E
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	IV.B2-32	3.1.1-83	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.1.2-2: Reactor Vessel, Internals, and Reactor Coolant System - Reactor Vessel Internals - Aging Management Evaluation

Subcomponent	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Upper core plate alignment pins	SS	Stainless Steel	(E) Treated water-primary	Changes in dimensions/void swelling	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-39	3.1.1-33	E
				Cracking/stress corrosion cracking, primary water stress corrosion cracking, irradiation-assisted stress corrosion cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-40	3.1.1-37	E, 5
					Primary Water Chemistry	IV.B2-40	3.1.1-37	A, 5
				Loss of fracture toughness/neutron irradiation embrittlement, void swelling	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-09	3.1.1-22	E
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	IV.B2-32	3.1.1-83	A
				Loss of material/wear	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-34	3.1.1-63	B

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.1.2-2: Reactor Vessel, Internals, and Reactor Coolant System - Reactor Vessel Internals - Aging Management Evaluation

Subcomponent	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Upper fuel alignment pins	SS	Stainless Steel	(E) Treated water-primary	Changes in dimensions/void swelling	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-39	3.1.1-33	E
				Cracking/stress corrosion cracking, primary water stress corrosion cracking, irradiation-assisted stress corrosion cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-40	3.1.1-37	E, 5
					Primary Water Chemistry	IV.B2-40	3.1.1-37	A, 5
				Loss of fracture toughness/neutron irradiation embrittlement, void swelling	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-09	3.1.1-22	E
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	IV.B2-32	3.1.1-83	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.1.2-2: Reactor Vessel, Internals, and Reactor Coolant System - Reactor Vessel Internals - Aging Management Evaluation

Subcomponent	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Upper instrumentation columns	SS	Stainless Steel	(E) Treated water-primary	Changes in dimensions/void swelling	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-35	3.1.1-33	E
				Cracking/stress corrosion cracking, irradiation-assisted stress corrosion cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-36	3.1.1-30	E
					Primary Water Chemistry	IV.B2-36	3.1.1-30	A
				Loss of fracture toughness/thermal aging and neutron irradiation embrittlement	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-37	3.1.1-80	E, 2
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	IV.B2-32	3.1.1-83	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.1.2-2: Reactor Vessel, Internals, and Reactor Coolant System - Reactor Vessel Internals - Aging Management Evaluation

Subcomponent	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Upper support column bolts	SS	Stainless Steel	(E) Treated water-primary	Changes in dimensions/void swelling	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-39	3.1.1-33	E
				Cracking/stress corrosion cracking, primary water stress corrosion cracking, irradiation-assisted stress corrosion cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-40	3.1.1-37	E, 5
					Primary Water Chemistry	IV.B2-40	3.1.1-37	A, 5
				Loss of fracture toughness/neutron irradiation embrittlement, void swelling	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-09	3.1.1-22	E
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	IV.B2-32	3.1.1-83	A
				Loss of preload/stress relaxation	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-38	3.1.1-27	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.1.2-2: Reactor Vessel, Internals, and Reactor Coolant System - Reactor Vessel Internals - Aging Management Evaluation

Subcomponent	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Upper support columns	SS	Stainless Steel	(E) Treated water-primary	Changes in dimensions/void swelling	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-35	3.1.1-33	E
				Cracking/stress corrosion cracking, irradiation-assisted stress corrosion cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-36	3.1.1-30	E
					Primary Water Chemistry	IV.B2-36	3.1.1-30	A
				Loss of fracture toughness/thermal aging and neutron irradiation embrittlement	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-37	3.1.1-80	E, 2
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	IV.B2-32	3.1.1-83	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.1.2-2: Reactor Vessel, Internals, and Reactor Coolant System - Reactor Vessel Internals - Aging Management Evaluation

Subcomponent	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Upper support plate assembly	FD; SS	Stainless Steel	(E) Treated water-primary	Changes in dimensions/void swelling	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-41	3.1.1-33	E
				Cracking/stress corrosion cracking, irradiation-assisted stress corrosion cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-42	3.1.1-30	E
					Primary Water Chemistry	IV.B2-42	3.1.1-30	A
				Loss of fracture toughness/neutron irradiation embrittlement, void swelling	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.B2-09	3.1.1-22	E
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	IV.B2-32	3.1.1-83	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.1.2-2 Notes:

Plant Standard Notes

Note - The following plant standard notes have generic applicability, but may or may not be used for each SSC:

S1. Thermal embrittlement is only applicable to CASS components that are subject to temperatures in excess of 482°F.

S2. Cracking due to SCC is only applicable to stainless steel components exposed to temperatures greater than 140°F.

S3. Selective leaching is applicable to the material group 'Steel,' but only for gray cast iron components.

System Specific Notes

1. Thermal embrittlement is only applicable to the CASS cruciform top end piece of the BMI column.

2. Thermal embrittlement is only applicable to the CASS base of the upper support columns, upper instrumentation columns, and flow mixing base of the RCCA guide tubes.

3. The radial support keys and clevis insert bolts are identified as separate components in Table 3.1.2-2.

4. The clevis inserts and clevis insert bolts are identified as separate components in Table 3.1.2-2.

5. The referenced aging item is applicable for both stainless steel and nickel-based alloy materials. Since the identified material for this component is stainless steel, the applicable aging mechanisms for this item are SCC and IASCC.

6. The referenced aging item is applicable for both stainless steel and nickel-based alloy materials. Since the identified material for this component is nickel-based alloy, the applicable aging mechanisms for this item are PWSCC and IASCC.

Industry Standard Notes

See last page of Section 3.1 tables.

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.1.2-3: Reactor Vessel, Internals, and Reactor Coolant System - Reactor Coolant - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Bolting	PB	Steel	(E) Air-indoor uncontrolled	Cracking/stress corrosion cracking	Bolting Integrity	IV.C2-07	3.1.1-52	A
				Loss of material/general, pitting, and crevice corrosion	Bolting Integrity	EP-025	3.2.1-23	A, 3
				Loss of preload/thermal effects, gasket creep, and self-loosening	Bolting Integrity	IV.C2-08	3.1.1-52	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	IV.C2-09	3.1.1-58	A
Condensing and Seal Chambers	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	IV.E-02	3.1.1-86	A
			(E) Borated water leakage	None	None	IV.E-03	3.1.1-86	A
			(I) Treated water-primary	Cracking/stress corrosion cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.C2-02	3.1.1-68	D, S2
					Primary Water Chemistry	IV.C2-02	3.1.1-68	D, S2
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	IV.C2-15	3.1.1-83	C

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.1.2-3: Reactor Vessel, Internals, and Reactor Coolant System - Reactor Coolant - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Flow Elements	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	IV.E-02	3.1.1-86	A
			(E) Borated water leakage	None	None	IV.E-03	3.1.1-86	A
			(I) Treated water-primary	Cracking/stress corrosion cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.C2-02	3.1.1-68	B, S2
					Primary Water Chemistry	IV.C2-02	3.1.1-68	A, S2
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	IV.C2-15	3.1.1-83	A
Flow Orifices	PB; RF	Stainless Steel	(E) Air-indoor uncontrolled	None	None	IV.E-02	3.1.1-86	A
			(E) Borated water leakage	None	None	IV.E-03	3.1.1-86	A
			(I) Treated water-primary	Cracking/stress corrosion cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.C2-02	3.1.1-68	B, S2
					Primary Water Chemistry	IV.C2-02	3.1.1-68	A, S2
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	IV.C2-15	3.1.1-83	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.1.2-3: Reactor Vessel, Internals, and Reactor Coolant System - Reactor Coolant - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Pipe (< NPS 4")	PB	Stainless Steel	(E) Air-indoor uncontrolled	Cumulative fatigue damage/fatigue	TLAA	IV.C2-10	3.1.1-07	A
			(E) Borated water leakage	None	None	IV.E-03	3.1.1-86	A
			(I) Treated water-primary	Cracking/cyclic loading	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.C2-26	3.1.1-62	B
				Cracking/stress corrosion cracking, thermal and mechanical loading	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.C2-01	3.1.1-70	B, S2
					Primary Water Chemistry	IV.C2-01	3.1.1-70	A, S2
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	IV.C2-15	3.1.1-83	A
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	E-044	3.2.1-31	A, 3
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	IV.C2-09	3.1.1-58	A
			(I) Treated water-closed cycle cooling	Loss of material/general, pitting, and crevice corrosion	Closed-Cycle Cooling Water System	IV.C2-14	3.1.1-53	B
					Work Control Process	IV.C2-14	3.1.1-53	E
				Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H
					Work Control Process			H

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.1.2-3: Reactor Vessel, Internals, and Reactor Coolant System - Reactor Coolant - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Pipe (>= NPS 4")	PB	Stainless Steel	(E) Air-indoor uncontrolled	Cumulative fatigue damage/fatigue	TLAA	IV.C2-10	3.1.1-07	A
			(E) Borated water leakage	None	None	IV.E-03	3.1.1-86	A
			(I) Treated water-primary	Cracking/cyclic loading	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.C2-26	3.1.1-62	B
				Cracking/stress corrosion cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.C2-03	3.1.1-24	E, S2, 5
						IV.C2-02	3.1.1-68	B, S2
					Primary Water Chemistry	IV.C2-03	3.1.1-24	A, S2, 5
						IV.C2-02	3.1.1-68	A, S2
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	IV.C2-15	3.1.1-83	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.1.2-3: Reactor Vessel, Internals, and Reactor Coolant System - Reactor Coolant - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Pressurizer (Shell and Cladding)	PB	Stainless Steel	(I) Treated water-primary	Cracking/cyclic loading	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.C2-18	3.1.1-67	B
				Cracking/stress corrosion cracking, primary water stress corrosion cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.C2-19	3.1.1-64	B, S2, 6
					Primary Water Chemistry	IV.C2-19	3.1.1-64	A, S2, 6
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	IV.C2-15	3.1.1-83	A
		Steel	(E) Air-indoor uncontrolled	None	None			H, 3
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	IV.C2-09	3.1.1-58	A
			(I) Treated water-primary	Cumulative fatigue damage/fatigue	TLAA	IV.C2-25	3.1.1-08	A, 4

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.1.2-3: Reactor Vessel, Internals, and Reactor Coolant System - Reactor Coolant - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Pressurizer Heater Sleeves and Sheaths	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	IV.E-02	3.1.1-86	A
			(E) Borated water leakage	None	None	IV.E-03	3.1.1-86	A
			(E) Treated water-primary	Cracking/stress corrosion cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.C2-20	3.1.1-68	B, S2, 2
					Primary Water Chemistry	IV.C2-20	3.1.1-68	A, S2, 2
				Cumulative fatigue damage/fatigue	TLAA	IV.C2-25	3.1.1-08	A
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	IV.C2-15	3.1.1-83	A, 2
Pressurizer Integral Support	SS	Steel	(E) Air-indoor uncontrolled	Cracking/cyclic loading	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.C2-16	3.1.1-61	B
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	IV.C2-09	3.1.1-58	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.1.2-3: Reactor Vessel, Internals, and Reactor Coolant System - Reactor Coolant - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Pressurizer Manway (Including Stainless Steel Insert)	PB	Stainless Steel	(I) Treated water-primary	Cracking/stress corrosion cracking	Primary Water Chemistry	IV.C2-02	3.1.1-68	E, S2, 1
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	IV.C2-15	3.1.1-83	A, 1
		Steel	(E) Air-indoor uncontrolled	None	None			H, 1, 3
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	IV.C2-09	3.1.1-58	A, 1
Pressurizer Relief Tank	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	E-044	3.2.1-31	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	IV.C2-09	3.1.1-58	A
			(I) Treated water-primary	Loss of material/general, pitting, and crevice corrosion	Primary Water Chemistry			H
					Work Control Process			H

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.1.2-3: Reactor Vessel, Internals, and Reactor Coolant System - Reactor Coolant - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Reactor Coolant Pumps	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	IV.E-02	3.1.1-86	A
			(E) Borated water leakage	None	None	IV.E-03	3.1.1-86	A
			(I) Treated water-primary	Cracking/stress corrosion cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.C2-03	3.1.1-24	E, S2, 5
					Primary Water Chemistry	IV.C2-03	3.1.1-24	A, S2, 5
				Loss of fracture toughness/thermal aging embrittlement	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.C2-06	3.1.1-55	B, S1
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	IV.C2-15	3.1.1-83	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.1.2-3: Reactor Vessel, Internals, and Reactor Coolant System - Reactor Coolant - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Resistance Temperature Detectors	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	IV.E-02	3.1.1-86	A
			(E) Borated water leakage	None	None	IV.E-03	3.1.1-86	A
			(E) Treated water-primary	Loss of material/pitting and crevice corrosion	Primary Water Chemistry	IV.C2-15	3.1.1-83	A
			(I) Treated water-primary	Cracking/stress corrosion cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.C2-02	3.1.1-68	B, S2
					Primary Water Chemistry	IV.C2-02	3.1.1-68	A, S2
Rupture Discs	PB	Nickel Alloys	(E) Air-indoor uncontrolled	None	None	IV.E-01	3.1.1-85	A
			(E) Borated water leakage	None	None			H
			(I) Treated water-primary	Loss of material/pitting and crevice corrosion	Primary Water Chemistry	IV.C2-15	3.1.1-83	A
		Stainless Steel	(E) Air-indoor uncontrolled	None	None	IV.E-02	3.1.1-86	A
			(E) Borated water leakage	None	None	IV.E-03	3.1.1-86	A
			(I) Treated water-primary	Loss of material/pitting and crevice corrosion	Primary Water Chemistry	IV.C2-15	3.1.1-83	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.1.2-3: Reactor Vessel, Internals, and Reactor Coolant System - Reactor Coolant - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
RxCP Motor Lower Bearing Oil Coolers	PB	Copper Alloys	(E) Lube oil	Loss of material/pitting and/or crevice corrosion	Lubricating Oil Analysis			H
					Work Control Process			H
			(I) Treated water-closed cycle cooling	Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H
					Work Control Process			H
				Loss of material/pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	IV.C2-11	3.1.1-54	B
					Work Control Process	IV.C2-11	3.1.1-54	E
RxCP Motor Upper Bearing Oil Coolers (Channel Head)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	E-044	3.2.1-31	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	IV.C2-09	3.1.1-58	A
			(I) Treated water-closed cycle cooling	Loss of material/general, pitting, and crevice corrosion	Closed-Cycle Cooling Water System	IV.C2-14	3.1.1-53	D
					Work Control Process	IV.C2-14	3.1.1-53	E
				Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H
					Work Control Process			H

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.1.2-3: Reactor Vessel, Internals, and Reactor Coolant System - Reactor Coolant - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
RxCP Motor Upper Bearing Oil Coolers (Tube Sheet)	PB	Steel	(E) Lube oil	Loss of material/general, pitting, crevice, and microbiologically influenced corrosion	Lubricating Oil Analysis	S-017	3.4.1-12	A
					Work Control Process	S-017	3.4.1-12	E
			(I) Treated water-closed cycle cooling	Loss of material/general, pitting, and crevice corrosion	Closed-Cycle Cooling Water System	IV.C2-14	3.1.1-53	D
					Work Control Process	IV.C2-14	3.1.1-53	E
				Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H
					Work Control Process			H
RxCP Motor Upper Bearing Oil Coolers (Tubes)	PB	Copper Alloys	(E) Lube oil	Loss of material/pitting and/or crevice corrosion	Lubricating Oil Analysis			H
					Work Control Process			H
			(I) Treated water-closed cycle cooling	Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H
					Work Control Process			H
				Loss of material/pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	IV.C2-11	3.1.1-54	B
					Work Control Process	IV.C2-11	3.1.1-54	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.1.2-3: Reactor Vessel, Internals, and Reactor Coolant System - Reactor Coolant - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
RxCP Thermal Barriers (Flange)	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	IV.E-02	3.1.1-86	A
			(E) Borated water leakage	None	None	IV.E-03	3.1.1-86	A
			(I) Treated water-closed cycle cooling	Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H
					Work Control Process			H
				Loss of material/pitting and crevice corrosion	Closed-Cycle Cooling Water System			H
					Work Control Process			H
			(I) Treated water-primary	Cracking/stress corrosion cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.C2-05	3.1.1-68	B, S2
					Primary Water Chemistry	IV.C2-05	3.1.1-68	A, S2
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	IV.C2-15	3.1.1-83	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.1.2-3: Reactor Vessel, Internals, and Reactor Coolant System - Reactor Coolant - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
RxCP Thermal Barriers (Heat Exchanger)	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	IV.E-02	3.1.1-86	A
			(E) Borated water leakage	None	None	IV.E-03	3.1.1-86	A
			(I) Treated water-closed cycle cooling	Cracking/stress corrosion cracking	Closed-Cycle Cooling Water System	EP-044	3.2.1-25	D
					Work Control Process	EP-044	3.2.1-25	E
				Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H
					Work Control Process			H
				Loss of material/pitting and crevice corrosion	Closed-Cycle Cooling Water System			H
					Work Control Process			H
			(I) Treated water-primary	Cracking/stress corrosion cracking	Primary Water Chemistry	IV.C2-05	3.1.1-68	E, S2
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	IV.C2-15	3.1.1-83	C
Thermal Sleeves	LTC	Stainless Steel	(E) Treated water-primary	Cracking/stress corrosion cracking	Primary Water Chemistry	IV.C2-02	3.1.1-68	E, S2
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	IV.C2-15	3.1.1-83	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.1.2-3: Reactor Vessel, Internals, and Reactor Coolant System - Reactor Coolant - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Tubing	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	IV.E-02	3.1.1-86	A
			(E) Borated water leakage	None	None	IV.E-03	3.1.1-86	A
			(I) Treated water-primary	Cracking/stress corrosion cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.C2-02	3.1.1-68	B, S2
					Primary Water Chemistry	IV.C2-02	3.1.1-68	A, S2
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	IV.C2-15	3.1.1-83	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.1.2-3: Reactor Vessel, Internals, and Reactor Coolant System - Reactor Coolant - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Valves	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	IV.E-02	3.1.1-86	A
			(E) Borated water leakage	None	None	IV.E-03	3.1.1-86	A
			(I) Treated water-primary	Cracking/stress corrosion cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.C2-03	3.1.1-24	E, S2, 5
						IV.C2-05	3.1.1-68	B, S2
					Primary Water Chemistry	IV.C2-03	3.1.1-24	A, S2, 5
						IV.C2-05	3.1.1-68	A, S2
				Loss of fracture toughness/thermal aging embrittlement	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.C2-06	3.1.1-55	B, S1
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	IV.C2-15	3.1.1-83	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.1.2-3 Notes:

Plant Standard Notes

Note - The following plant standard notes have generic applicability, but may or may not be used for each SSC:

S1. Thermal embrittlement is only applicable to CASS components that are subject to temperatures in excess of 482°F.

S2. Cracking due to SCC is only applicable to stainless steel components exposed to temperatures greater than 140°F.

S3. Selective leaching is applicable to the material group 'Steel,' but only for gray cast iron components.

System Specific Notes

1. The pressurizer manway is fabricated of low-alloy steel and the insert is fabricated from stainless steel.
2. The heater sheathes and sleeves penetrate the bottom of the pressurizer. They are exposed externally to air uncontrolled outside of the pressurizer and treated primary water inside the pressurizer.
3. General corrosion is not an applicable aging mechanism for steel in air-indoor uncontrolled environment when the normal operating temperature is greater than 212°F since condensation is not expected to occur.
4. The steel material for this component is clad with stainless steel and is not exposed directly to the treated water-primary environment.
5. Applies to Cast Austenitic Stainless Steel components
6. The referenced aging item is applicable for both stainless steel and nickel-based alloy materials. Since the identified material for this component is stainless steel, the applicable aging mechanism for this item is SCC and not PWSCC.

Industry Standard Notes

See last page of Section 3.1 tables.

Table 3.1.2-4: Reactor Vessel, Internals, and Reactor Coolant System - Steam Generator - Aging Management Evaluation

Subcomponent	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Anti-Vibration Bars	SS	Stainless Steel	(E) Treated water and/or steam-secondary	Cracking/stress corrosion cracking	Secondary Water Chemistry	IV.D1-14	3.1.1-74	A
					Steam Generator Tube Integrity	IV.D1-14	3.1.1-74	B
				Loss of material/crevice corrosion and fretting	Secondary Water Chemistry	IV.D1-15	3.1.1-74	A
					Steam Generator Tube Integrity	IV.D1-15	3.1.1-74	B

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.1.2-4: Reactor Vessel, Internals, and Reactor Coolant System - Steam Generator - Aging Management Evaluation

Subcomponent	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Channel Head (and stainless steel cladding)	PB; SS	Nickel Alloys	(E) Air-indoor uncontrolled	None	None	IV.E-01	3.1.1-85	A
			(E) Borated water leakage	None	None			H
		Stainless Steel	(I) Treated water-primary	Cracking/stress corrosion cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.D1-01	3.1.1-68	D
					Primary Water Chemistry	IV.D1-01	3.1.1-68	C
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	RP-023	3.1.1-83	A
		Steel	(E) Air-indoor uncontrolled	None	None			H, 4
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	IV.D1-03	3.1.1-58	A, 1
			(I) Treated water-primary	Cumulative fatigue damage/fatigue	TLAA	IV.D1-08	3.1.1-10	A, 3
Closure Ring	SS	Nickel Alloys	(E) Treated water-primary	Cracking/primary water stress corrosion cracking	Primary Water Chemistry	IV.D1-06	3.1.1-81	C
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	RP-023	3.1.1-83	C

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.1.2-4: Reactor Vessel, Internals, and Reactor Coolant System - Steam Generator - Aging Management Evaluation

Subcomponent	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Divider Plate	FD	Nickel Alloys	(E) Treated water-primary	Cracking/primary water stress corrosion cracking	Primary Water Chemistry	IV.D1-06	3.1.1-81	A
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	RP-023	3.1.1-83	C
Feedwater Inlet Ring and Supports	PB	Steel	(E) Treated water and/or steam-secondary	Loss of material/erosion, general, pitting, and crevice corrosion	Secondary Water Chemistry	IV.D1-09	3.1.1-76	C
					Steam Generator Tube Integrity	IV.D1-09	3.1.1-76	D
Feedwater Inlet Ring J Nozzles	PB	Nickel Alloys	(E) Treated water and/or steam-secondary	Cracking/stress corrosion cracking	Secondary Water Chemistry	IV.D1-14	3.1.1-74	C
					Steam Generator Tube Integrity	IV.D1-14	3.1.1-74	D
				Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	SP-018	3.4.1-37	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.1.2-4: Reactor Vessel, Internals, and Reactor Coolant System - Steam Generator - Aging Management Evaluation

Subcomponent	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Feedwater Nozzle (and nickel alloy cladding)	PB	Nickel Alloys	(I) Treated water and/or steam-secondary	Cracking/stress corrosion cracking	Secondary Water Chemistry	IV.D1-14	3.1.1-74	E
				Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	SP-018	3.4.1-37	A
		Steel	(E) Air-indoor uncontrolled	None	None			H, 4
			(I) Treated water and/or steam-secondary	Cumulative fatigue damage/fatigue	TLAA	IV.D1-11	3.1.1-07	A
				Loss of material/general, pitting, and crevice corrosion	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.D1-12	3.1.1-16	D
					Secondary Water Chemistry	IV.D1-12	3.1.1-16	C
Feedwater Nozzle Thermal Sleeve	LTC	Nickel Alloys	(E) Treated water and/or steam-secondary	Cracking/stress corrosion cracking	Secondary Water Chemistry	IV.D1-14	3.1.1-74	E
				Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	SP-018	3.4.1-37	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.1.2-4: Reactor Vessel, Internals, and Reactor Coolant System - Steam Generator - Aging Management Evaluation

Subcomponent	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Flow Distribution Baffle	FD	Stainless Steel	(E) Treated water and/or steam-secondary	Cracking/stress corrosion cracking	Secondary Water Chemistry	IV.D1-14	3.1.1-74	C
					Steam Generator Tube Integrity	IV.D1-14	3.1.1-74	D
				Loss of material/crevice corrosion and fretting	Secondary Water Chemistry	IV.D1-15	3.1.1-74	C
					Steam Generator Tube Integrity	IV.D1-15	3.1.1-74	D
Moisture Separator Assembly	PB	Steel	(E) Treated water and/or steam-secondary	Loss of material/erosion, general, pitting, and crevice corrosion	Secondary Water Chemistry	IV.D1-09	3.1.1-76	C
					Steam Generator Tube Integrity	IV.D1-09	3.1.1-76	D
Primary Manway Bolting	PB	Steel	(E) Air-indoor uncontrolled	Cracking/stress corrosion cracking	Bolting Integrity	IV.D1-02	3.1.1-52	A
				Loss of material/general, pitting, and crevice corrosion	Bolting Integrity	EP-025	3.2.1-23	A
				Loss of preload/thermal effects, gasket creep, and self-loosening	Bolting Integrity	IV.D1-10	3.1.1-52	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	IV.D1-03	3.1.1-58	A, 1

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.1.2-4: Reactor Vessel, Internals, and Reactor Coolant System - Steam Generator - Aging Management Evaluation

Subcomponent	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Primary Manway Cover and Diaphragm	PB	Stainless Steel	(E) Treated water-primary	Cracking/stress corrosion cracking	Primary Water Chemistry	IV.D1-07	3.1.1-82	C
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	RP-023	3.1.1-83	A
		Steel	(E) Air-indoor uncontrolled	None	None			H, 4
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	IV.D1-03	3.1.1-58	A, 1
Primary Nozzles (and stainless steel cladding)	PB	Stainless Steel	(I) Treated water-primary	Cracking/stress corrosion cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.D1-01	3.1.1-68	B
					Primary Water Chemistry	IV.D1-01	3.1.1-68	A
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	RP-023	3.1.1-83	A
		Steel	(E) Air-indoor uncontrolled	None	None			H, 4
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	IV.D1-03	3.1.1-58	A, 1
			(I) Treated water-primary	Cumulative fatigue damage/fatigue	TLAA	IV.D1-08	3.1.1-10	A, 3

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.1.2-4: Reactor Vessel, Internals, and Reactor Coolant System - Steam Generator - Aging Management Evaluation

Subcomponent	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Primary Nozzles Safe End/Buttering	PB	Nickel Alloys	(E) Air-indoor uncontrolled	None	None	IV.E-01	3.1.1-85	C
			(E) Borated water leakage	None	None			H, 1
			(I) Treated water-primary	Cracking/primary water stress corrosion cracking	Alloy 600 Inspections	IV.D1-04	3.1.1-31	E
					ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.D1-04	3.1.1-31	B
					Primary Water Chemistry	IV.D1-04	3.1.1-31	A
				Cumulative fatigue damage/fatigue	TLAA	IV.D1-08	3.1.1-10	A
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	RP-023	3.1.1-83	A
		Stainless Steel	(E) Air-indoor uncontrolled	None	None	IV.E-02	3.1.1-86	A
			(E) Borated water leakage	None	None	IV.E-03	3.1.1-86	A, 1

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.1.2-4: Reactor Vessel, Internals, and Reactor Coolant System - Steam Generator - Aging Management Evaluation

Subcomponent	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Primary Nozzles Safe End/Buttering	PB	Stainless Steel	(I) Treated water-primary	Cracking/stress corrosion cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.D1-01	3.1.1-68	B
					Primary Water Chemistry	IV.D1-01	3.1.1-68	A
				Cumulative fatigue damage/fatigue	TLAA	IV.D1-08	3.1.1-10	A
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	RP-023	3.1.1-83	A
Secondary Manway and Handhole Bolting	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general, pitting, and crevice corrosion	Bolting Integrity	EP-025	3.2.1-23	A
				Loss of preload/thermal effects, gasket creep, and self-loosening	Bolting Integrity	IV.D1-10	3.1.1-52	A
Secondary Manway and Handhole Covers	PB	Steel	(E) Air-indoor uncontrolled	None	None			H, 4
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	IV.D1-12	3.1.1-16	C
Secondary Side Nozzles (Except Main Steam and Feedwater)	PB	Steel	(E) Air-indoor uncontrolled	None	None			H, 4
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.D1-12	3.1.1-16	D
					Secondary Water Chemistry	IV.D1-12	3.1.1-16	C

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.1.2-4: Reactor Vessel, Internals, and Reactor Coolant System - Steam Generator - Aging Management Evaluation

Subcomponent	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Shell - Top Elliptical Head	PB	Steel	(E) Air-indoor uncontrolled	None	None			H, 4
			(I) Treated water and/or steam-secondary	Cumulative fatigue damage/fatigue	TLAA	IV.D1-11	3.1.1-07	A
				Loss of material/general, pitting, and crevice corrosion	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.D1-12	3.1.1-16	B
					Secondary Water Chemistry	IV.D1-12	3.1.1-16	A
Shell - Upper, Lower and Transition Cone	PB	Steel	(E) Air-indoor uncontrolled	None	None			H, 4
			(I) Treated water and/or steam-secondary	Cumulative fatigue damage/fatigue	TLAA	IV.D1-11	3.1.1-07	A
				Loss of material/general, pitting, and crevice corrosion	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.D1-12	3.1.1-16	B
					Secondary Water Chemistry	IV.D1-12	3.1.1-16	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.1.2-4: Reactor Vessel, Internals, and Reactor Coolant System - Steam Generator - Aging Management Evaluation

Subcomponent	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Steam Nozzle	PB	Steel	(E) Air-indoor uncontrolled	None	None			H, 4
			(I) Treated water and/or steam-secondary	Cumulative fatigue damage/fatigue	TLAA	IV.D1-11	3.1.1-07	A
				Loss of material/general, pitting, and crevice corrosion	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	IV.D1-12	3.1.1-16	D
					Secondary Water Chemistry	IV.D1-12	3.1.1-16	C
Steam Nozzle Flow Restrictor	RF	Nickel Alloys	(E) Treated water and/or steam-secondary	Cracking/stress corrosion cracking	Secondary Water Chemistry	IV.D1-14	3.1.1-74	E
				Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	SP-018	3.4.1-37	A
Tube Bundle Support Hardware	SS	Nickel Alloys	(E) Treated water and/or steam-secondary	Cracking/stress corrosion cracking	Secondary Water Chemistry	IV.D1-14	3.1.1-74	C
					Steam Generator Tube Integrity	IV.D1-14	3.1.1-74	D
				Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	SP-018	3.4.1-37	C
		Steel	(E) Treated water and/or steam-secondary	Loss of material/erosion, general, pitting, and crevice corrosion	Secondary Water Chemistry	IV.D1-09	3.1.1-76	C
					Steam Generator Tube Integrity	IV.D1-09	3.1.1-76	D

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.1.2-4: Reactor Vessel, Internals, and Reactor Coolant System - Steam Generator - Aging Management Evaluation

Subcomponent	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Tube Plugs	PB	Nickel Alloys	(E) Treated water and/or steam-secondary	Cracking/intergranular attack	Secondary Water Chemistry	IV.D1-22	3.1.1-72	C, 2
					Steam Generator Tube Integrity	IV.D1-22	3.1.1-72	D, 2
				Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	SP-018	3.4.1-37	C, 2
			(I) Treated water-primary	Cracking/primary water stress corrosion cracking	Primary Water Chemistry	IV.D1-18	3.1.1-73	A, 2
					Steam Generator Tube Integrity	IV.D1-18	3.1.1-73	B, 2
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	RP-023	3.1.1-83	C, 2
Tube Support Plates	SS	Stainless Steel	(E) Treated water and/or steam-secondary	Cracking/stress corrosion cracking	Secondary Water Chemistry	IV.D1-14	3.1.1-74	C
					Steam Generator Tube Integrity	IV.D1-14	3.1.1-74	D
				Loss of material/crevice corrosion and fretting	Secondary Water Chemistry	IV.D1-15	3.1.1-74	C
					Steam Generator Tube Integrity	IV.D1-15	3.1.1-74	D
Tube Wrapper	FD; SS	Steel	(E) Treated water and/or steam-secondary	Loss of material/erosion, general, pitting, and crevice corrosion	Secondary Water Chemistry	IV.D1-09	3.1.1-76	A
					Steam Generator Tube Integrity	IV.D1-09	3.1.1-76	B

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.1.2-4: Reactor Vessel, Internals, and Reactor Coolant System - Steam Generator - Aging Management Evaluation

Subcomponent	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Tubes and sleeves	HT; PB	Nickel Alloys	(E) Treated water and/or steam-secondary	Cracking/intergranular attack	Secondary Water Chemistry	IV.D1-22	3.1.1-72	A, 2
					Steam Generator Tube Integrity	IV.D1-22	3.1.1-72	B, 2
				Cumulative fatigue damage/fatigue	TLAA	IV.D1-21	3.1.1-06	A, 2
				Loss of material/fretting and wear	Secondary Water Chemistry	IV.D1-24	3.1.1-72	A, 2
					Steam Generator Tube Integrity	IV.D1-24	3.1.1-72	B, 2
				Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	SP-018	3.4.1-37	A, 2
			(I) Treated water-primary	Cracking/primary water stress corrosion cracking	Primary Water Chemistry	IV.D1-20	3.1.1-73	A, 2
					Steam Generator Tube Integrity	IV.D1-20	3.1.1-73	B, 2
				Cumulative fatigue damage/fatigue	TLAA	IV.D1-21	3.1.1-06	A, 2
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	RP-023	3.1.1-83	A, 2

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.1.2-4: Reactor Vessel, Internals, and Reactor Coolant System - Steam Generator - Aging Management Evaluation

Subcomponent	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Tubesheet (and nickel alloy cladding)	PB	Nickel Alloys	(E) Treated water-primary	Cracking/primary water stress corrosion cracking	Primary Water Chemistry	IV.D1-06	3.1.1-81	C
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	RP-023	3.1.1-83	C
		Steel	(E) Air-indoor uncontrolled	None	None			H, 4
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	IV.D1-03	3.1.1-58	A, 1
			(E) Treated water and/or steam-secondary	Loss of material/erosion, general, pitting, and crevice corrosion	Secondary Water Chemistry	IV.D1-09	3.1.1-76	C
					Steam Generator Tube Integrity	IV.D1-09	3.1.1-76	D

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.1.2-4 Notes:

Plant Standard Notes

Note - The following plant standard notes have generic applicability, but may or may not be used for each SSC:

S1. Thermal embrittlement is only applicable to CASS components that are subject to temperatures in excess of 482°F.

S2. Cracking due to SCC is only applicable to stainless steel components exposed to temperatures greater than 140°F.

S3. Selective leaching is applicable to the material group 'Steel,' but only for gray cast iron components.

System Specific Notes

1. Loss of material due to boric acid corrosion is only applicable to the primary-side subcomponents of the SG. The geometry of the steam generator primary head and the physical distance between the primary manways and the upper and lower shells essentially eliminate the potential for boric acid exposure to the secondary-side subcomponents.

2. Based on the fall 2006 steam generator inspections, there are zero tubes plugged and zero sleeves installed in both steam generators 1A and 1B, however, they are included in case they are used prior to the period of extended operation.

3. The steel material for this component is clad with stainless steel and is not exposed directly to the treated water-primary environment.

4. General corrosion is not an applicable aging mechanism for steel in an air-indoor uncontrolled environment when the normal operating temperature is greater than 212°F since condensation is not expected to occur.

Industry Standard Notes

See last page of Section 3.1 tables.

Notes for Tables 3.1.2-1 through 3.1.2-4

Industry 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 component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

D. Component is different, but 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 item for component, 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. (Not used. See discussion in Section 3.0)

G. Environment not in NUREG-1801 for this component and material. (Not used. See discussion in Section 3.0)

H. Aging effect not in NUREG-1801 for this component, material and environment combination.

I. Aging effect in NUREG-1801 for this component, material and environment combination is not applicable. (Not used. See discussion in Section 3.0)

J. Neither the component nor the material and environment combination is evaluated in NUREG-1801. (Not used. See discussion in Section 3.0)

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

3.2 AGING MANAGEMENT OF ENGINEERED SAFETY FEATURES SYSTEMS

3.2.1 INTRODUCTION

This section provides the results of the aging management review for those components identified in Section 2.3.2, Engineered Safety Features Systems, as being subject to aging management review. The systems, or portions of systems, which are addressed in this section, are described in the indicated sections.

- Containment Vessel Internal Spray System (Section 2.3.2.1)
- Safety Injection System (Section 2.3.2.2)
- Residual Heat Removal System (Section 2.3.2.3)

Table 3.2.1, Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of NUREG-1801, provides the summary of the programs evaluated in NUREG-1801 for the Engineered Safety Features components that are relied on for license renewal.

This table uses the format described in Section 3.0 above.

3.2.2 RESULTS

The following tables summarize the results of the aging management review for systems in the Engineered Safety Features Systems group.

Table 3.2.2-1, Containment Vessel Internal Spray - Aging Management Evaluation

Table 3.2.2-2, Safety Injection - Aging Management Evaluation

Table 3.2.2-3, Residual Heat Removal - Aging Management Evaluation

The materials from which components are fabricated, the environments to which components 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 of Section 3.2.2.1, Materials, Environment, Aging Effects Requiring Management and Aging Management Programs:

Section 3.2.2.1.1, Containment Vessel Internal Spray System

Section 3.2.2.1.2, Safety Injection System

Section 3.2.2.1.3, Residual Heat Removal System

3.2.2.1 MATERIALS, ENVIRONMENT, AGING EFFECTS REQUIRING MANAGEMENT AND AGING MANAGEMENT PROGRAMS

3.2.2.1.1 Containment Vessel Internal Spray System

Materials

The materials of construction for the Containment Vessel Internal Spray System component types are:

- Stainless Steel
- Steel

Environment

The Containment Vessel Internal Spray System component types are exposed to the following environments:

- Air-indoor uncontrolled
- Air-moist
- Borated water leakage
- Treated water-closed cycle cooling
- Treated water-primary

Aging Effects Requiring Management

The following aging effects, associated with the Containment Vessel Internal Spray System, 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 Containment Vessel Internal Spray System component types:

- Bolting Integrity
- Boric Acid Corrosion

- Closed-Cycle Cooling Water System
- External Surfaces Monitoring
- Primary Water Chemistry
- Selective Leaching of Materials
- Work Control Process

3.2.2.1.2 Safety Injection System

Materials

The materials of construction for the Safety Injection System component types are:

- Copper Alloys
- Glass
- Stainless Steel
- Steel

Environment

The Safety Injection System component types are exposed to the following environments:

- Air-indoor uncontrolled
- Air-moist
- Borated water leakage
- Concrete
- Gas-inert
- Lube oil
- Raw water
- Treated water-closed cycle cooling
- Treated water-primary

Aging Effects Requiring Management

The following aging effects, associated with the Safety Injection System, require management:

- Cracking
- Cumulative fatigue damage
- Loss of fracture toughness
- Loss of material
- Loss of preload
- Reduction of heat transfer

Aging Management Programs

The following aging management programs manage the aging effects for the Safety Injection System component types:

- ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD
- Bolting Integrity
- Boric Acid Corrosion
- Closed-Cycle Cooling Water System
- External Surfaces Monitoring
- Lubricating Oil Analysis
- Open-Cycle Cooling Water System
- Primary Water Chemistry
- Selective Leaching of Materials
- Work Control Process

3.2.2.1.3 Residual Heat Removal System

Materials

The materials of construction for the Residual Heat Removal System component types are:

- Stainless Steel
- Steel

Environment

The Residual Heat Removal System component types are exposed to the following environments:

- Air-indoor uncontrolled
- Borated water leakage
- Treated water-closed cycle cooling
- Treated water-primary

Aging Effects Requiring Management

The following aging effects, associated with the Residual Heat Removal System, require management:

- Cracking
- Cumulative fatigue damage
- Loss of fracture toughness
- Loss of material
- Loss of preload
- Reduction of heat transfer

Aging Management Programs

The following aging management programs manage the aging effects for the Residual Heat Removal System component types:

- ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD
- Bolting Integrity
- Boric Acid Corrosion
- Closed-Cycle Cooling Water System
- External Surfaces Monitoring
- Primary Water Chemistry
- Selective Leaching of Materials
- Work Control Process

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 in the license renewal application. For the Engineered Safety Features Systems, those programs are addressed in the following sections.

3.2.2.2.1 Cumulative Fatigue Damage

Fatigue is a TLAA as defined in 10 CFR 54.3. TLAAs are required to be evaluated in accordance with 10 CFR 54.21(c). The evaluation of this TLAA is addressed separately in Section 4.3, Metal Fatigue.

3.2.2.2.2 Loss of Material due to Cladding Breach

The cladding failures described in NUREG-1801 are based on NRC Information Notice 94-63, which describes cladding breach of the high-head safety injection pumps at North Anna Power Station. The pumps at North Anna were designed to perform the high-head safety injection function and the normal charging to the Reactor Coolant System. The failures at North Anna were related to the manufacturing at the Pacific Pump Division of Dresser Industries and not related to aging. The safety injection pumps at the Kewaunee Power Station are only designed to perform the safety injection function and were manufactured by Sulzer Bingham. There is no operating experience related to loss of material due to cladding breach in Sulzer Bingham pumps. Therefore, this item is not applicable.

3.2.2.2.3 Loss of Material due to Pitting and Crevice Corrosion

3.2.2.2.3.1 Loss of Material due to Pitting and Crevice Corrosion

Stainless steel containment isolation piping and component internal surfaces exposed to treated water environment are evaluated for aging management in their respective mechanical systems.

3.2.2.2.3.2 Loss of Material due to Pitting and Crevice Corrosion

The Engineered Safety Features Systems do not have any components fabricated from stainless steel and exposed to a soil environment. Therefore, this item is not applicable.

3.2.2.2.3.3 Loss of Material due to Pitting and Crevice Corrosion

Applicable to BWR Only

3.2.2.2.3.4 Loss of Material due to Pitting and Crevice Corrosion

Loss of material from pitting and crevice corrosion of the stainless steel and copper-alloy components exposed to lubricating oil in the Safety Injection System is managed by the Lubricating Oil Analysis program. In lieu of a one-time inspection, the Work Control Process program is used to provide confirmation of the effectiveness of the Lubricating Oil Analysis program. The Work Control Process program provides the opportunity to visually inspect the internal surfaces of components constructed of typical system materials and exposed to typical system environments, including stagnant locations, during preventive and corrective maintenance activities on an ongoing basis.

The Work Control Process program provides input to the Corrective Action program if aging effects are identified. The Corrective Action program would evaluate the cause and extent of condition and, if required, recommend enhancements to ensure continued effectiveness of the Lubricating Oil program.

3.2.2.2.3.5 Loss of Material due to Pitting and Crevice Corrosion

This item addresses the exterior of a tank bottom that may have its moisture barrier breached and exposed to rain water or other sources of raw water. The refueling water storage tank is located inside the Auxiliary Building and is not exposed to a raw water environment. Based on plant-specific operating experience, the tank has not been exposed to any moisture that could collect underneath the tank. Therefore, this item is not applicable.

3.2.2.2.3.6 Loss of Material due to Pitting and Crevice Corrosion

The loss of material due to pitting and crevice corrosion for stainless steel piping exposed to internal condensation or air-moist environment is managed by the Work Control Process program. The Work Control Process program provides the opportunity to visually inspect the internal surfaces of components constructed of typical system materials and exposed to typical system environments during preventive and corrective maintenance activities on an ongoing basis. The Work Control Process program provide input to the Corrective Action program if aging effects are identified. The Corrective Action program would evaluate the cause and extent of condition.

3.2.2.2.4 Reduction of Heat Transfer due to Fouling

3.2.2.2.4.1 Reduction of Heat Transfer due to Fouling

Reduction of heat transfer of the copper alloy tubes of the emergency diesel generator are managed by the Lubricating Oil Analysis program. In lieu of a one-time inspection, the Work Control Process program is used to provide confirmation of the effectiveness of the Lubricating Oil Analysis program. The Work Control Process program provides the opportunity to visually inspect the internal surfaces of components constructed of typical system materials and exposed to typical system environments, including stagnant locations, during preventive and corrective maintenance activities on an ongoing basis.

The Work Control Process program provides input to the Corrective Action program if aging effects are identified. The Corrective Action program would evaluate the cause and extent of condition and, if required, recommend enhancements to ensure continued effectiveness of the Lubricating Oil Analysis program.

3.2.2.2.4.2 Reduction of Heat Transfer due to Fouling

Reduction of heat transfer of the stainless steel heat exchanger tubes exposed to treated water in the containment vessel internal spray pump, residual heat removal and safety injection gland seal heat exchangers is managed by the Primary Water Chemistry program. In lieu of a one-time inspection, the Work Control Process program is used to provide confirmation of the effectiveness of the Primary Water Chemistry program. The Work Control Process program provides the opportunity to visually inspect the internal surfaces of components (including heat exchangers) constructed of typical system materials and exposed to typical system environments during preventive and corrective maintenance activities on an ongoing basis.

The Work Control Process program provides input to the Corrective Action program if aging effects are identified. The Corrective Action program would evaluate the cause and extent of condition and, if required, recommend enhancements to ensure continued effectiveness of the Primary Water Chemistry program.

3.2.2.2.5 Hardening and Loss of Strength due to Elastomer Degradation

Applicable to BWR Only

3.2.2.2.6 Loss of Material due to Erosion

This item specifically addresses erosion of orifices used in applications where centrifugal charging pumps are used as high-head safety injection pumps. The installed safety injection pumps are not used as the normal charging pumps. In addition, the charging pumps are positive displacement pumps and they do not have miniflow recirculation orifices. Therefore, this item is not applicable.

3.2.2.2.7 Loss of Material due to General Corrosion and Fouling

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 Loss of material due to General, Pitting, and Crevice Corrosion

Applicable to BWR Only

3.2.2.2.8.2 Loss of material due to General, Pitting, and Crevice Corrosion

Steel containment isolation piping, piping components and piping elements internal surfaces exposed to treated water environment are evaluated for aging management in their respective mechanical systems.

3.2.2.2.8.3 Loss of material due to General, Pitting, and Crevice Corrosion

Loss of material from general, pitting and crevice corrosion of the steel components exposed to lubricating oil is managed by the Lubricating Oil Analysis program. In lieu of a one-time inspection, the Work Control Process program is used to provide confirmation of the effectiveness of the Lubricating Oil Analysis program. The Work Control Process program provides the opportunity to visually inspect the internal surfaces of components constructed of typical system materials and exposed to typical system environments, including stagnant locations, during preventive and corrective maintenance activities on an ongoing basis.

The Work Control Process program provides input to the Corrective Action program if aging effects are identified. The Corrective Action program would evaluate the cause and extent of condition and, if required, recommend enhancements to ensure continued effectiveness of the Lubricating Oil program.

3.2.2.2.9 Loss of material due to General, Pitting, Crevice, and Microbiologically-Influenced Corrosion (MIC)

Applicable to BWR Only

3.2.2.3 TIME-LIMITED AGING ANALYSIS

The TLAA identified below are associated with the Engineered Safety Features Systems. The section of the LRA that contains the TLAA review results is indicated in parenthesis.

- Metal Fatigue (Section 4.3)
- Leak-before Break (Section 4.7.3)

3.2.3 CONCLUSION

The components of Engineered Safety Features Systems that are subject to aging management review have been identified in accordance with the requirements of 10 CFR 54.4. The aging management programs selected to manage aging effects for the Engineered Safety Features Systems components are identified in the summary tables and Section 3.2.2.1, Materials, Environment, Aging Effects Requiring Management and Aging Management Programs.

A description of these aging management programs is provided in Appendix B, along with the demonstration that the identified aging effects will be managed for the period of extended operation.

Therefore, based on the programs provided in Appendix B, the effects of aging associated with the Engineered Safety Features Systems components will be adequately managed so that there is reasonable assurance that the intended function(s) will be maintained consistent with the current licensing basis during the period of extended operation.

Results Tables: Engineered Safety Features Systems

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	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	Further evaluation is documented 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, verify that plant-specific program addresses cladding breach	NUREG-1801 item is not applicable. The safety injection pumps are only designed to perform the safety injection function as opposed to a charging function and were manufactured by Sulzer Bingham. Further evaluation is documented in Subsection 3.2.2.2.2.
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 and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Containment isolation piping and components are evaluated for aging management in their respective mechanical systems. Further evaluation is documented in Subsection 3.2.2.2.3.1.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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, plant-specific	NUREG-1801 item is not applicable. There are no ESF Systems components fabricated from stainless steel and exposed to a soil environment. Further evaluation is documented in Subsection 3.2.2.2.3.2.
3.2.1-05	BWR Only				
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 and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. Loss of material due to pitting and crevice corrosion is managed by the Work Control Process program, which is a plant-specific program, and the Lubricating Oil Analysis program. Further evaluation is documented in Subsection 3.2.2.2.3.4.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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, plant-specific	NUREG-1801 item not applicable. There are no ESF System partially encased stainless steel tanks located outside and exposed to raw water. Further evaluation is documented in Subsection 3.2.2.2.3.5.
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, plant-specific	Consistent with NUREG-1801. Loss of material due to pitting and crevice corrosion for stainless steel piping exposed to internal condensation or moist air is managed by the Work Control Process program, which is a plant-specific program. Further evaluation is documented in Subsection 3.2.2.2.3.6.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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 and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. Reduction of heat transfer due to fouling is managed by the Work Control Process program, which is a plant-specific program, and the Lubricating Oil Analysis program. Further evaluation is documented 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 and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. Reduction of heat transfer due to fouling is managed by the Work Control Process program, which is a plant-specific program, and the Primary Water Chemistry program. Further evaluation is documented in Subsection 3.2.2.2.4.2.
3.2.1-11	BWR Only				

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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, plant-specific	NUREG-1801 item is not applicable. The safety injection pumps are not used as the normal charging pumps. Further evaluation is documented in Subsection 3.2.2.2.6.
3.2.1-13	BWR Only				
3.2.1-14	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 and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Containment isolation piping, piping components, and piping elements are evaluated for aging management in their respective mechanical systems. Further evaluation is documented in Subsection 3.2.2.2.8.2.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	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 and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. Loss of material due to general, pitting, and crevice corrosion is managed by the Work Control Process program, which is a plant-specific program, and the Lubricating Oil Analysis program. Further evaluation is documented in Subsection 3.2.2.2.8.3.
3.2.1-17	BWR Only				
3.2.1-18	BWR Only				
3.2.1-19	BWR Only				
3.2.1-20	BWR Only				

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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	No	Consistent with NUREG-1801. Cracking due to cyclic loading or stress corrosion cracking of high strength steel closure bolting exposed to air with steam or water leakage is managed by the Bolting Integrity program.
3.2.1-22	Steel closure bolting exposed to air with steam or water leakage	Loss of material due to general corrosion	Bolting Integrity	No	Consistent with NUREG-1801. Loss of material due to general, pitting, and crevice corrosion of steel closure bolting exposed to air-indoor uncontrolled is managed by the Bolting Integrity program.
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	No	Consistent with NUREG-1801. Loss of material due to general, pitting, and crevice corrosion of steel closure bolting exposed to air-indoor uncontrolled is managed by the Bolting Integrity program. There is no ESF steel bolting exposed to air-outdoor.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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	No	Consistent with NUREG-1801. Loss of preload due to thermal effects, gasket creep, and self-loosening of steel closure bolting exposed to air-indoor uncontrolled (external) is managed by the Bolting Integrity program
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	No	Consistent with NUREG-1801. Cracking due to stress corrosion cracking was only determined to be applicable to the heat exchanger tubing exposed to closed cycle cooling water and is managed by Closed-Cycle Cooling Water System program, which takes exception to the NUREG-1801 AMP, and Work Control Process program, which is a plant-specific program.
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	No	Containment isolation piping and components are evaluated for aging management in their respective mechanical systems.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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	No	Consistent with NUREG-1801. Loss of material due to general, pitting, crevice, and galvanic corrosion for steel heat exchanger components exposed to closed cycle cooling water is managed by the Closed-Cycle Cooling Water System program, which takes exception to the NUREG-1801 AMP and the Work Control Process program, which is a plant-specific program.
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	No	Consistent with NUREG-1801. Loss of material due to pitting and crevice corrosion for stainless steel components exposed to closed cycle cooling water is managed by the Closed-Cycle Cooling Water System program, which takes exception to the NUREG-1801 AMP and the Work Control Process program, which is a plant-specific program.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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	No	NUREG-1801 Item is not applicable. There are no ESF System components fabricated from copper alloy and exposed to closed cycle cooling water.
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	No	Consistent with NUREG-1801. Reduction of heat transfer due to fouling for stainless steel components exposed to closed cycle cooling water is managed by the Closed-Cycle Cooling Water System program, which takes exception to the NUREG-1801 AMP and the Work Control Process program, which is a plant-specific program. There are no ESF heat exchanger components fabricated from copper alloy and exposed to closed cycle cooling water.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	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	No	Consistent with NUREG-1801. Loss of material due to general corrosion for the external surfaces of steel components is managed by the External Surfaces Monitoring program.
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	No	NUREG-1801 Item is not applicable. There are no ESF steel piping or ducting components fabricated from steel and internally exposed to air-indoor uncontrolled.
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	No	Loss of material due to general, pitting, and crevice corrosion for the internal surfaces of steel encapsulation components is managed by the Work Control Process program, which is a plant-specific program.
3.2.1-34	BWR Only				

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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 micro-biologically-influenced corrosion, and fouling	Open-Cycle Cooling Water System	No	Containment isolation components fabricated from steel and exposed to open cycle cooling water are evaluated for aging management in their respective mechanical systems.
3.2.1-36	Steel heat exchanger components exposed to raw water	Loss of material due to general, pitting, crevice, galvanic, and micro-biologically-influenced corrosion, and fouling	Open-Cycle Cooling Water System	No	NUREG-1801 item is not applicable. There are no ESF System steel heat exchanger components exposed to raw water.
3.2.1-37	Stainless steel piping, piping components, and piping elements exposed to raw water	Loss of material due to pitting, crevice, and micro-biologically-influenced corrosion	Open-Cycle Cooling Water System	No	Loss of material due to pitting, crevice, and microbiologically-influenced corrosion for the stainless steel piping from the Reactor Containment Vessel sump to the safety injection pumps that is exposed to raw water is managed by the Work Control Process program, which is a plant-specific program.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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 micro-biologically-influenced corrosion, and fouling	Open-Cycle Cooling Water System	No	Containment isolation components fabricated from stainless steel and exposed to open cycle cooling water are evaluated for aging management in their respective mechanical systems.
3.2.1-39	Stainless steel heat exchanger components exposed to raw water	Loss of material due to pitting, crevice, and micro-biologically-influenced corrosion, and fouling	Open-Cycle Cooling Water System	No	Loss of material due to pitting, crevice, and microbiologically-influenced corrosion, and fouling for stainless steel heat exchangers exposed to raw water is managed by the Work Control Process program, which is a plant-specific program.
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	No	NUREG-1801 item is not applicable. There are no ESF heat exchanger tubes fabricated from steel or stainless steel and exposed to open-cycle cooling water.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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	No	Consistent with NUREG-1801. There are no ESF system components fabricated from copper alloy and exposed to closed cycle cooling water. The Diesel Generator System copper alloy >15% Zn piping, piping components, piping elements, and heat exchanger components exposed to closed cycle cooling water are managed by the Selective Leaching of Materials program.
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	No	Consistent with NUREG-1801. Loss of material due to selective leaching for gray cast iron components exposed to close-cycle cooling water are managed by the Selective Leaching of Materials program.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	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	No	NUREG-1801 Item is not applicable. There are no ESF System components fabricated from gray cast iron and exposed to soil.
3.2.1-44	Gray cast iron motor cooler exposed to treated water	Loss of material due to selective leaching	Selective Leaching of Materials	No	NUREG-1801 Item is not applicable. There are no ESF motor coolers fabricated from gray cast iron and exposed to treated water.
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	No	Consistent with NUREG-1801. Loss of material due to boric acid corrosion for copper alloy with >15% Zn, and steel external surfaces are managed by the Boric Acid Corrosion program. There are no ESF System components fabricated from aluminum.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	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	No	Loss of material due to boric acid corrosion for the interior surfaces of steel encapsulation components are managed by the Work Control Process program, which is a plant-specific program.
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	Loss of fracture toughness due to thermal aging embrittlement of cast austenitic stainless steel valves in the SI and RHR system are managed by the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program, which takes exception to the NUREG-1801 AMP.
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	No	Consistent with NUREG-1801. Cracking due to stress corrosion cracking for stainless steel components are managed by the Work Control Process program, which is a plant-specific program and the Primary Water Chemistry program.

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	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	No	Consistent with NUREG-1801. Loss of material due to pitting and crevice corrosion for stainless steel components are managed by the Work Control Process program, which is a plant-specific program and the Primary Water Chemistry program.
3.2.1-50	Aluminum piping, piping components, and piping elements exposed to air- indoor uncontrolled (internal/external)	None	None	NA - No AEM or AMP	Consistent with NUREG-1801. There are no aging effects associated with aluminum components exposed to air-indoor uncontrolled.
3.2.1-51	Galvanized steel ducting exposed to air – indoor controlled (external)	None	None	NA - No AEM or AMP	NUREG-1801 Item is not applicable. There are no ESF System components fabricated from galvanized steel and exposed to air-indoor controlled (external).

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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 - No AEM or AMP	Consistent with NUREG-1801. There are no aging effects associated with Glass exposed to air – indoor uncontrolled (external), lubricating oil, raw water, treated water, or treated borated water.
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 - No AEM or AMP	Consistent with NUREG-1801. There are no aging effects associated with stainless steel, or copper alloy ESF System components exposed to air-indoor uncontrolled.
3.2.1-54	Steel piping, piping components, and piping elements exposed to air – indoor controlled (external)	None	None	NA - No AEM or AMP	NUREG-1801 item is not applicable. There are no ESF System components fabricated from steel and exposed to air-indoor controlled (external).

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-55	Steel and stainless steel piping, piping components, and piping elements in concrete	None	None	NA - No AEM or AMP	Consistent with NUREG-1801. There are no aging effects associated with steel or stainless steel ESF components in concrete.
3.2.1-56	Steel, stainless steel, and copper alloy piping, piping components, and piping elements exposed to gas	None	None	NA - No AEM or AMP	Consistent with NUREG-1801. There are no aging effects associated with the stainless steel ESF components exposed to gas.
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 - No AEM or AMP	Consistent with NUREG-1801. There are no aging effects associated with stainless steel components exposed to air with borated water leakage. Additionally, ESF System components fabricated from copper alloy are assumed to be greater than 15% Zn and are evaluated in Table 3.2.1 Item 3.2.1-45

Results Tables: Engineered Safety Features Systems AMR Results

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.2.2-1: Engineered Safety Features - Containment Vessel Internal Spray - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Bolting	PB	Steel	(E) Air-indoor uncontrolled	Cracking/cyclic loading, stress corrosion cracking	Bolting Integrity	V.E-03	3.2.1-21	A
				Loss of material/general, pitting, and crevice corrosion	Bolting Integrity	V.E-04	3.2.1-23	A
				Loss of preload/thermal effects, gasket creep, and self-loosening	Bolting Integrity	V.E-05	3.2.1-24	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	V.E-02	3.2.1-45	A
Caustic Additive Filter Housing	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	V.E-07	3.2.1-31	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	V.E-09	3.2.1-45	A
			(I) Treated water-primary	Loss of material/general, pitting, and crevice corrosion	Primary Water Chemistry			H, 1
					Work Control Process			H, 1
Caustic Additive Recirculation & Fill Pump	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	V.E-07	3.2.1-31	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	V.E-09	3.2.1-45	A
			(I) Treated water-primary	Loss of material/general, pitting, and crevice corrosion	Primary Water Chemistry			H, 1
					Work Control Process			H, 1

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.2.2-1: Engineered Safety Features - Containment Vessel Internal Spray - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Caustic Additive Standpipe	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	V.E-07	3.2.1-31	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	V.E-09	3.2.1-45	A
			(I) Treated water-primary	Loss of material/general, pitting, and crevice corrosion	Primary Water Chemistry			H, 1
					Work Control Process			H, 1
Caustic Fill Tank	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	V.E-07	3.2.1-31	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	V.E-09	3.2.1-45	A
			(I) Treated water-primary	Loss of material/general, pitting, and crevice corrosion	Primary Water Chemistry			H, 1
					Work Control Process			H, 1

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.2.2-1: Engineered Safety Features - Containment Vessel Internal Spray - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Containment Spray Pump Gland Seal Coolers (Shell)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	V.E-07	3.2.1-31	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	V.E-09	3.2.1-45	A
			(I) Treated water-closed cycle cooling	Loss of material/general, pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	V.A-09	3.2.1-27	B
					Work Control Process	V.A-09	3.2.1-27	E
				Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H
					Work Control Process			H
				Loss of material/selective leaching	Selective Leaching of Materials	EP-052	3.2.1-42	A, S3

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.2.2-1: Engineered Safety Features - Containment Vessel Internal Spray - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Containment Spray Pump Gland Seal Coolers (Tubing)	HT; PB	Stainless Steel	(E) Treated water-closed cycle cooling	Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H
					Work Control Process			H
				Loss of material/pitting and crevice corrosion	Closed-Cycle Cooling Water System	V.A-07	3.2.1-28	B
					Work Control Process	V.A-07	3.2.1-28	E
				Reduction of heat transfer/fouling	Closed-Cycle Cooling Water System	V.A-13	3.2.1-30	B
					Work Control Process	V.A-13	3.2.1-30	E
			(I) Treated water-primary	Loss of material/pitting and crevice corrosion	Primary Water Chemistry	V.A-27	3.2.1-49	A
					Work Control Process	V.A-27	3.2.1-49	E
				Reduction of heat transfer/fouling	Primary Water Chemistry	V.A-16	3.2.1-10	A
					Work Control Process	V.A-16	3.2.1-10	E
Containment Spray Pumps	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	V.F-12	3.2.1-53	A
			(E) Borated water leakage	None	None	V.F-13	3.2.1-57	A
			(I) Treated water-primary	Loss of material/pitting and crevice corrosion	Primary Water Chemistry	V.A-27	3.2.1-49	A
					Work Control Process	V.A-27	3.2.1-49	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.2.2-1: Engineered Safety Features - Containment Vessel Internal Spray - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Flow Elements	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	V.F-12	3.2.1-53	A
			(E) Borated water leakage	None	None	V.F-13	3.2.1-57	A
			(I) Treated water-primary	Loss of material/pitting and crevice corrosion	Primary Water Chemistry	V.A-27	3.2.1-49	A
					Work Control Process	V.A-27	3.2.1-49	E
Flow Orifices	PB; RF	Stainless Steel	(E) Air-indoor uncontrolled	None	None	V.F-12	3.2.1-53	A
			(E) Borated water leakage	None	None	V.F-13	3.2.1-57	A
			(I) Treated water-primary	Loss of material/pitting and crevice corrosion	Primary Water Chemistry	V.A-27	3.2.1-49	A
					Work Control Process	V.A-27	3.2.1-49	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.2.2-1: Engineered Safety Features - Containment Vessel Internal Spray - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Pipe	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	V.F-12	3.2.1-53	A
			(E) Borated water leakage	None	None	V.F-13	3.2.1-57	A
			(I) Air-moist	Loss of material/pitting and crevice corrosion	Work Control Process	V.A-26	3.2.1-08	E
			(I) Treated water-primary	Loss of material/pitting and crevice corrosion	Primary Water Chemistry	V.A-27	3.2.1-49	A
					Work Control Process	V.A-27	3.2.1-49	E
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	V.E-07	3.2.1-31	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	V.E-09	3.2.1-45	A
			(I) Treated water-primary	Loss of material/general, pitting, and crevice corrosion	Primary Water Chemistry			H, 1
					Work Control Process			H, 1
Spray Nozzles	SP	Stainless Steel	(E) Air-indoor uncontrolled	None	None	V.F-12	3.2.1-53	A
			(E) Borated water leakage	None	None	V.F-13	3.2.1-57	A
			(I) Air-indoor uncontrolled	None	None	V.F-12	3.2.1-53	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.2.2-1: Engineered Safety Features - Containment Vessel Internal Spray - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Tubing	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	V.F-12	3.2.1-53	A
			(E) Borated water leakage	None	None	V.F-13	3.2.1-57	A
			(I) Treated water-primary	Loss of material/pitting and crevice corrosion	Primary Water Chemistry	V.A-27	3.2.1-49	A
					Work Control Process	V.A-27	3.2.1-49	E
Valves	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	V.F-12	3.2.1-53	A
			(E) Borated water leakage	None	None	V.F-13	3.2.1-57	A
			(I) Treated water-primary	Loss of material/pitting and crevice corrosion	Primary Water Chemistry	V.A-27	3.2.1-49	A
					Work Control Process	V.A-27	3.2.1-49	E
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	V.E-07	3.2.1-31	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	V.E-09	3.2.1-45	A
			(I) Treated water-primary	Loss of material/general, pitting, and crevice corrosion	Primary Water Chemistry			H, 1
					Work Control Process			H, 1

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.2.2-1 Notes:

Plant Standard Notes

Note - The following plant standard notes have generic applicability, but may or may not be used for each SSC:

S1. Thermal embrittlement is only applicable to CASS components that are subject to temperatures in excess of 482°F.

S2. Cracking due to SCC is only applicable to stainless steel components exposed to temperatures greater than 140°F.

S3. Selective leaching is applicable to the material group 'Steel,' but only for gray cast iron components.

System Specific Notes

1. This portion of the Chemical Injection System is included with the Containment Vessel Internal Spray system and it contains demineralized water with NaOH added. The treated water in Chemical Injection portion of the system does not contain any boric acid.

Industry Standard Notes

See last page of Section 3.2 tables.

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.2.2-2: Engineered Safety Features - Safety Injection - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Accumulators (Steel with stainless steel clad.)	PB	Stainless Steel	(I) Treated water-primary	Loss of material/pitting and crevice corrosion	Primary Water Chemistry	V.D1-30	3.2.1-49	A
					Work Control Process	V.D1-30	3.2.1-49	E
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	V.E-07	3.2.1-31	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	V.E-09	3.2.1-45	A
Bolting	PB	Steel	(E) Air-indoor uncontrolled	Cracking/cyclic loading, stress corrosion cracking	Bolting Integrity	V.E-03	3.2.1-21	A
				Loss of material/general, pitting, and crevice corrosion	Bolting Integrity	V.E-04	3.2.1-23	A
				Loss of preload/thermal effects, gasket creep, and self-loosening	Bolting Integrity	V.E-05	3.2.1-24	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	V.E-02	3.2.1-45	A
Reactor Containment Vessel Sump Strainers	FLT	Stainless Steel	(E) Air-indoor uncontrolled	None	None	V.F-12	3.2.1-53	A
			(E) Borated water leakage	None	None	V.F-13	3.2.1-57	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.2.2-2: Engineered Safety Features - Safety Injection - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Flow Elements	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	V.F-12	3.2.1-53	A
			(E) Borated water leakage	None	None	V.F-13	3.2.1-57	A
			(I) Treated water-primary	Loss of material/pitting and crevice corrosion	Primary Water Chemistry	V.D1-30	3.2.1-49	A
					Work Control Process	V.D1-30	3.2.1-49	E
Flow Indicators	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	V.F-12	3.2.1-53	A
			(E) Borated water leakage	None	None	V.F-13	3.2.1-57	A
			(I) Treated water-primary	Loss of material/pitting and crevice corrosion	Primary Water Chemistry	V.D1-30	3.2.1-49	A
					Work Control Process	V.D1-30	3.2.1-49	E
Flow Orifices	PB; RF	Stainless Steel	(E) Air-indoor uncontrolled	None	None	V.F-12	3.2.1-53	A
			(E) Borated water leakage	None	None	V.F-13	3.2.1-57	A
			(I) Treated water-primary	Loss of material/pitting and crevice corrosion	Primary Water Chemistry	V.D1-30	3.2.1-49	A
					Work Control Process	V.D1-30	3.2.1-49	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.2.2-2: Engineered Safety Features - Safety Injection - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Pipe	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	V.F-12	3.2.1-53	A
			(E) Borated water leakage	None	None	V.F-13	3.2.1-57	A
			(E) Concrete	None	None	V.F-14	3.2.1-55	A
			(I) Gas-inert	None	None	V.F-15	3.2.1-56	A, 1
			(I) Lube oil	Loss of material/pitting and crevice corrosion	Lubricating Oil Analysis	V.D1-24	3.2.1-06	A
					Work Control Process	V.D1-24	3.2.1-06	E
			(I) Raw water	Loss of material/pitting, crevice, and microbiologically influenced corrosion	Work Control Process	V.D1-25	3.2.1-37	E, 2
			(I) Treated water-primary	Cracking/stress corrosion cracking	Primary Water Chemistry	V.D1-31	3.2.1-48	A, S2
					Work Control Process	V.D1-31	3.2.1-48	E, S2
				Cumulative fatigue damage/fatigue	TLAA	V.D1-27	3.2.1-01	A
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	V.D1-30	3.2.1-49	A
					Work Control Process	V.D1-30	3.2.1-49	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.2.2-2: Engineered Safety Features - Safety Injection - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Pipe	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	V.E-07	3.2.1-31	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	V.E-09	3.2.1-45	A
			(I) Lube oil	Loss of material/general, pitting, and crevice corrosion	Lubricating Oil Analysis	V.D1-28	3.2.1-16	A
					Work Control Process	V.D1-28	3.2.1-16	E
				Loss of material/selective leaching	Selective Leaching of Materials			H, S3
Pipe (Class 1)	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	V.F-12	3.2.1-53	A
			(E) Borated water leakage	None	None	V.F-13	3.2.1-57	A
			(I) Treated water-primary	Cracking/stress corrosion cracking, thermal and mechanical loading	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	R-002	3.1.1-70	B, S2
					Primary Water Chemistry	R-002	3.1.1-70	A, S2
				Cumulative fatigue damage/fatigue	TLAA	V.D1-27	3.2.1-01	A
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	V.D1-30	3.2.1-49	A
					Work Control Process	V.D1-30	3.2.1-49	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.2.2-2: Engineered Safety Features - Safety Injection - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Refueling Water Storage Tank	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	V.F-12	3.2.1-53	A
			(E) Borated water leakage	None	None	V.F-13	3.2.1-57	A
			(I) Treated water-primary	Loss of material/pitting and crevice corrosion	Primary Water Chemistry	V.D1-30	3.2.1-49	A
					Work Control Process	V.D1-30	3.2.1-49	E
Safety Injection Pump Gland Seal Coolers (Shell)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	V.E-07	3.2.1-31	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	V.E-09	3.2.1-45	A
			(I) Treated water-closed cycle cooling	Loss of material/general, pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	V.D1-06	3.2.1-27	B
					Work Control Process	V.D1-06	3.2.1-27	E
				Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H
					Work Control Process			H
				Loss of material/selective leaching	Selective Leaching of Materials	V.D1-20	3.2.1-42	A, S3

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.2.2-2: Engineered Safety Features - Safety Injection - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Safety Injection Pump Gland Seal Coolers (Tubing)	HT; PB	Stainless Steel	(E) Treated water-closed cycle cooling	Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H
					Work Control Process			H
				Loss of material/pitting and crevice corrosion	Closed-Cycle Cooling Water System	V.D1-04	3.2.1-28	B
					Work Control Process	V.D1-04	3.2.1-28	E
				Reduction of heat transfer/fouling	Closed-Cycle Cooling Water System	V.D1-09	3.2.1-30	B
					Work Control Process	V.D1-09	3.2.1-30	E
			(I) Treated water-primary	Loss of material/pitting and crevice corrosion	Primary Water Chemistry	V.D1-30	3.2.1-49	C
					Work Control Process	V.D1-30	3.2.1-49	E
Safety Injection Pumps (Steel with stainless steel clad.)	PB	Stainless Steel	(I) Treated water-primary	Loss of material/pitting and crevice corrosion	Primary Water Chemistry	V.D1-30	3.2.1-49	A
					Work Control Process	V.D1-30	3.2.1-49	E
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	V.E-07	3.2.1-31	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	V.E-09	3.2.1-45	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.2.2-2: Engineered Safety Features - Safety Injection - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
SI Pump Lube Oil Reservoirs	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	V.E-07	3.2.1-31	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	V.E-09	3.2.1-45	A
			(I) Lube oil	Loss of material/general, pitting, and crevice corrosion	Lubricating Oil Analysis	V.D1-28	3.2.1-16	C
					Work Control Process	V.D1-28	3.2.1-16	E
				Loss of material/selective leaching	Selective Leaching of Materials			H, S3
Sight Glass	PB	Glass	(E) Air-indoor uncontrolled	None	None	V.F-06	3.2.1-52	A
			(I) Lube oil	None	None	V.F-07	3.2.1-52	A
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	V.E-07	3.2.1-31	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	V.E-09	3.2.1-45	A
			(I) Lube oil	Loss of material/general, pitting, and crevice corrosion	Lubricating Oil Analysis	V.D1-28	3.2.1-16	C
					Work Control Process	V.D1-28	3.2.1-16	E
				Loss of material/selective leaching	Selective Leaching of Materials			H, S3

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.2.2-2: Engineered Safety Features - Safety Injection - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Tubing	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	V.F-12	3.2.1-53	A
			(E) Borated water leakage	None	None	V.F-13	3.2.1-57	A
			(I) Treated water-primary	Loss of material/pitting and crevice corrosion	Primary Water Chemistry	V.D1-30	3.2.1-49	A
					Work Control Process	V.D1-30	3.2.1-49	E
Valve Enclosures	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	V.E-07	3.2.1-31	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	V.E-09	3.2.1-45	A
			(I) Air-indoor uncontrolled	Loss of material/general, pitting, and crevice corrosion	Work Control Process	EP-042	3.2.1-33	E
			(I) Air-moist	Loss of material/general, pitting, crevice and boric acid corrosion	Work Control Process	EP-043	3.2.1-46	A, 4

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.2.2-2: Engineered Safety Features - Safety Injection - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Valves	PB	Copper Alloys	(E) Air-indoor uncontrolled	None	None	V.F-03	3.2.1-53	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	V.E-11	3.2.1-45	A
			(I) Lube oil	Loss of material/pitting and crevice corrosion	Lubricating Oil Analysis	V.D1-18	3.2.1-06	A
					Work Control Process	V.D1-18	3.2.1-06	E
				Loss of material/selective leaching	Selective Leaching of Materials			H
		Stainless Steel	(E) Air-indoor uncontrolled	None	None	V.F-12	3.2.1-53	A
			(E) Borated water leakage	None	None	V.F-13	3.2.1-57	A
			(I) Gas-inert	None	None	V.F-15	3.2.1-56	A, 1
			(I) Treated water-primary	Cracking/stress corrosion cracking	Primary Water Chemistry	V.D1-31	3.2.1-48	A, S2
					Work Control Process	V.D1-31	3.2.1-48	E, S2
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	V.D1-30	3.2.1-49	A
					Work Control Process	V.D1-30	3.2.1-49	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.2.2-2: Engineered Safety Features - Safety Injection - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Valves (Class 1)	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	V.F-12	3.2.1-53	A
			(E) Borated water leakage	None	None	V.F-13	3.2.1-57	A
			(I) Treated water-primary	Cracking/stress corrosion cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	R-009	3.1.1-68	B, S2
					Primary Water Chemistry	R-009	3.1.1-68	A, S2
				Loss of fracture toughness/thermal aging embrittlement	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	V.D1-16	3.2.1-47	E, S1, 3
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	V.D1-30	3.2.1-49	A
					Work Control Process	V.D1-30	3.2.1-49	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.2.2-2 Notes:

Plant Standard Notes

Note - The following plant standard notes have generic applicability, but may or may not be used for each SSC:

S1. Thermal embrittlement is only applicable to CASS components that are subject to temperatures in excess of 482°F.

S2. Cracking due to SCC is only applicable to stainless steel components exposed to temperatures greater than 140°F.

S3. Selective leaching is applicable to the material group 'Steel,' but only for gray cast iron components.

System Specific Notes

1. Piping and valves associated with adding nitrogen to SI accumulators.

2. The piping from the Reactor Containment Vessel sump is assumed to contain raw water because of the potential contaminants.

3. It is permissible to use the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program because NUREG 1801 Section XI.M12, "Thermal Aging Embrittlement of Cast Austenitic Stainless Steel," states that the ISI Program is adequate for managing pump casings and valve bodies.

4. "Air-moist" environment also considers the effects of borated water leakage.

Industry Standard Notes

See last page of Section 3.2 tables.

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.2.2-3: Engineered Safety Features - Residual Heat Removal - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Bolting	PB	Steel	(E) Air-indoor uncontrolled	Cracking/cyclic loading, stress corrosion cracking	Bolting Integrity	V.E-03	3.2.1-21	A
				Loss of material/general, pitting, and crevice corrosion	Bolting Integrity	V.E-04	3.2.1-23	A
				Loss of preload/thermal effects, gasket creep, and self-loosening	Bolting Integrity	V.E-05	3.2.1-24	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	V.E-02	3.2.1-45	A
Expansion Tanks	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	V.F-12	3.2.1-53	A
			(E) Borated water leakage	None	None	V.F-13	3.2.1-57	A
			(I) Air-indoor uncontrolled	None	None	V.F-12	3.2.1-53	A
Flow Elements	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	V.F-12	3.2.1-53	A
			(E) Borated water leakage	None	None	V.F-13	3.2.1-57	A
			(I) Treated water-primary	Cracking/stress corrosion cracking	Primary Water Chemistry	V.D1-31	3.2.1-48	A, S2
					Work Control Process	V.D1-31	3.2.1-48	E, S2
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	V.D1-30	3.2.1-49	A
					Work Control Process	V.D1-30	3.2.1-49	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.2.2-3: Engineered Safety Features - Residual Heat Removal - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Miniflow Orifice	PB; RF	Stainless Steel	(E) Air-indoor uncontrolled	None	None	V.F-12	3.2.1-53	A
			(E) Borated water leakage	None	None	V.F-13	3.2.1-57	A
			(I) Treated water-primary	Cracking/stress corrosion cracking	Primary Water Chemistry	V.D1-31	3.2.1-48	A, S2
					Work Control Process	V.D1-31	3.2.1-48	E, S2
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	V.D1-30	3.2.1-49	A
					Work Control Process	V.D1-30	3.2.1-49	E
Pipe	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	V.F-12	3.2.1-53	A
			(E) Borated water leakage	None	None	V.F-13	3.2.1-57	A
			(I) Treated water-primary	Cracking/stress corrosion cracking	Primary Water Chemistry	V.D1-31	3.2.1-48	A, S2
					Work Control Process	V.D1-31	3.2.1-48	E, S2
				Cumulative fatigue damage/fatigue	TLAA	V.D1-27	3.2.1-01	A
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	V.D1-30	3.2.1-49	A
					Work Control Process	V.D1-30	3.2.1-49	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.2.2-3: Engineered Safety Features - Residual Heat Removal - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Pipe (Class 1)	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	V.F-12	3.2.1-53	A
			(E) Borated water leakage	None	None	V.F-13	3.2.1-57	A
			(I) Treated water-primary	Cracking/stress corrosion cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	R-007	3.1.1-68	B, S2
					Primary Water Chemistry	R-007	3.1.1-68	A, S2
				Cumulative fatigue damage/fatigue	TLAA	V.D1-27	3.2.1-01	A
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	V.D1-30	3.2.1-49	A
					Work Control Process	V.D1-30	3.2.1-49	E
Residual Heat Exchangers (Channel Head)	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	V.F-12	3.2.1-53	C
			(E) Borated water leakage	None	None	V.F-13	3.2.1-57	C
			(I) Treated water-primary	Cracking/stress corrosion cracking	Primary Water Chemistry	V.D1-31	3.2.1-48	C, S2
					Work Control Process	V.D1-31	3.2.1-48	E, S2
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	V.D1-30	3.2.1-49	C
					Work Control Process	V.D1-30	3.2.1-49	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.2.2-3: Engineered Safety Features - Residual Heat Removal - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Residual Heat Exchangers (Shell)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	V.E-07	3.2.1-31	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	V.E-09	3.2.1-45	A
			(I) Treated water-closed cycle cooling	Loss of material/general, pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	V.D1-06	3.2.1-27	B
					Work Control Process	V.D1-06	3.2.1-27	E
				Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H
					Work Control Process			H
Residual Heat Exchangers (Tube Sheet)	PB	Stainless Steel	(E) Treated water-closed cycle cooling	Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H
					Work Control Process			H
				Loss of material/pitting and crevice corrosion	Closed-Cycle Cooling Water System	V.D1-04	3.2.1-28	B
					Work Control Process	V.D1-04	3.2.1-28	E
			(I) Treated water-primary	Cracking/stress corrosion cracking	Primary Water Chemistry	V.D1-31	3.2.1-48	C, S2
					Work Control Process	V.D1-31	3.2.1-48	E, S2
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	V.D1-30	3.2.1-49	C
					Work Control Process	V.D1-30	3.2.1-49	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.2.2-3: Engineered Safety Features - Residual Heat Removal - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Residual Heat Exchangers (Tubes)	HT; PB	Stainless Steel	(E) Treated water-closed cycle cooling	Cracking/stress corrosion cracking	Closed-Cycle Cooling Water System	V.D1-23	3.2.1-25	D
					Work Control Process	V.D1-23	3.2.1-25	E
				Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H
					Work Control Process			H
				Loss of material/pitting and crevice corrosion	Closed-Cycle Cooling Water System	V.D1-04	3.2.1-28	B
					Work Control Process	V.D1-04	3.2.1-28	E
				Reduction of heat transfer/fouling	Closed-Cycle Cooling Water System	V.D1-09	3.2.1-30	B
					Work Control Process	V.D1-09	3.2.1-30	E
			(I) Treated water-primary	Cracking/stress corrosion cracking	Primary Water Chemistry	V.D1-31	3.2.1-48	C, S2
					Work Control Process	V.D1-31	3.2.1-48	E, S2
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	V.D1-30	3.2.1-49	C
					Work Control Process	V.D1-30	3.2.1-49	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.2.2-3: Engineered Safety Features - Residual Heat Removal - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Residual Heat Removal Pumps	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	V.F-12	3.2.1-53	A
			(E) Borated water leakage	None	None	V.F-13	3.2.1-57	A
			(I) Treated water-primary	Cracking/stress corrosion cracking	Primary Water Chemistry	V.D1-31	3.2.1-48	A, S2
					Work Control Process	V.D1-31	3.2.1-48	E, S2
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	V.D1-30	3.2.1-49	A
					Work Control Process	V.D1-30	3.2.1-49	E
Rupture Disks	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	V.F-12	3.2.1-53	A
			(E) Borated water leakage	None	None	V.F-13	3.2.1-57	A
			(I) Air-indoor uncontrolled	None	None	V.F-12	3.2.1-53	A
			(I) Treated water-primary	Cracking/stress corrosion cracking	Primary Water Chemistry	V.D1-31	3.2.1-48	A, S2
					Work Control Process	V.D1-31	3.2.1-48	E, S2
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	V.D1-30	3.2.1-49	A
					Work Control Process	V.D1-30	3.2.1-49	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.2.2-3: Engineered Safety Features - Residual Heat Removal - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Shaft Seal Heat Exchangers (Shell)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	V.E-07	3.2.1-31	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	V.E-09	3.2.1-45	A
			(I) Treated water-closed cycle cooling	Loss of material/general, pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	V.D1-06	3.2.1-27	B
					Work Control Process	V.D1-06	3.2.1-27	E
				Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H
					Work Control Process			H
				Loss of material/selective leaching	Selective Leaching of Materials	V.D1-20	3.2.1-42	A, S3

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.2.2-3: Engineered Safety Features - Residual Heat Removal - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Shaft Seal Heat Exchangers (Tubing)	HT; PB	Stainless Steel	(E) Treated water-closed cycle cooling	Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H
					Work Control Process			H
				Loss of material/pitting and crevice corrosion	Closed-Cycle Cooling Water System	V.D1-04	3.2.1-28	B
					Work Control Process	V.D1-04	3.2.1-28	E
				Reduction of heat transfer/fouling	Closed-Cycle Cooling Water System	V.D1-09	3.2.1-30	B
					Work Control Process	V.D1-09	3.2.1-30	E
			(I) Treated water-primary	Cracking/stress corrosion cracking	Primary Water Chemistry	V.D1-31	3.2.1-48	C, S2
					Work Control Process	V.D1-31	3.2.1-48	E, S2
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	V.D1-30	3.2.1-49	C
					Work Control Process	V.D1-30	3.2.1-49	E
Tubing	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	V.F-12	3.2.1-53	A
			(E) Borated water leakage	None	None	V.F-13	3.2.1-57	A
			(I) Treated water-primary	Cracking/stress corrosion cracking	Primary Water Chemistry	V.D1-31	3.2.1-48	A, S2
					Work Control Process	V.D1-31	3.2.1-48	E, S2
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	V.D1-30	3.2.1-49	A
					Work Control Process	V.D1-30	3.2.1-49	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.2.2-3: Engineered Safety Features - Residual Heat Removal - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Valves	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	V.F-12	3.2.1-53	A
			(E) Borated water leakage	None	None	V.F-13	3.2.1-57	A
			(I) Treated water-primary	Cracking/stress corrosion cracking	Primary Water Chemistry	V.D1-31	3.2.1-48	A, S2
					Work Control Process	V.D1-31	3.2.1-48	E, S2
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	V.D1-30	3.2.1-49	A
					Work Control Process	V.D1-30	3.2.1-49	E
Valves (Class 1)	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	V.F-12	3.2.1-53	A
			(E) Borated water leakage	None	None	V.F-13	3.2.1-57	A
			(I) Treated water-primary	Cracking/stress corrosion cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	R-009	3.1.1-68	B, S2
					Primary Water Chemistry	R-009	3.1.1-68	A, S2
				Loss of fracture toughness/thermal aging embrittlement	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	V.D1-16	3.2.1-47	E, S1, 1
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	V.D1-30	3.2.1-49	A
					Work Control Process	V.D1-30	3.2.1-49	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.2.2-3 Notes:

Plant Standard Notes

Note - The following plant standard notes have generic applicability, but may or may not be used for each SSC:

S1. Thermal embrittlement is only applicable to CASS components that are subject to temperatures in excess of 482°F.

S2. Cracking due to SCC is only applicable to stainless steel components exposed to temperatures greater than 140°F.

S3. Selective leaching is applicable to the material group 'Steel,' but only for gray cast iron components.

System Specific Notes

1. It is permissible to use the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program because NUREG 1801 Section XI.M12, "Thermal Aging Embrittlement of Cast Austenitic Stainless Steel," states that the ISI Program is adequate for managing pump casings and valve bodies.

Industry Standard Notes

See last page of Section 3.2 tables.

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Notes for Tables 3.2.2-1 through 3.2.2-3

Industry 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 component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

D. Component is different, but 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 item for component, 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. (Not used. See discussion in Section 3.0)

G. Environment not in NUREG-1801 for this component and material. (Not used. See discussion in Section 3.0)

H. Aging effect not in NUREG-1801 for this component, material and environment combination.

I. Aging effect in NUREG-1801 for this component, material and environment combination is not applicable. (Not used. See discussion in Section 3.0)

J. Neither the component nor the material and environment combination is evaluated in NUREG-1801. (Not used. See discussion in Section 3.0)

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

3.3 AGING MANAGEMENT OF AUXILIARY SYSTEMS

3.3.1 INTRODUCTION

This section provides the results of the aging management review for those components identified in Section 2.3.3, Auxiliary Systems. The systems, or portions of systems, which are addressed in this section, are described in the indicated sections.

- New Fuel Storage (Section 2.3.3.1)
- Spent Fuel Storage (Section 2.3.3.2)
- Spent Fuel Pool Cooling System (Section 2.3.3.3)
- Fuel Handling System (Section 2.3.3.4)
- Cranes (Excluding Fuel Handling) System (Section 2.3.3.5)
- Service Water System (Section 2.3.3.6)
- Component Cooling System (Section 2.3.3.7)
- Station and Instrument Air System (Section 2.3.3.8)
- Chemical and Volume Control System (Section 2.3.3.9)
- Control Room Air Conditioning System (Section 2.3.3.10)
- Auxiliary Building Air Conditioning System (Section 2.3.3.11)
- Auxiliary Building Special Ventilation and Steam Exclusion System (Section 2.3.3.12)
- Auxiliary Building Ventilation System (Section 2.3.3.13)
- Reactor Building Ventilation System (Section 2.3.3.14)
- Turbine Building and Screenhouse Ventilation System (Section 2.3.3.15)
- Shield Building Ventilation System (Section 2.3.3.16)
- Technical Support Center Ventilation System (Section 2.3.3.17)
- Fire Protection System (Section 2.3.3.18)
- Diesel Generator System (Section 2.3.3.19)
- Circulating Water System (Section 2.3.3.20)
- Gaseous Waste Processing and Discharge System (Section 2.3.3.21)
- Liquid Waste Processing and Discharge System (Section 2.3.3.22)

- Radiation Monitoring System (Section 2.3.3.23)
- Makeup and Demineralized Water System (Section 2.3.3.24)
- Service Water Pretreatment System (Section 2.3.3.25)
- Miscellaneous Drains and Sumps System (Section 2.3.3.26)
- Miscellaneous Gas System (Section 2.3.3.27)
- Potable Water System (Section 2.3.3.28)
- Primary Sampling System (Section 2.3.3.29)

Table 3.3.1, Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801, provides the summary of the programs evaluated in NUREG-1801 for the Auxiliary Systems components that are relied on for license renewal.

This table uses the format described in Section 3.0 above.

3.3.2 RESULTS

The following tables summarize the results of the aging management review for systems in the Auxiliary System group:

Table 3.3.2-1, New Fuel Storage - Aging Management Evaluation

Table 3.3.2-2, Spent Fuel Storage - Aging Management Evaluation

Table 3.3.2-3, Spent Fuel Pool Cooling - Aging Management Evaluation

Table 3.3.2-4, Fuel Handling - Aging Management Evaluation

Table 3.3.2-5, Cranes (Excluding Fuel Handling) - Aging Management Evaluation

Table 3.3.2-6, Service Water - Aging Management Evaluation

Table 3.3.2-7, Component Cooling - Aging Management Evaluation

Table 3.3.2-8, Station and Instrument Air - Aging Management Evaluation

Table 3.3.2-9, Chemical and Volume Control - Aging Management Evaluation

Table 3.3.2-10, Control Room Air Conditioning - Aging Management Evaluation

Table 3.3.2-11, Auxiliary Building Air Conditioning - Aging Management Evaluation

Table 3.3.2-12, Auxiliary Building Special Ventilation and Steam Exclusion - Aging Management Evaluation

Table 3.3.2-13, Auxiliary Building Ventilation - Aging Management Evaluation

Table 3.3.2-14, Reactor Building Ventilation - Aging Management Evaluation

Table 3.3.2-15, Turbine Building and Screenhouse Ventilation - Aging Management Evaluation

Table 3.3.2-16, Shield Building Ventilation - Aging Management Evaluation

Table 3.3.2-17, Technical Support Center Ventilation - Aging Management Evaluation

Table 3.3.2-18, Fire Protection - Aging Management Evaluation

Table 3.3.2-19, Diesel Generator - Aging Management Evaluation

Table 3.3.2-20, Circulating Water - Aging Management Evaluation

Table 3.3.2-21, Gaseous Waste Processing and Discharge - Aging Management Evaluation

Table 3.3.2-22, Liquid Waste Processing and Discharge - Aging Management Evaluation

Table 3.3.2-23, Radiation Monitoring - Aging Management Evaluation

Table 3.3.2-24, Makeup and Demineralized Water - Aging Management Evaluation

Table 3.3.2-25, Service Water Pretreatment - Aging Management Evaluation

Table 3.3.2-26, Miscellaneous Drains and Sumps - Aging Management Evaluation

Table 3.3.2-27, Miscellaneous Gas - Aging Management Evaluation

Table 3.3.2-28, Potable Water - Aging Management Evaluation

Table 3.3.2-29, Primary Sampling - Aging Management Evaluation

The materials from which components are fabricated, the environments to which components 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 of Section 3.3.2.1, Materials, Environment, Aging Effects Requiring Management and Aging Management Programs:

Section 3.3.2.1.1, New Fuel Storage

Section 3.3.2.1.2, Spent Fuel Storage

Section 3.3.2.1.3, Spent Fuel Pool Cooling System

Section 3.3.2.1.4, Fuel Handling System

Section 3.3.2.1.5, Cranes (Excluding Fuel Handling) System

Section 3.3.2.1.6, Service Water System

Section 3.3.2.1.7, Component Cooling System

Section 3.3.2.1.8, Station and Instrument Air System

Section 3.3.2.1.9, Chemical and Volume Control System

Section 3.3.2.1.10, Control Room Air Conditioning System

Section 3.3.2.1.11, Auxiliary Building Air Conditioning System

Section 3.3.2.1.12, Auxiliary Building Special Ventilation and Steam Exclusion System

Section 3.3.2.1.13, Auxiliary Building Ventilation System

Section 3.3.2.1.14, Reactor Building Ventilation System

Section 3.3.2.1.15, Turbine Building and Screenhouse Ventilation System

Section 3.3.2.1.16, Shield Building Ventilation System

Section 3.3.2.1.17, Technical Support Center Ventilation System

Section 3.3.2.1.18, Fire Protection System

Section 3.3.2.1.19, Diesel Generator System

Section 3.3.2.1.20, Circulating Water System

Section 3.3.2.1.21, Gaseous Waste Processing and Discharge System

Section 3.3.2.1.22, Liquid Waste Processing and Discharge System

Section 3.3.2.1.23, Radiation Monitoring System

Section 3.3.2.1.24, Make-up and Demineralized Water System

Section 3.3.2.1.25, Service Water Pretreatment System

Section 3.3.2.1.26, Miscellaneous Drains and Sumps System

Section 3.3.2.1.27, Miscellaneous Gas System

Section 3.3.2.1.28, Potable Water System

Section 3.3.2.1.29, Primary Sampling System

3.3.2.1 MATERIALS, ENVIRONMENT, AGING EFFECTS REQUIRING MANAGEMENT AND AGING MANAGEMENT PROGRAMS

3.3.2.1.1 New Fuel Storage

Materials

The materials of construction for the New Fuel Storage structural members are:

- Stainless Steel
- Steel

Environment

The New Fuel Storage structural members are exposed to the following environments:

- Air-indoor uncontrolled

Aging Effects Requiring Management

The following aging effects, associated with the New Fuel Storage structural members, require management:

- Loss of material

Aging Management Programs

The following aging management programs manage the aging effects for the New Fuel Storage structural members:

- Bolting Integrity

3.3.2.1.2 Spent Fuel Storage

Materials

The materials of construction for the Spent Fuel Storage structural members are:

- Neutron-Absorbing Materials
- Stainless Steel

Environment

The Spent Fuel Storage structural members are exposed to the following environments:

- Treated water-primary

Aging Effects Requiring Management

The following aging effects, associated with the Spent Fuel Storage structural members, require management:

- Loss of material

Aging Management Programs

The following aging management programs manage the aging effects for the Spent Fuel Storage structural members:

- Primary Water Chemistry
- Work Control Process

3.3.2.1.3 Spent Fuel Pool Cooling System

Materials

The materials of construction for the Spent Fuel Pool Cooling System component types are:

- Stainless Steel
- Steel

Environment

The Spent Fuel Pool Cooling System component types are exposed to the following environments:

- Air-indoor uncontrolled
- Borated water leakage
- Concrete
- Raw water
- Treated water-primary

Aging Effects Requiring Management

The following aging effects, associated with the Spent Fuel Pool Cooling System, require management:

- Cracking
- Loss of material
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for the Spent Fuel Pool Cooling System component types:

- Bolting Integrity
- Boric Acid Corrosion
- External Surfaces Monitoring
- Primary Water Chemistry
- Work Control Process

3.3.2.1.4 Fuel Handling System

Materials

The materials of construction for the Fuel Handling System structural members are:

- Stainless Steel
- Steel

Environment

The Fuel Handling System structural members are exposed to the following environments:

- Air-indoor uncontrolled
- Borated water leakage
- Treated water-primary

Aging Effects Requiring Management

The following aging effects, associated with the Fuel Handling System, require management:

- Loss of material

Aging Management Programs

The following aging management programs manage the aging effects for the Fuel Handling System structural members:

- Boric Acid Corrosion
- Inspection of Overhead Heavy Load and Refueling Handling Systems
- Primary Water Chemistry
- Work Control Process

3.3.2.1.5 Cranes (Excluding Fuel Handling) System

Materials

The materials of construction for the Cranes (Excluding Fuel Handling) System structural members are:

- Steel

Environment

The Cranes (Excluding Fuel Handling) System structural members are exposed to the following environments:

- Air-indoor uncontrolled
- Borated water leakage

Aging Effects Requiring Management

The following aging effects, associated with the Cranes (Excluding Fuel Handling) System, require management:

- Cumulative fatigue damage
- Loss of material

Aging Management Programs

The following aging management programs manage the aging effects for the Cranes (Excluding Fuel Handling) System structural members:

- Boric Acid Corrosion
- Inspection of Overhead Heavy Load and Refueling Handling Systems

3.3.2.1.6 Service Water System

Materials

The materials of construction for the Service Water System component types are:

- Copper Alloys
- Glass
- Non-Metallic
- Stainless Steel
- Steel

Environment

The Service Water System component types are exposed to the following environments:

- Air-indoor uncontrolled
- Borated water leakage
- Concrete
- Raw water

Aging Effects Requiring Management

The following aging effects, associated with the Service Water System, require management:

- Cracking
- Loss of material
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for the Service Water System component types:

- Bolting Integrity
- Boric Acid Corrosion
- External Surfaces Monitoring
- Open-Cycle Cooling Water System
- Selective Leaching of Materials
- Work Control Process

3.3.2.1.7 Component Cooling System

Materials

The materials of construction for the Component Cooling System component types are:

- Copper Alloys
- Stainless Steel
- Steel

Environment

The Component Cooling System component types are exposed to the following environments:

- Air-indoor uncontrolled
- Borated water leakage
- Raw water
- Treated water-closed cycle cooling

Aging Effects Requiring Management

The following aging effects, associated with the Component Cooling System, 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 Component Cooling System component types:

- Bolting Integrity
- Boric Acid Corrosion
- Closed-Cycle Cooling Water System
- External Surfaces Monitoring
- Open-Cycle Cooling Water System
- Work Control Process

3.3.2.1.8 Station and Instrument Air System

Materials

The materials of construction for the Station and Instrument Air System component types are:

- Aluminum
- Copper Alloys
- Elastomers
- Glass
- Non-Metallic
- Stainless Steel
- Steel

Environment

The Station and Instrument Air System component types are exposed to the following environments:

- Air-dried
- Air-indoor uncontrolled
- Air-moist

- Borated water leakage
- Gas-inert
- Lube oil
- Raw water

Aging Effects Requiring Management

The following aging effects, associated with the Station and Instrument Air System, require management:

- Change in material properties
- Cracking
- Loss of material
- Loss of preload
- Loss of strength
- Reduction of heat transfer

Aging Management Programs

The following aging management programs manage the aging effects for the Station and Instrument Air System component types:

- Bolting Integrity
- Boric Acid Corrosion
- Compressed Air Monitoring
- External Surfaces Monitoring
- Lubricating Oil Analysis
- Selective Leaching of Materials
- Work Control Process

3.3.2.1.9 Chemical and Volume Control System

Materials

The materials of construction for the Chemical and Volume Control System component types are:

- Stainless Steel

- Steel

Environment

The Chemical and Volume Control System component types are exposed to the following environments:

- Air-indoor uncontrolled
- Borated water leakage
- Gas-inert
- Lube oil
- Raw water
- Treated water and/or steam-secondary
- Treated water-closed cycle cooling
- Treated water-primary

Aging Effects Requiring Management

The following aging effects, associated with the Chemical and Volume Control System, require management:

- Cracking
- Cumulative fatigue damage
- 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
- Bolting Integrity
- Boric Acid Corrosion
- Closed-Cycle Cooling Water System
- External Surfaces Monitoring

- Lubricating Oil Analysis
- Primary Water Chemistry
- Secondary Water Chemistry
- Work Control Process

3.3.2.1.10 Control Room Air Conditioning System

Materials

The materials of construction for the Control Room Air Conditioning System component types are:

- Aluminum
- Copper Alloys
- Elastomers
- Stainless Steel
- Steel

Environment

The Control Room Air Conditioning System component types are exposed to the following environments:

- Air-indoor controlled
- Air-indoor uncontrolled
- Air-moist
- Gas-inert
- Raw water
- Treated water and/or steam-secondary
- Treated water-closed cycle cooling

Aging Effects Requiring Management

The following aging effects, associated with the Control Room Air Conditioning System, require management:

- Change in material properties
- Cracking

- Cracking; Delamination
- Hardening and loss of strength
- Loss of material
- Loss of preload
- Reduction of heat transfer

Aging Management Programs

The following aging management programs manage the aging effects for the Control Room Air Conditioning System component types:

- Bolting Integrity
- Closed-Cycle Cooling Water System
- External Surfaces Monitoring
- Open-Cycle Cooling Water System
- Secondary Water Chemistry
- Selective Leaching of Materials
- Work Control Process

3.3.2.1.11 Auxiliary Building Air Conditioning System

Materials

The materials of construction for the Auxiliary Building Air Conditioning System component types are:

- Elastomers
- Stainless Steel
- Steel

Environment

The Auxiliary Building Air Conditioning System component types are exposed to the following environments:

- Air-indoor controlled
- Air-indoor uncontrolled
- Air-moist

- Borated water leakage
- Gas-inert
- Raw water

Aging Effects Requiring Management

The following aging effects, associated with the Auxiliary Building Air Conditioning System, require management:

- Change in material properties
- Cracking
- Cracking; Delamination
- 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 Auxiliary Building Air Conditioning System component types:

- Bolting Integrity
- Boric Acid Corrosion
- External Surfaces Monitoring
- Open-Cycle Cooling Water System
- Work Control Process

3.3.2.1.12 Auxiliary Building Special Ventilation and Steam Exclusion System

Materials

The materials of construction for the Auxiliary Building Special Ventilation and Steam Exclusion System component types are:

- Copper Alloys
- Elastomers
- Steel

Environment

The Auxiliary Building Special Ventilation and Steam Exclusion System component types are exposed to the following environments:

- Air-indoor uncontrolled
- Air-moist
- Borated water leakage

Aging Effects Requiring Management

The following aging effects, associated with the Auxiliary Building Special Ventilation and Steam Exclusion System, require management:

- Change in material properties
- Cracking
- Cracking; Delamination
- 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 Auxiliary Building Special Ventilation and Steam Exclusion System component types:

- Bolting Integrity
- Boric Acid Corrosion
- External Surfaces Monitoring
- Work Control Process

3.3.2.1.13 Auxiliary Building Ventilation System

Materials

The materials of construction for the Auxiliary Building Ventilation System component types are:

- Aluminum
- Copper Alloys

- Elastomers
- Stainless Steel
- Steel

Environment

The Auxiliary Building Ventilation System component types are exposed to the following environments:

- Air-indoor uncontrolled
- Air-moist
- Borated water leakage
- Raw water
- Treated water and/or steam-secondary

Aging Effects Requiring Management

The following aging effects, associated with the Auxiliary Building Ventilation System, require management:

- Change in material properties
- Cracking
- Cracking; Delamination
- 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 Ventilation System component types:

- Bolting Integrity
- Boric Acid Corrosion
- External Surfaces Monitoring
- Open-Cycle Cooling Water System

- Secondary Water Chemistry
- Work Control Process

3.3.2.1.14 Reactor Building Ventilation System

Materials

The materials of construction for the Reactor Building Ventilation System component types are:

- Aluminum
- Copper Alloys
- Elastomers
- Stainless Steel
- Steel

Environment

The Reactor Building Ventilation System component types are exposed to the following environments:

- Air-indoor uncontrolled
- Air-moist
- Borated water leakage
- Raw water

Aging Effects Requiring Management

The following aging effects, associated with the Reactor Building Ventilation System, require management:

- Change in material properties
- Cracking
- Cracking; Delamination
- 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 Reactor Building Ventilation System component types:

- Bolting Integrity
- Boric Acid Corrosion
- External Surfaces Monitoring
- Open-Cycle Cooling Water System
- Work Control Process

3.3.2.1.15 Turbine Building and Screenhouse Ventilation System

Materials

The materials of construction for the Turbine Building and Screenhouse Ventilation System component types are:

- Aluminum
- Copper Alloys
- Elastomers
- Stainless Steel
- Steel

Environment

The Turbine Building and Screenhouse Ventilation System component types are exposed to the following environments:

- Air-indoor uncontrolled
- Air-moist
- Concrete
- Raw water

Aging Effects Requiring Management

The following aging effects, associated with the Turbine Building and Screenhouse Ventilation System, require management:

- Change in material properties

- Cracking
- Cracking; Delamination
- 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 Turbine Building and Screenhouse Ventilation System component types:

- Bolting Integrity
- External Surfaces Monitoring
- Open-Cycle Cooling Water System
- Work Control Process

3.3.2.1.16 Shield Building Ventilation System

Materials

The materials of construction for the Shield Building Ventilation System component types are:

- Copper Alloys
- Elastomers
- Steel

Environment

The Shield Building Ventilation System component types are exposed to the following environments:

- Air-indoor uncontrolled
- Air-moist
- Borated water leakage

Aging Effects Requiring Management

The following aging effects, associated with the Shield Building Ventilation System, require management:

- Change in material properties
- Cracking
- Cracking; Delamination
- 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 Shield Building Ventilation System component types:

- Bolting Integrity
- Boric Acid Corrosion
- External Surfaces Monitoring
- Work Control Process

3.3.2.1.17 Technical Support Center Ventilation System

Materials

The materials of construction for the Technical Support Center Ventilation System component types are:

- Aluminum
- Copper Alloys
- Elastomers
- Steel

Environment

The Technical Support Center Ventilation System component types are exposed to the following environments:

- Air-indoor uncontrolled

- Air-moist
- Air-outdoor
- Gas-inert
- Raw water

Aging Effects Requiring Management

The following aging effects, associated with the Technical Support Center Ventilation System, require management:

- Change in material properties
- Cracking
- Cracking; Delamination
- 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 Technical Support Center Ventilation System component types:

- Bolting Integrity
- External Surfaces Monitoring
- Work Control Process

3.3.2.1.18 Fire Protection System

Materials

The materials of construction for the Fire Protection System component types are:

- Aluminum
- Copper Alloys
- Glass
- Stainless Steel

- Steel

Environment

The Fire Protection System component types are exposed to the following environments:

- Air-indoor controlled
- Air-indoor uncontrolled
- Air-moist
- Air-outdoor
- Borated water leakage
- Concrete
- Lube oil
- Raw water
- Soil
- Treated water and/or steam-secondary

Aging Effects Requiring Management

The following aging effects, associated with the Fire Protection System, require management:

- Cracking
- 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
- Boric Acid Corrosion
- Buried Piping and Tanks Inspection
- External Surfaces Monitoring
- Fire Protection

- Secondary Water Chemistry
- Selective Leaching of Materials
- Work Control Process

3.3.2.1.19 Diesel Generator System

Materials

The materials of construction for the Diesel Generator System component types are:

- Aluminum
- Copper Alloys
- Glass
- Non-Metallic
- Stainless Steel
- Steel

Environment

The Diesel Generator System component types are exposed to the following environments:

- Air-dried
- Air-indoor uncontrolled
- Air-moist
- Air-outdoor
- Concrete
- Diesel exhaust
- Fuel oil
- Lube oil
- Raw water
- Soil
- Treated water-closed cycle cooling

Aging Effects Requiring Management

The following aging effects, associated with the Diesel Generator System, 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 Diesel Generator System component types:

- Bolting Integrity
- Buried Piping and Tanks Inspection
- Closed-Cycle Cooling Water System
- Compressed Air Monitoring
- External Surfaces Monitoring
- Fuel Oil Chemistry
- Fuel Oil Tank Inspections
- Lubricating Oil Analysis
- Open-Cycle Cooling Water System
- Selective Leaching of Materials
- Work Control Process

3.3.2.1.20 Circulating Water System

Materials

The materials of construction for the Circulating Water System component types are:

- Copper Alloys
- Glass
- Stainless Steel
- Steel

Environment

The Circulating Water System component types are exposed to the following environments:

- Air-indoor uncontrolled
- Air-outdoor
- Concrete
- Raw water
- Soil
- Treated water and/or steam-secondary

Aging Effects Requiring Management

The following aging effects, associated with the Circulating Water System, require management:

- Cracking
- Loss of material
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for the Circulating Water System component types:

- Bolting Integrity
- Buried Piping and Tanks Inspection
- External Surfaces Monitoring
- Open-Cycle Cooling Water System
- Secondary Water Chemistry
- Selective Leaching of Materials
- Work Control Process

3.3.2.1.21 Gaseous Waste Processing and Discharge System

Materials

The materials of construction for the Gaseous Waste Processing and Discharge System component types are:

- Copper Alloys
- Glass
- Stainless Steel
- Steel

Environment

The Gaseous Waste Processing and Discharge System component types are exposed to the following environments:

- Air-indoor uncontrolled
- Air-moist
- Borated water leakage
- Raw water
- Treated water-closed cycle cooling
- Treated water-primary

Aging Effects Requiring Management

The following aging effects, associated with the Gaseous Waste Processing and Discharge System, 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 Gaseous Waste Processing and Discharge System component types:

- Bolting Integrity

- Boric Acid Corrosion
- Closed-Cycle Cooling Water System
- External Surfaces Monitoring
- Primary Water Chemistry
- Work Control Process

3.3.2.1.22 Liquid Waste Processing and Discharge System

Materials

The materials of construction for the Liquid Waste Processing and Discharge System component types are:

- Elastomers
- Glass
- Stainless Steel
- Steel

Environment

The Liquid Waste Processing and Discharge System component types are exposed to the following environments:

- Air-indoor uncontrolled
- Air-moist
- Borated water leakage
- Concrete
- Raw water
- Treated water-primary

Aging Effects Requiring Management

The following aging effects, associated with the Liquid Waste Processing and Discharge System, require management:

- Cracking
- Hardening and loss of strength
- Loss of material

- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for the Liquid Waste Processing and Discharge System component types:

- Bolting Integrity
- Boric Acid Corrosion
- External Surfaces Monitoring
- Primary Water Chemistry
- Selective Leaching of Materials
- Work Control Process

3.3.2.1.23 Radiation Monitoring System

Materials

The materials of construction for the Radiation Monitoring System component types are:

- Stainless Steel
- Steel

Environment

The Radiation Monitoring System component types are exposed to the following environments:

- Air-indoor uncontrolled
- Air-moist
- Borated water leakage
- Raw water
- Treated water and/or steam-secondary

Aging Effects Requiring Management

The following aging effects, associated with the Radiation Monitoring System, require management:

- Cracking
- Loss of material
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for the Radiation Monitoring System component types:

- Bolting Integrity
- Boric Acid Corrosion
- Secondary Water Chemistry
- Work Control Process

3.3.2.1.24 Make-up and Demineralized Water System

Materials

The materials of construction for the Makeup and Demineralized Water System component types are:

- Glass
- Stainless Steel
- Steel

Environment

The Makeup and Demineralized Water System component types are exposed to the following environments:

- Air-indoor uncontrolled
- Borated water leakage
- Treated water-primary

Aging Effects Requiring Management

The following aging effects, associated with the Makeup and Demineralized Water System, require management:

- Cracking

- Loss of material
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for the Makeup and Demineralized Water System component types:

- Bolting Integrity
- Boric Acid Corrosion
- External Surfaces Monitoring
- Primary Water Chemistry
- Work Control Process

3.3.2.1.25 Service Water Pretreatment System

Materials

The materials of construction for the Service Water Pretreatment System component types are:

- Copper Alloys
- Stainless Steel
- Steel

Environment

The Service Water Pretreatment System component types are exposed to the following environments:

- Air-indoor uncontrolled
- Raw water

Aging Effects Requiring Management

The following aging effects, associated with the Service Water Pretreatment System, require management:

- Cracking
- Loss of material

- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for the Service Water Pretreatment System component types:

- Bolting Integrity
- External Surfaces Monitoring
- Selective Leaching of Materials
- Work Control Process

3.3.2.1.26 Miscellaneous Drains and Sumps System

Materials

The materials of construction for the Miscellaneous Drains and Sumps System component types are:

- Elastomers
- Stainless Steel
- Steel

Environment

The Miscellaneous Drains and Sumps System component types are exposed to the following environments:

- Air-indoor uncontrolled
- Air-moist
- Borated water leakage
- Concrete
- Raw water

Aging Effects Requiring Management

The following aging effects, associated with the Miscellaneous Drains and Sumps System, require management:

- Cracking

- Hardening and loss of strength
- Loss of material
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for the Miscellaneous Drains and Sumps System component types:

- Bolting Integrity
- Boric Acid Corrosion
- External Surfaces Monitoring
- Selective Leaching of Materials
- Work Control Process

3.3.2.1.27 Miscellaneous Gas System

Materials

The materials of construction for the Miscellaneous Gas System component types are:

- Aluminum
- Copper Alloys
- Elastomers
- Non-Metallic
- Stainless Steel
- Steel

Environment

The Miscellaneous Gas System component types are exposed to the following environments:

- Air-indoor uncontrolled
- Air-moist
- Borated water leakage
- Gas-inert

- Treated water and/or steam-secondary

Aging Effects Requiring Management

The following aging effects, associated with the Miscellaneous Gas System, require management:

- Change in material properties
- Cracking
- Loss of material
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for the Miscellaneous Gas System component types:

- Bolting Integrity
- Boric Acid Corrosion
- External Surfaces Monitoring
- Secondary Water Chemistry
- Work Control Process

3.3.2.1.28 Potable Water System

Materials

The materials of construction for the Potable Water System component types are:

- Copper Alloys
- Steel

Environment

The Potable Water System component types are exposed to the following environments:

- Air-indoor controlled
- Air-indoor uncontrolled
- Borated water leakage

- Raw water

Aging Effects Requiring Management

The following aging effects, associated with the Potable Water System, require management:

- Cracking
- Loss of material
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for the Potable Water System component types:

- Bolting Integrity
- Boric Acid Corrosion
- External Surfaces Monitoring
- Selective Leaching of Materials
- Work Control Process

3.3.2.1.29 Primary Sampling System

Materials

The materials of construction for the Primary Sampling System component types are:

- Stainless Steel
- Steel

Environment

The Primary Sampling System component types are exposed to the following environments:

- Air-indoor uncontrolled
- Borated water leakage
- Gas-inert

- Treated water-closed cycle cooling
- Treated water-primary

Aging Effects Requiring Management

The following aging effects, associated with the Primary Sampling System, require management:

- Cracking
- Loss of material
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for the Primary Sampling System component types:

- Bolting Integrity
- Boric Acid Corrosion
- Closed-Cycle Cooling Water System
- External Surfaces Monitoring
- Primary Water Chemistry
- Work Control Process

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 in the license renewal application. For the Auxiliary Systems, those programs are addressed in the following sections.

3.3.2.2.1 Cumulative Fatigue Damage

Fatigue is a TLAA as defined in 10 CFR 54.3. TLAAs are required to be evaluated in accordance with 10 CFR 54.21(c)(1). The evaluation of this TLAA for cranes, including structural girders, is addressed in Section 4.7.1, Crane Load Cycle Limit and for piping and heat exchangers in Section 4.3, Metal Fatigue.

3.3.2.2.2 Reduction of Heat Transfer due to Fouling

Applicable to BWR Only

3.3.2.2.3 Cracking due to Stress Corrosion Cracking (SCC)

3.3.2.2.3.1 Cracking due to Stress Corrosion Cracking (SCC)

Applicable to BWR Only

3.3.2.2.3.2 Cracking due to Stress Corrosion Cracking (SCC)

Applicable to BWR Only

3.3.2.2.3.3 Cracking due to Stress Corrosion Cracking (SCC)

Cracking due to stress corrosion cracking in stainless steel components exposed to diesel exhaust is managed by the Work Control Process program. The Work Control Process program provides the opportunity to visually inspect the internal surfaces of components constructed of typical system materials and exposed to typical system environments, including stagnant locations, during preventive and corrective maintenance activities on an ongoing basis.

3.3.2.2.4 Cracking due to Stress Corrosion Cracking and Cyclic Loading

3.3.2.2.4.1 Cracking due to Stress Corrosion Cracking and Cyclic Loading

Cracking due to SCC for the stainless steel components of the non-regenerative heat exchanger (i.e., letdown heat exchanger) exposed to treated borated water greater than 60 degrees Celsius (greater than 140 degrees Fahrenheit) in the Chemical and Volume Control System is managed by the Primary Water Chemistry program. The Work Control Process program is used to provide confirmation of the effectiveness of the Primary Water Chemistry program. This is accomplished by monitoring the temperature, radioactivity and surge tank level of the Component Cooling System that cools the letdown heat exchanger. In the event one of these parameters exceeds a designated threshold, Corrective Action is initiated to evaluate the cause and extent of condition, and ensure that intended functions are maintained.

3.3.2.2.4.2 Cracking due to Stress Corrosion Cracking and Cyclic Loading

Cracking due to SCC and cyclic loading in stainless steel PWR regenerative heat exchanger components exposed to treated borated water greater than 60 degrees Celsius (140 degrees Fahrenheit) is an aging effect requiring management. The Primary Water Chemistry program manages cracking of stainless steel regenerative heat exchanger components exposed to treated borated water. The regenerative heat exchanger is of all welded construction and internal inspections are not possible. The Primary Water Chemistry program is augmented by the Work Control Process program which will verify the absence of cracking through the use of visual inspections of components fabricated of the same materials in similar environments.

3.3.2.2.4.3 Cracking due to Stress Corrosion Cracking and Cyclic Loading

Cracking due to cyclic loading could occur in the stainless steel positive displacement pump casing of the high-pressure pumps in the chemical and volume control system. Cracking due to stress corrosion cracking is not an aging effect requiring aging management because the casings are not exposed to temperatures greater than the 140°F threshold for stress corrosion cracking to occur. Cracking of the charging pumps due to cyclic loading is managed by the Work Control Process program.

3.3.2.2.4.4 Cracking due to Stress Corrosion Cracking and Cyclic Loading

The bolting associated with the high-pressure charging pump pressure head are not fabricated from high-strength steel. Therefore, this item is not applicable.

3.3.2.2.5 Hardening and Loss of Strength due to Elastomer Degradation

3.3.2.2.5.1 Hardening and Loss of Strength due to Elastomer Degradation

Hardening and loss of strength due to elastomer degradation in ventilation system elastomeric materials exposed to an air-indoor uncontrolled environment will be managed by the External Surfaces Monitoring program on the external surfaces. Hardening and loss of strength due to elastomer degradation in air-indoor controlled and air-moist environments is managed by the Work Control Process program.

3.3.2.2.5.2 Hardening and Loss of Strength due to Elastomer Degradation

There are no elastomer lined components in the Spent Fuel Pool Cooling System. Therefore, this item is not applicable.

3.3.2.2.6 Reduction of Neutron-Absorbing Capacity and Loss of Material due to General Corrosion

Boral plates, consisting of boron carbide and aluminum, are used in the fuel transfer canal spent fuel storage area and boron carbide plates are used in the north and south spent fuel storage areas.

Boron carbide by itself is a stable and inert chemical compound. However, industry experience has identified that the aluminum used in Boral plates and the phenolic resin or contaminants used in boron carbide plates have reacted to produce hydrogen gas and bulging in non-vented neutron absorber enclosures. Additionally, industry experience indicates that Boral plates manufactured prior to 1990 experienced aluminum oxide blistering along the edges of the Boral plates.

Holtec International revised their specifications and manufacturing procedures for Boral in 1990, resolving the gas bulging and the blistering problems. Accelerated testing by Holtec and industry coupon testing of spent fuel racks manufactured since 1990 indicates that the Boral neutron absorber plates manufactured by Holtec have not exhibited any reduction in neutron absorption capability or loss of material (blistering). The Boral plates used at Kewaunee were manufactured in 2000 by Holtec and are not susceptible to these aging mechanisms.

The boron carbide plates were initially installed in 1979 in hermetically sealed enclosures. In 1980 it was determined that a number of the enclosures experienced some wall deflection or bulging. The enclosures were subsequently modified to allow venting. Since then, more than twenty five years of acceptable in-house coupon testing has indicated that the boron carbide plates have not exhibited any bulging, reduction in neutron absorption capability or loss of material.

Therefore, aging management is not required for the two different types of neutron-absorbing plates used in the spent fuel racks.

3.3.2.2.7 Loss of Material due to General, Pitting, and Crevice Corrosion

3.3.2.2.7.1 Loss of Material due to General, Pitting, and Crevice Corrosion

The loss of material due to general, pitting, and crevice corrosion of steel reactor coolant pump oil collection subsystem components is managed by the Fire Protection and Work Control Process programs.

The loss of material due to general, pitting, and crevice corrosion for applicable steel components exposed to a lubricating oil environment is managed by the Lubricating Oil Analysis program. In lieu of a one-time inspection, the Work Control Process program is used to provide confirmation of the effectiveness of the Lubricating Oil Analysis program. The Work Control Process program provides the opportunity to visually inspect the internal surfaces of components constructed of typical system materials and exposed to typical system environments, including stagnant locations, during preventive and corrective maintenance activities on an ongoing basis.

The Work Control Process program provides input to the Corrective Action Program if aging effects are identified. The Corrective Action Program would evaluate the cause and extent of condition and, if required, recommend enhancements to ensure continued effectiveness of the Lubricating Oil Analysis program.

3.3.2.2.7.2 Loss of Material due to General, Pitting, and Crevice Corrosion

Applicable to BWR Only

3.3.2.2.7.3 Loss of Material due to General, Pitting, and Crevice Corrosion

Loss of material due to general (steel only) pitting and crevice corrosion for steel and stainless steel components in the Diesel Generator System exposed to diesel exhaust is managed by the Work Control Process program. The Work Control Process program provides the opportunity to visually inspect the internal surfaces of components constructed of typical system materials and exposed to typical system environments, including stagnant locations, during preventive and corrective maintenance activities on an ongoing basis.

3.3.2.2.8 Loss of Material due to General, Pitting, Crevice, and Microbiologically-Influenced Corrosion (MIC)

Loss of material due to general, pitting, crevice, and microbiologically influenced corrosion for steel components exposed to soil is managed by the Buried Piping and Tanks Inspection program.

3.3.2.2.9 Loss of Material due to General, Pitting, Crevice, Microbiologically-Influenced Corrosion and Fouling

3.3.2.2.9.1 Loss of Material due to General, Pitting, Crevice, Microbiologically-Influenced Corrosion and Fouling

The loss of material due to general, pitting, crevice, and microbiologically influenced corrosion and fouling for applicable Diesel Generator System steel components exposed to a fuel oil environment is managed by the Fuel Oil Chemistry program. In lieu of a one-time inspection, the Work Control Process program is used to provide confirmation of the effectiveness of the Fuel Oil Chemistry program. The Work Control Process program provides the opportunity to visually inspect the internal surfaces of components constructed of typical system materials and exposed to typical system environments, including stagnant locations, during preventive and corrective maintenance activities on an ongoing basis.

The Work Control Process program provides input to the Corrective Action Program if aging effects are identified. The Corrective Action Program would evaluate the cause and extent of condition and, if required, recommend enhancements to ensure continued effectiveness of the Fuel Oil Chemistry program.

In addition to the Fuel Oil Chemistry program, the internal surfaces of the buried fuel oil storage tanks are inspected by the Fuel Oil Tank Inspections program.

3.3.2.2.9.2 Loss of Material due to General, Pitting, Crevice, Microbiologically-Influenced Corrosion and Fouling

The loss of material due to general, pitting, and crevice, microbiologically-influenced corrosion and fouling for steel heat exchanger components exposed to a lubricating oil environment is managed by the Lubricating Oil Analysis program. In lieu of a one-time inspection, the Work Control Process program is used to provide confirmation of the effectiveness of the Lubricating Oil Analysis program. The Work Control Process program provides the opportunity to visually inspect the internal surfaces of components constructed of typical system materials and exposed to typical system environments, including stagnant locations, during preventive and corrective maintenance activities on an ongoing basis.

The Work Control Process program provides input to the Corrective Action Program if aging effects are identified. The Corrective Action Program would evaluate the cause and extent of condition and, if required, recommend enhancements to ensure continued effectiveness of the Lubricating Oil Analysis program.

3.3.2.2.10 Loss of Material due to Pitting and Crevice Corrosion

3.3.2.2.10.1 Loss of Material due to Pitting and Crevice Corrosion

There are no elastomer lined steel or stainless steel clad piping, piping components, or piping elements exposed to treated water or treated borated water in the Auxiliary Systems. Therefore, this item is not applicable.

3.3.2.2.10.2 Loss of Material due to Pitting and Crevice Corrosion

Applicable to BWR Only

3.3.2.2.10.3 Loss of Material due to Pitting and Crevice Corrosion

Loss of material due to pitting and crevice corrosion could occur for copper alloy piping, piping components, and piping elements exposed to condensation (external). The External Surfaces Monitoring program is used as the aging management program to detect loss of material on the copper components exposed to external condensation. Some copper components subject to condensation may not be visible because of the outer casing/shroud of the component. The Work Control Process program is used to detect loss of material due to corrosion on copper components when some component disassembly is required to view the component.

3.3.2.2.10.4 Loss of Material due to Pitting and Crevice Corrosion

The loss of material due to pitting and crevice corrosion for applicable components exposed to a lubricating oil environment is managed by the Lubricating Oil Analysis program. In lieu of a one-time inspection, the Work Control Process program is used to provide confirmation of the effectiveness of the Lubricating Oil Analysis program. The Work Control Process program provides the opportunity to visually inspect the internal surfaces of components constructed of typical system materials and exposed to typical system environments, including stagnant locations, during preventive and corrective maintenance activities on an ongoing basis.

The Work Control Process program provides input to the Corrective Action Program if aging effects are identified. The Corrective Action Program would evaluate the cause and extent of condition and, if required, recommend enhancements to ensure continued effectiveness of the Lubricating Oil Analysis program.

3.3.2.2.10.5 Loss of Material due to Pitting and Crevice Corrosion

Loss of material due to pitting and crevice corrosion for aluminum and stainless steel components exposed to condensation are managed by the External Surfaces Monitoring and Work Control Process programs.

3.3.2.2.10.6 Loss of Material due to Pitting and Crevice Corrosion

The copper alloy components in the Fire Protection System, waste gas compressor, and various ventilation systems that are intermittently wetted or exposed to condensation are managed for the loss of material effects due to pitting and crevice corrosion by either the Work Control Process program or the Fire Protection program. The loss of material due to pitting and crevice corrosion for copper alloy components exposed to condensation in the Diesel Generator System and Station and Instrument Air System is managed with the Compressed Air Monitoring program.

3.3.2.2.10.7 Loss of Material due to Pitting and Crevice Corrosion

Loss of material due to pitting and crevice corrosion for stainless steel piping, piping components, and piping elements exposed to soil is managed by the Buried Piping and Tanks Inspection program.

3.3.2.2.10.8 Loss of Material due to Pitting and Crevice Corrosion

Applicable to BWR Only

3.3.2.2.11 Loss of Material due to Pitting, Crevice, and Galvanic Corrosion

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 Loss of Material due to Pitting, Crevice, and Microbiologically-Influenced Corrosion

There are no aluminum components exposed to a fuel oil environment. The loss of material due to pitting, crevice, and microbiologically influenced corrosion for applicable Diesel Generator System stainless steel and copper alloy components exposed to a fuel oil environment is managed by the Fuel Oil Chemistry program. In lieu of a one-time inspection, the Work Control Process program is used to provide confirmation of the effectiveness of the Fuel Oil Chemistry program. The Work Control Process program provides the opportunity to visually inspect the internal surfaces of components constructed of typical system materials and exposed to typical system environments, including stagnant locations, during preventive and corrective maintenance activities on an ongoing basis.

The Work Control Process program provides input to the Corrective Action Program if aging effects are identified. The Corrective Action Program would evaluate the cause and extent of condition and, if required, recommend enhancements to ensure continued effectiveness of the Fuel Oil Chemistry program.

3.3.2.2.12.2 Loss of Material due to Pitting, Crevice, and Microbiologically-Influenced Corrosion

The loss of material due to pitting, crevice, and microbiologically influenced corrosion for stainless steel components exposed to a lubricating oil environment is managed by the Lubricating Oil Analysis program. In lieu of a one-time inspection, the Work Control Process program is used to provide confirmation of the effectiveness of the Lubricating Oil Analysis program. The Work Control Process program provides the opportunity to visually inspect the internal surfaces of components constructed of typical system materials and exposed to typical system environments, including stagnant locations, during preventive and corrective maintenance activities on an ongoing basis.

The Work Control Process program provides input to the Corrective Action Program if aging effects are identified. The Corrective Action Program would evaluate the cause and extent of condition and, if required, recommend enhancements to ensure continued effectiveness of the Lubricating Oil Analysis program.

The loss of material due to pitting, crevice, and microbiologically influenced corrosion for stainless steel components associated with the reactor coolant pump oil collection subsystem exposed to a lubricating oil environment is managed by the Fire Protection and Work Control Process programs.

3.3.2.2.13 Loss of Material due to Wear

Loss of material due to wear of elastomer seals and components exposed to air-indoor uncontrolled (internal or external) is managed by the Work Control Process program and the External Surfaces Monitoring program.

3.3.2.2.14 Loss of Material due to Cladding Breach

The cladding failures described are based on NRC Information Notice 94-63, which describes cladding breach of the centrifugal charging pumps at North Anna Power Station. The charging pumps at Kewaunee Power Station are positive displacement pumps that were manufactured by Ajax Iron Works. The Kewaunee charging pump pressure heads are stainless steel, not steel with stainless steel cladding. Therefore, this NUREG 1801 item is not applicable.

3.3.2.3 TIME-LIMITED AGING ANALYSIS

The TLAA identified below are associated with the Auxiliary Systems. The section of the LRA that contains the TLAA review results is indicated in parenthesis.

- Metal Fatigue (Section 4.3)
- Crane Load Cycle Limit (Section 4.7.1)

3.3.3 CONCLUSION

The Auxiliary Systems components that are subject to aging management review have been identified in accordance with the requirements of 10 CFR 54.4. The aging management programs selected to manage aging effects for the Auxiliary System components are identified in the summary tables and Section 3.3.2.1.

A description of these aging management programs is provided in Appendix B, along with the demonstration that the identified aging effects will be managed for the period of extended operation.

Therefore, based on the programs provided in Appendix B, the effects of aging associated with the Auxiliary Systems components will be adequately managed so that there is reasonable assurance that the intended function(s) will be maintained consistent with the current licensing basis during the period of extended operation.

Results Tables: Auxiliary Systems

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	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	Further evaluation is documented 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	Further evaluation is documented in Subsection 3.3.2.2.1.
3.3.1-03	BWR Only				
3.3.1-04	BWR Only				
3.3.1-05	BWR Only				

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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, plant specific	Consistent with NUREG-1801. Cracking due to stress corrosion cracking in stainless steel components exposed to diesel exhaust is managed by the Work Control Process program, which is a plant-specific program. Further evaluation is documented in Subsection 3.3.2.2.3.3.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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 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, plant specific	Cracking due to stress corrosion cracking and cyclic loading of stainless steel non-regenerative heat exchanger (i.e., Letdown Heat Exchanger) components exposed to treated borated water > 60°C (>140°F) is managed by the Primary Water Chemistry program and the Work Control Process program, which is a plant-specific program. Further evaluation is documented in Subsection 3.3.2.2.4.1.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	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	Water Chemistry and a plant-specific verification program. The AMP is to be augmented by verifying the absence of cracking due to stress corrosion cracking and cyclic loading. A plant specific aging management program is to be evaluated.	Yes, plant specific	Consistent with NUREG-1801. Cracking due to stress corrosion cracking and cyclic loading of stainless steel regenerative heat exchanger components exposed to treated borated water > 60°C (>140°F) is managed by the Primary Water Chemistry program and the Work Control Process program. The Work Control Process program is a plant-specific program. Further evaluation is documented in Subsection 3.3.2.2.4.2.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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	Water Chemistry and a plant-specific verification program. The AMP is to be augmented by verifying the absence of cracking due to stress corrosion cracking and cyclic loading. A plant specific aging management program is to be evaluated.	Yes, plant specific	Consistent with NUREG-1801. Cracking due to stress corrosion cracking is not applicable. Cracking due to cyclic loading is managed by the Work Control Process program, which is a plant-specific program. Further evaluation is documented in Subsection 3.3.2.2.4.3.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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 The AMP is to be augmented by appropriate inspection to detect cracking if the bolts are not otherwise replaced during maintenance.	Yes, if the bolts are not replaced during maintenance	NUREG-1801 item is not applicable. The bolting associated with the high-pressure charging pump pressure head are not fabricated from high-strength steel. Further evaluation is documented in Subsection 3.3.2.2.4.4.
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, plant specific	Consistent with NUREG-1801. Hardening and loss of strength due to elastomer degradation in elastomeric materials are managed by the External Surfaces Monitoring program on the external surfaces. Further evaluation is documented in Subsection 3.3.2.2.5.1.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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, plant specific	NUREG-1801 item is not applicable. There are no Spent Fuel Pool Cooling System elastomer lined components. Further evaluation is documented in Subsection 3.3.2.2.5.2.
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, plant specific	NUREG-1801 item is not applicable. Reduction of neutron-absorbing capacity and loss of material due to general corrosion of Boral or boron carbide sheets in the spent fuel storage racks exposed to treated borated water does not require aging management. Further evaluation is documented in Subsection 3.3.2.2.6.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	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 and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Loss of material due to general, pitting, and crevice corrosion for applicable steel components exposed to a lubricating oil environment is managed by the Work Control Process program, which is a plant-specific program, and the Lubricating Oil Analysis program. Further evaluation is documented 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 and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Loss of material due to general, pitting, and crevice corrosion of the steel reactor coolant pump oil collection subsystem components is managed by the Work Control Process program, which is a plant-specific program. Further evaluation is documented in Subsection 3.3.2.2.7.1.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	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 and One-Time Inspection to evaluate the thickness of the lower portion of the tank	Yes, detection of aging effects is to be evaluated	Loss of material due to general, pitting, and crevice corrosion of the steel reactor coolant pump oil collection subsystem tank is managed by the Fire Protection program, which takes exception to the NUREG-1801 AMP. Further evaluation is documented in Subsection 3.3.2.2.7.1.
3.3.1-17	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, plant specific	Consistent with NUREG-1801. Loss of material due to general (steel only), pitting and crevice corrosion for steel and stainless steel components exposed to diesel exhaust is managed by the Work Control Process program, which is a plant-specific program. Further evaluation is documented in Subsection 3.3.2.2.7.3.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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 Surveillance or Buried Piping and Tanks Inspection	No or Yes, detection of aging effects and operating experience are to be further evaluated	Consistent with NUREG-1801. Loss of material due to general, pitting, crevice, and microbiologically influenced corrosion for steel components exposed to soil is managed by the Buried Piping and Tanks Inspection program. Further evaluation is documented in Subsection 3.3.2.2.8.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	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 micro-biologically influenced corrosion, and fouling	Fuel Oil Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Loss of material due to general, pitting, crevice, and microbiologically influenced corrosion and fouling for applicable Diesel Generator System steel components exposed to a fuel oil environment is managed by Work Control Process program, which is a plant-specific program, and the Fuel Oil Chemistry program, which takes exception to the NUREG-1801 AMP. Loss of material due to general, pitting, and crevice corrosion for the fuel oil storage tanks is managed by the Fuel Oil Chemistry program, which takes exception to the NUREG-1801 AMP, and the Fuel Oil Tank Inspections program. Further evaluation is documented in Subsection 3.3.2.2.9.1.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-21	Steel heat exchanger components exposed to lubricating oil	Loss of material due to general, pitting, crevice, and micro-biologically influenced corrosion, and fouling	Lubricating Oil Analysis and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. Loss of material due to general, pitting, crevice, and microbiologically influenced corrosion, and fouling for steel heat exchanger components exposed to a lubricating oil environment is managed by the Work Control Process program, which is a plant-specific program, and the Lubricating Oil Analysis program. Further evaluation is documented in Subsection 3.3.2.2.9.2.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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 and One-Time Inspection	Yes, detection of aging effects is to be evaluated	NUREG-1801 item is not applicable. There are no Auxiliary Systems steel components with elastomer lining or stainless steel cladding piping, piping components, and piping elements exposed to treated water or treated borated water. Further evaluation is documented in Subsection 3.3.2.2.10.1.
3.3.1-23	BWR Only				
3.3.1-24	BWR Only				

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	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, plant specific	Consistent with NUREG-1801. Loss of material due to pitting and crevice corrosion is managed by the Work Control Process program, which is a plant-specific program, and the External Surfaces Monitoring program. Further evaluation is documented 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 and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. Loss of material due to pitting and crevice corrosion for applicable components exposed to a lubricating oil environment is managed by the Work Control Process program, which is a plant-specific program, and the Lubricating Oil Analysis program. Further evaluation is documented in Subsection 3.3.2.2.10.4.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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, plant specific	Consistent with NUREG-1801. Loss of material due to pitting and crevice corrosion is managed by the Work Control Process program, which is a plant-specific program, and the External Surfaces Monitoring program. Further evaluation is documented in Subsection 3.3.2.2.10.5.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	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, plant specific	Consistent with NUREG-1801. Loss of material due to pitting and crevice corrosion is managed by the Work Control Process program, which is a plant-specific program, and the Fire Protection and Compressed Air Monitoring programs. The Fire Protection and Compressed Air Monitoring programs both take exception to the NUREG-1801 AMPs. Further evaluation is documented in Subsection 3.3.2.2.10.6.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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, plant specific	Consistent with NUREG-1801. Loss of material due to pitting and crevice corrosion for stainless steel piping, piping components, and piping elements exposed to soil is managed by the Buried Piping and Tanks Inspection program. Further evaluation is documented in Subsection 3.3.2.2.10.7.
3.3.1-30	BWR Only				
3.3.1-31	BWR Only				

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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 micro-biologically influenced corrosion	Fuel Oil Chemistry and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. Loss of material due to pitting, crevice, and microbiologically influenced corrosion is managed by the Fuel Oil Chemistry program, which takes exception to the NUREG-1801 AMP, and the Work Control Process program, which is a plant-specific program. Further evaluation is documented in Subsection 3.3.2.2.12.1.
3.3.1-33	Stainless steel piping, piping components, and piping elements exposed to lubricating oil	Loss of material due to pitting, crevice, and micro-biologically influenced corrosion	Lubricating Oil Analysis and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Loss of material due to pitting, crevice, and microbiologically influenced corrosion for stainless steel piping components exposed to a lubricating oil environment is managed by the Work Control Process program, which is a plant-specific program, and the Lubricating Oil Analysis program. (continued on next page)

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-33 (cont'd.)	Stainless steel piping, piping components, and piping elements exposed to lubricating oil	Loss of material due to pitting, crevice, and micro-biologically influenced corrosion	Lubricating Oil Analysis and One-Time Inspection	Yes, detection of aging effects is to be evaluated	The loss of material due to pitting, crevice, and microbiologically influenced corrosion for applicable reactor coolant pump oil collection subsystem stainless steel components exposed to a lubricating oil environment is managed by the Fire Protection program, which takes exception to the NUREG-1801 AMP and the Work Control Process program, which is a plant-specific program. Further evaluation is documented in Subsection 3.3.2.2.12.2.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	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, plant specific	Consistent with NUREG-1801. Loss of material due to wear of elastomer seals and components exposed to air-indoor uncontrolled (internal or external) is managed by the Work Control Process program, which is a plant-specific program, and the External Surfaces Monitoring program. Further evaluation is documented in Subsection 3.3.2.2.13.
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, verify plant-specific program addresses cladding breach	NUREG-1801 item is not applicable. The Kewaunee charging pumps are not fabricated from steel with stainless steel cladding. Further evaluation is documented in Subsection 3.3.2.2.14.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-36	BWR Only				
3.3.1-37	BWR Only				
3.3.1-38	BWR Only				
3.3.1-39	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	Loss of material due to general, pitting, and crevice corrosion for steel tanks exposed to air - outdoor (external) is managed by the External Surfaces Monitoring program.
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	No	Consistent with NUREG-1801. Cracking due to cyclic loading, stress corrosion cracking for high-strength steel closure bolting is managed by the Bolting Integrity program.
3.3.1-42	Steel closure bolting exposed to air with steam or water leakage	Loss of material due to general corrosion	Bolting Integrity	No	Loss of material due to general corrosion for steel closure bolting is managed by the Bolting Integrity program.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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	No	Consistent with NUREG-1801. Loss of material due to general, pitting, and crevice corrosion for steel bolting and closure bolting is managed by the Bolting Integrity program.
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	No	Consistent with NUREG-1801. Loss of material due to general, pitting, and crevice corrosion for steel compressed air system closure bolting exposed to condensation is managed by the Bolting Integrity program.
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	No	Consistent with NUREG-1801. Loss of preload due to thermal effects, gasket creep, and self-loosening for steel closure bolting exposed to air – indoor uncontrolled (external) is managed by the Bolting Integrity program.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	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	No	Consistent with NUREG-1801. Cracking due to stress corrosion cracking of stainless steel heat exchanger components exposed to closed cycle cooling water >60°C (>140°F) is managed by the Closed-Cycle Cooling Water System program, which takes exception to the NUREG-1801 AMP, and the Work Control Process program, which is a plant-specific program.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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	No	Loss of material due to general, pitting, and crevice corrosion of steel piping, piping components, piping elements, and tanks exposed to closed cycle cooling water is managed by the Closed-Cycle Cooling Water System program, which takes exception to the NUREG-1801 AMP, and the Work Control Process program, which is a plant-specific program. Loss of material due to general, pitting, and crevice corrosion of steel components in the TSC diesel generator cooling water subsystem is managed by the Work Control Process program, which is a plant-specific program.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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	No	Loss of material due to general, pitting, crevice, and galvanic corrosion of steel heat exchanger components exposed to closed cycle cooling water is managed by the Closed-Cycle Cooling Water System program, which takes exception to the NUREG-1801 AMP, and the Work Control Process program, which is a plant-specific program. Loss of material due to general, pitting, crevice, and galvanic corrosion of steel components in the TSC diesel generator cooling water subsystem is managed by the Work Control Process program, which is a plant-specific program.
3.3.1-49	BWR Only				

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	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	No	Loss of material due to pitting and crevice corrosion of stainless steel piping, piping components, and piping elements exposed to cycle cooling water is managed by the Closed-Cycle Cooling Water System program, which takes exception to the NUREG-1801 AMP, and the Work Control Process program, which is a plant-specific program. Loss of material due to pitting and crevice corrosion of stainless steel components in the TSC diesel generator cooling water subsystem is managed by the Work Control Process program, which is a plant-specific program.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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	No	Loss of material due to pitting, crevice, and galvanic corrosion of copper alloy piping, piping components, piping elements, and heat exchanger components exposed to closed cycle cooling water is managed by the Closed-Cycle Cooling Water System program, which takes exception to the NUREG-1801 AMP, and the Work Control Process program, which is a plant-specific program. Loss of material due to pitting, crevice, and galvanic corrosion of copper alloy components in the TSC diesel generator cooling water subsystem is managed by the Work Control Process program, which is a plant-specific program.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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	No	Consistent with NUREG-1801. Reduction of heat transfer due to fouling of steel, stainless steel, and copper alloy heat exchanger tubes exposed to closed cycle cooling water is managed by the Closed-Cycle Cooling Water System program, which takes exception to the NUREG-1801 AMP, and the Work Control Process program, which is a plant-specific program.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	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	Loss of material due to general and pitting corrosion of steel compressed air system piping, piping components, and piping elements exposed to condensation is managed by the Compressed Air Monitoring program, which takes exception to the NUREG-1801 AMP. Loss of material due to general and pitting corrosion of steel traps in the Station and Instrument Air System is managed by the Work Control Process program, which is a plant-specific program.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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	Loss of material due to pitting and crevice corrosion of stainless steel piping, piping components, and piping elements is managed by the Compressed Air Monitoring program, which takes exception to the NUREG-1801 AMP. Loss of material due to pitting and crevice corrosion of stainless steel piping, piping components, and piping elements exposed to internal condensation in systems not within the scope of the Compressed Air Monitoring program is managed by the Work Control Process program, which is a plant-specific program.
3.3.1-55	Steel ducting closure bolting exposed to air – indoor uncontrolled (external)	Loss of material due to general corrosion	External Surfaces Monitoring	No	Loss of material due to general corrosion for steel bolting and closure bolting is managed by the Bolting Integrity program.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	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	No	Consistent with NUREG-1801. Loss of material due to general corrosion of steel HVAC ducting and components external surfaces exposed to air - indoor uncontrolled is managed by the External Surfaces Monitoring program.
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	No	Consistent with NUREG-1801. Loss of material due to general corrosion of steel tanks external surfaces exposed to air - indoor uncontrolled is managed by the External Surfaces Monitoring program.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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	No	Loss of material due to general corrosion of steel external surfaces exposed to air - indoor uncontrolled, air - outdoor, and condensation is managed by the External Surfaces Monitoring program. Loss of material due to general corrosion of the TSC air conditioning compressor and the potable water nozzles that are exposed to air-indoor uncontrolled are managed by the Work Control Process program, which is a plant-specific program.
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	No	Consistent with NUREG-1801. Loss of material due to general, pitting, and crevice corrosion of steel piping and heat exchanger components exposed to air - indoor uncontrolled or air -outdoor is managed by the External Surfaces Monitoring program.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	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	No	Consistent with NUREG-1801. Loss of material due to general, pitting, and crevice corrosion of steel piping, piping components, and piping elements exposed to air - outdoor is managed by the External Surfaces Monitoring program.
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	No	Consistent with NUREG-1801. Increased hardness, shrinkage and loss of strength due to weathering of elastomer fire barrier penetration seals exposed to air - outdoor or air - indoor uncontrolled is managed by the Fire Protection program, which takes exception to the NUREG-1801 AMP.
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	No	NUREG-1801 item is not applicable. There are no Fire Protection System aluminum piping, piping components, and piping elements exposed to raw water.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-63	Steel fire rated doors exposed to air – outdoor or air - indoor uncontrolled	Loss of material due to Wear	Fire Protection	No	Consistent with NUREG-1801. Loss of material due to wear of steel fire rated doors exposed to air - indoor uncontrolled is managed by the Fire Protection program, which takes exception to the NUREG-1801 AMP.
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 and Fuel Oil Chemistry	No	NUREG-1801 item is not applicable. There are no Fire Protection System steel piping, piping components, and piping elements exposed to fuel oil.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	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 and Structures Monitoring Program	No	Consistent with NUREG-1801. Concrete cracking and spalling due to aggressive chemical attack, and reaction with aggregates in reinforced concrete structural fire barriers exposed to air - indoor uncontrolled is managed by the Fire Protection program, which takes exception to the NUREG-1801 AMP, and the Structures Monitoring Program.
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 and Structures Monitoring Program	No	Consistent with NUREG-1801. Concrete cracking and spalling due to freeze thaw, aggressive chemical attack, and reaction with aggregates in reinforced concrete structural fire barriers exposed to air - outdoor is managed by the Fire Protection program, which takes exception to the NUREG-1801 AMP, and the Structures Monitoring Program.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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 and Structures Monitoring Program	No	Consistent with NUREG-1801. Loss of material due to corrosion of embedded steel in reinforced concrete structural fire barriers exposed to air - outdoor or air - indoor uncontrolled is managed by the Fire Protection program, which takes exception to the NUREG-1801 AMP, and the Structures Monitoring Program.
3.3.1-68	Steel piping, piping components, and piping elements exposed to raw water	Loss of material due to general, pitting, crevice, and micro-biologically influenced corrosion, and fouling	Fire Water System	No	Loss of material due to general, pitting, crevice, and microbiologically influenced corrosion, and fouling of steel piping, piping components, and piping elements in the Fire Protection System exposed to raw water is managed by the Fire Protection program. (continued on next page)

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-68 (cont'd.)	Steel piping, piping components, and piping elements exposed to raw water	Loss of material due to general, pitting, crevice, and micro-biologically influenced corrosion, and fouling	Fire Water System	No	The Fire Protection program encompasses the recommendations of NUREG-1801, Section XI.M2, "Fire Protection", with exceptions, and NUREG-1801, Section XI.M27, "Fire Water System". Loss of material due to general, pitting, crevice, and microbiologically influenced corrosion, and fouling of steel piping, piping components, and piping elements exposed to raw water in systems other than the Fire Protection System is managed by the Work Control Process program, which is a plant-specific program, or the External Surfaces Monitoring program.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	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	No	Consistent with NUREG-1801. Loss of material due to pitting and crevice corrosion, and fouling of stainless steel piping, piping components, and piping elements exposed to raw water in the Fire Protection System is managed by the Fire Protection program. The Fire Protection program encompasses the recommendations of NUREG-1801, Section XI.M2, "Fire Protection", with exceptions, and NUREG-1801, Section XI.M27, "Fire Water System".

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	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 micro-biologically influenced corrosion, and fouling	Fire Water System	No	Consistent with NUREG-1801. Loss of material due to pitting, crevice, and microbiologically influenced corrosion, and fouling of copper alloy piping, piping components, and piping elements exposed to raw water in the Fire Protection System is managed by the Fire Protection program. The Fire Protection program encompasses the recommendations of NUREG-1801, Section XI.M2, "Fire Protection", with exceptions, and NUREG-1801, Section XI.M27, "Fire Water System".

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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	No	Loss of material due to general, pitting, and crevice corrosion of steel piping, piping components, and piping elements exposed to moist air or condensation is managed by the Work Control Process program, which is a plant-specific program. Loss of material due to general, pitting, and crevice corrosion of steel piping, piping components, and piping elements exposed to moist air or condensation is managed by the Compressed Air Monitoring program for some components in the Diesel Generator System and the Fire Protection program for some components in the Fire Protection System program. Both programs take exception to the NUREG-1801 AMPs.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	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	No	Loss of material due to general, pitting, crevice, and (for drip pans and drain lines) microbiologically influenced corrosion of steel HVAC ducting and components internal surfaces exposed to condensation is managed by the Work Control Process program, which is a plant-specific program.
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	No	Consistent with NUREG-1801. Loss of material due to general corrosion of steel crane structural girders in load handling system exposed to air-indoor uncontrolled is managed by the Inspection of Overhead Heavy Load and Refueling Handling Systems program.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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	No	Consistent with NUREG-1801. Loss of material due to wear of steel cranes - rails exposed to air - indoor uncontrolled is managed by the Inspection of Overhead Heavy Load and Refueling Handling Systems program.
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	No	Hardening and loss of strength due to elastomer degradation; loss of material due to erosion of elastomer seals and components exposed to raw water are managed by the Work Control Process program, which is a plant-specific program.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	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 micro-biologically influenced corrosion, fouling, and lining/coating degradation	Open-Cycle Cooling Water System	No	Loss of material due to general, pitting, crevice, and microbiologically influenced corrosion and fouling of safety-related steel piping, piping components, and piping elements exposed to raw water is managed by the Open-Cycle Cooling Water System program, which takes exception to the NUREG-1801 AMP. Loss of material due to general, pitting, crevice, and microbiologically influenced corrosion and fouling of non-safety-related steel piping, piping components, and piping elements exposed to raw water is managed by the Work Control Process program, which is a plant-specific program, and the Compressed Air Monitoring program

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-77	Steel heat exchanger components exposed to raw water	Loss of material due to general, pitting, crevice, galvanic, and micro-biologically influenced corrosion, and fouling	Open-Cycle Cooling Water System	No	Loss of material due to general, pitting, crevice, galvanic, and microbiologically influenced corrosion, and fouling of safety-related steel heat exchanger components exposed to raw water is managed by the Open-Cycle Cooling Water System program, which takes exception to the NUREG-1801 AMP. Loss of material due to general, pitting, crevice, galvanic, and microbiologically influenced corrosion, and fouling of non-safety-related steel heat exchanger components exposed to raw water is managed by the Work Control Process program, which is a plant-specific program.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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	No	Loss of material due to pitting and crevice corrosion of safety-related stainless steel piping, piping components, and piping elements exposed to raw water is managed by the Open-Cycle Cooling Water System program, which takes exception to the NUREG-1801 AMP. Loss of material due to pitting and crevice corrosion of non-safety-related stainless steel piping, piping components, and piping elements exposed to raw water is managed by the Work Control Process program, which is a plant-specific program.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	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	No	Loss of material due to pitting and crevice corrosion, and fouling of safety-related stainless steel piping, piping components, and piping elements exposed to raw water is managed by the Open-Cycle Cooling Water System program, which takes exception to the NUREG-1801 AMP. Loss of material due to pitting and crevice corrosion, and fouling of non-safety-related stainless steel piping, piping components, and piping elements exposed to raw water is managed by the Work Control Process program, which is a plant-specific program.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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 micro-biologically influenced corrosion	Open-Cycle Cooling Water System	No	Loss of material due to pitting, crevice, and microbiologically influenced corrosion of stainless steel piping, piping components, and piping elements exposed to raw water is managed by the Work Control Process program, which is a plant-specific program, or the Structures Monitoring Program.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-81	Copper alloy piping, piping components, and piping elements, exposed to raw water	Loss of material due to pitting, crevice, and micro-biologically influenced corrosion, and fouling	Open-Cycle Cooling Water System	No	Loss of material due to pitting, crevice, and microbiologically influenced corrosion, and fouling of safety-related copper alloy piping, piping components, and piping elements, exposed to raw water is managed by the Open-Cycle Cooling Water System program, which takes exception to the NUREG-1801 AMP. Loss of material due to pitting, crevice, and microbiologically influenced corrosion, and fouling of non-safety-related copper alloy piping, piping components, and piping elements, exposed to raw water is managed by the Work Control Process program, which is a plant-specific program.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	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 micro-biologically influenced corrosion, and fouling	Open-Cycle Cooling Water System	No	Loss of material due to pitting, crevice, galvanic, and microbiologically influenced corrosion, and fouling of safety-related copper alloy heat exchanger components exposed to raw water is managed by the Open-Cycle Cooling Water System program, which takes exception to the NUREG-1801 AMP. Loss of material due to pitting, crevice, galvanic, and microbiologically influenced corrosion, and fouling of non-safety-related copper alloy heat exchanger components exposed to raw water is managed by the Work Control Process program, which is a plant-specific program.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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	No	Reduction of heat transfer due to fouling of safety-related copper alloy heat exchanger tubes exposed to raw water is managed by the Open-Cycle Cooling Water System program, which takes exception to the NUREG-1801 AMP. Reduction of heat transfer due to fouling of non-safety-related copper alloy heat exchanger tubes exposed to raw water is managed by the Work Control Process program, which is a plant-specific program.
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	No	Consistent with NUREG-1801. Loss of material due to selective leaching of copper alloy >15% Zn piping, piping components, piping elements, and heat exchanger components exposed to raw water or closed cycle cooling water is managed by the Selective Leaching of Materials program.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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	No	Consistent with NUREG-1801. Loss of material due to selective leaching of gray cast iron piping, piping components, and piping elements exposed to soil, raw water, or closed-cycle cooling water is managed by the Selective Leaching of Materials program.
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	No	NUREG-1801 item is not applicable. The new fuel storage rack assembly is constructed of stainless steel.
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	NUREG-1801 item is not applicable. The spent fuel storage racks do not have any components fabricated from Boraflex.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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	No	Consistent with NUREG-1801. Loss of material due to boric acid corrosion of aluminum and copper alloy >15% Zn piping, piping components, and piping elements exposed to air with borated water leakage is managed by the Boric Acid Corrosion program.
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	No	Consistent with NUREG-1801. Loss of material due to boric acid corrosion of steel bolting and external surfaces exposed to air with borated water leakage is managed by the Boric Acid Corrosion program.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	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	No	Cracking due to stress corrosion cracking of non-ASME Class 1 stainless steel piping, piping components, tanks, and heat exchanger components exposed to treated borated water >60°C (>140°F) is managed by the Work Control Process program, which is a plant-specific program, and the Primary Water Chemistry program. Cracking due to stress corrosion cracking of ASME Class 1 stainless steel piping and valves exposed to treated borated water >60°C (>140°F) is managed by the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program, which takes exception to the NUREG-1801 AMP, and the Primary Water Chemistry program.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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	No	Loss of material due to pitting and crevice corrosion for equipment exposed to treated borated water is managed by the Work Control Process program, which is a plant-specific program, and the Primary Water Chemistry program.
3.3.1-92	Galvanized steel piping, piping components, and piping elements exposed to air – indoor uncontrolled	None	None	NA - No AEM or AMP	NUREG-1801 item is not applicable. It has been conservatively determined that aging effects are applicable to components fabricated from galvanized steel and exposed to air – indoor uncontrolled environment.
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 - No AEM or AMP	Consistent with NUREG-1801. There are no aging effects associated with glass piping elements.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-94	Stainless steel and nickel alloy piping, piping components, and piping elements exposed to air – indoor uncontrolled (external)	None	None	NA - No AEM or AMP	Consistent with NUREG-1801. There are no aging effects associated with stainless steel components exposed to air - indoor uncontrolled.
3.3.1-95	Steel and aluminum piping, piping components, and piping elements exposed to air – indoor controlled (external)	None	None	NA - No AEM or AMP	Consistent with NUREG-1801. There are no aging effects associated with steel and aluminum components exposed to air - indoor controlled.
3.3.1-96	Steel and stainless steel piping, piping components, and piping elements in concrete	None	None	NA - No AEM or AMP	Consistent with NUREG-1801. There are no aging effects associated with steel and stainless steel components in concrete.
3.3.1-97	Steel, stainless steel, aluminum, and copper alloy piping, piping components, and piping elements exposed to gas	None	None	NA - No AEM or AMP	Consistent with NUREG-1801. There are no aging effects associated with steel, stainless steel, aluminum, and copper alloy components exposed to gas.

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-98	Steel, stainless steel, and copper alloy piping, piping components, and piping elements exposed to dried air	None	None	NA - No AEM or AMP	Consistent with NUREG-1801. There are no aging effects associated with steel, stainless steel, and copper alloy components exposed to dried air
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 - No AEM or AMP	Consistent with NUREG-1801. There are no aging effects associated with stainless steel and copper alloy <15% Zn components exposed to air with borated water leakage.

Results Tables: Auxiliary Systems AMR Results

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-1: Auxiliary Systems - New Fuel Storage - Aging Management Evaluation

Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Bolting	SS	Steel	(E) Air-indoor uncontrolled	Loss of material/general, pitting, and crevice corrosion	Bolting Integrity	VII.I-04	3.3.1-43	A
New Fuel Storage Rack	SS	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	C

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-1 Notes:

Plant Standard Notes

Note - The following plant standard notes have generic applicability, but may or may not be used for each SSC:

S1. Thermal embrittlement is only applicable to CASS components that are subject to temperatures in excess of 482°F.

S2. Cracking due to SCC is only applicable to stainless steel components exposed to temperatures greater than 140°F.

S3. Selective leaching is applicable to the material group 'Steel,' but only for gray cast iron components.

Industry Standard Notes

See last page of Section 3.3 tables.

Table 3.3.2-2: Auxiliary Systems - Spent Fuel Storage - Aging Management Evaluation

Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Spent Fuel Storage Racks	AN; SS	Neutron - Absorbing Materials	(E) Treated water-primary	None	None			H
		Stainless Steel	(E) Treated water-primary	Loss of material/pitting and crevice corrosion	Primary Water Chemistry	VII.A2-01	3.3.1-91	A
					Work Control Process	VII.A2-01	3.3.1-91	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-2 Notes:

Plant Standard Notes

Note - The following plant standard notes have generic applicability, but may or may not be used for each SSC:

S1. Thermal embrittlement is only applicable to CASS components that are subject to temperatures in excess of 482°F.

S2. Cracking due to SCC is only applicable to stainless steel components exposed to temperatures greater than 140°F.

S3. Selective leaching is applicable to the material group 'Steel,' but only for gray cast iron components.

Industry Standard Notes

See last page of Section 3.3 tables.

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-3: Auxiliary Systems - Spent Fuel Pool Cooling - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Bolting	PB	Steel	(E) Air-indoor uncontrolled	Cracking/cyclic loading, stress corrosion cracking	Bolting Integrity	VII.I-03	3.3.1-41	A
				Loss of material/general, pitting, and crevice corrosion	Bolting Integrity	VII.I-04	3.3.1-43	A
				Loss of preload/thermal effects, gasket creep, and self-loosening	Bolting Integrity	VII.I-05	3.3.1-45	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-02	3.3.1-89	A
Convection Tank	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	C
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	C
			(I) Treated water-primary	Loss of material/pitting and crevice corrosion	Primary Water Chemistry	EP-041	3.2.1-49	A
					Work Control Process	EP-041	3.2.1-49	E
Filter Housings	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Treated water-primary	Loss of material/pitting and crevice corrosion	Primary Water Chemistry	VII.A3-08	3.3.1-91	A
					Work Control Process	VII.A3-08	3.3.1-91	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-3: Auxiliary Systems - Spent Fuel Pool Cooling - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Pipe	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(E) Concrete	None	None	VII.J-17	3.3.1-96	A
			(I) Treated water-primary	Loss of material/pitting and crevice corrosion	Primary Water Chemistry	VII.A3-08	3.3.1-91	A
					Work Control Process	VII.A3-08	3.3.1-91	E
Pumps	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Treated water-primary	Loss of material/pitting and crevice corrosion	Primary Water Chemistry	VII.A3-08	3.3.1-91	A
					Work Control Process	VII.A3-08	3.3.1-91	E
Spent Fuel Pool Demineralizer	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	C
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	C
			(I) Treated water-primary	Loss of material/pitting and crevice corrosion	Primary Water Chemistry	VII.A3-08	3.3.1-91	A
					Work Control Process	VII.A3-08	3.3.1-91	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-3: Auxiliary Systems - Spent Fuel Pool Cooling - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Spent Fuel Pool Heat Exchanger (Channel head)	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	C
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	C
			(I) Treated water-primary	Loss of material/pitting and crevice corrosion	Primary Water Chemistry	VII.A3-08	3.3.1-91	C
					Work Control Process	VII.A3-08	3.3.1-91	E
Spent Fuel Pool Heat Exchanger (Shell)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.A3-02	3.3.1-89	A
			(I) Raw water	Loss of material/erosion	Work Control Process			H
				Loss of material/general, pitting, crevice, galvanic, and microbiologically influenced corrosion, and fouling	Work Control Process	A-064	3.3.1-77	E
Spent Fuel Pool Heat Exchanger (Tubes)	HT; PB	Stainless Steel	(E) Raw water	Loss of material/erosion	Work Control Process			H
				Loss of material/fretting	Work Control Process			H
				Loss of material/pitting, crevice, and microbiologically influenced corrosion, and fouling	Work Control Process	E-020	3.2.1-39	E
			(I) Treated water-primary	Loss of material/pitting and crevice corrosion	Primary Water Chemistry	VII.A3-08	3.3.1-91	C
					Work Control Process	VII.A3-08	3.3.1-91	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-3: Auxiliary Systems - Spent Fuel Pool Cooling - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Spent Fuel Pool Heat Exchanger (Tubesheet)	PB	Stainless Steel	(E) Raw water	Loss of material/erosion	Work Control Process			H
				Loss of material/pitting, crevice, and microbiologically influenced corrosion, and fouling	Work Control Process	E-020	3.2.1-39	E
			(I) Treated water-primary	Loss of material/pitting and crevice corrosion	Primary Water Chemistry	VII.A3-08	3.3.1-91	C
					Work Control Process	VII.A3-08	3.3.1-91	E
Tubing	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Treated water-primary	Loss of material/pitting and crevice corrosion	Primary Water Chemistry	VII.A3-08	3.3.1-91	A
					Work Control Process	VII.A3-08	3.3.1-91	E
Valves	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Treated water-primary	Loss of material/pitting and crevice corrosion	Primary Water Chemistry	VII.A3-08	3.3.1-91	A
					Work Control Process	VII.A3-08	3.3.1-91	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-3 Notes:

Plant Standard Notes

Note - The following plant standard notes have generic applicability, but may or may not be used for each SSC:

S1. Thermal embrittlement is only applicable to CASS components that are subject to temperatures in excess of 482°F.

S2. Cracking due to SCC is only applicable to stainless steel components exposed to temperatures greater than 140°F.

S3. Selective leaching is applicable to the material group 'Steel,' but only for gray cast iron components.

Industry Standard Notes

See last page of Section 3.3 tables.

Table 3.3.2-4: Auxiliary Systems - Fuel Handling - Aging Management Evaluation

Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Auxiliary Building upending rig winch (support housing and frame)	SS	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	Inspection of Overhead Heavy Load and Refueling Handling Systems	VII.B-03	3.3.1-73	A
Cranes and Monorails including bridge & trolley support members (girders, beams, angles, plates, rails and fasteners)	SS	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	Inspection of Overhead Heavy Load and Refueling Handling Systems	VII.B-03	3.3.1-73	A
				Loss of material/wear	Inspection of Overhead Heavy Load and Refueling Handling Systems	VII.B-01	3.3.1-74	A, 1
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A, 2
Fuel transfer equipment (carriage, lifting frame, support frame, rails and fasteners)	SS	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	C
			(E) Treated water-primary	Loss of material/pitting and crevice corrosion	Primary Water Chemistry	AP-079	3.3.1-91	C
					Work Control Process	AP-079	3.3.1-91	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-4 Notes:

Plant Standard Notes

Note - The following plant standard notes have generic applicability, but may or may not be used for each SSC:

S1. Thermal embrittlement is only applicable to CASS components that are subject to temperatures in excess of 482°F.

S2. Cracking due to SCC is only applicable to stainless steel components exposed to temperatures greater than 140°F.

S3. Selective leaching is applicable to the material group 'Steel,' but only for gray cast iron components.

System Specific Notes

1. Loss of material due to wear is applicable to the rails only.

2. The Manipulator crane is the only crane in this system subjected to borated water leakage.

Industry Standard Notes

See last page of Section 3.3 tables.

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-5: Auxiliary Systems - Cranes (Excluding Fuel Handling) - Aging Management Evaluation

Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Cranes and Monorails including bridge & trolley support members (girders, beams, angles, plates, rails and fasteners)	SS	Steel	(E) Air-indoor uncontrolled	Cumulative fatigue damage/fatigue	TLAA	VII.B-02	3.3.1-01	A
				Loss of material/general corrosion	Inspection of Overhead Heavy Load and Refueling Handling Systems	VII.B-03	3.3.1-73	A
				Loss of material/wear	Inspection of Overhead Heavy Load and Refueling Handling Systems	VII.B-01	3.3.1-74	A, 1
Reactor Building Pedestal Crane (boom, structural frame and plates)	SS	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	Inspection of Overhead Heavy Load and Refueling Handling Systems	VII.B-03	3.3.1-73	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-5 Notes:

Plant Standard Notes

Note - The following plant standard notes have generic applicability, but may or may not be used for each SSC:

S1. Thermal embrittlement is only applicable to CASS components that are subject to temperatures in excess of 482°F.

S2. Cracking due to SCC is only applicable to stainless steel components exposed to temperatures greater than 140°F.

S3. Selective leaching is applicable to the material group 'Steel,' but only for gray cast iron components.

System Specific Notes

1. Loss of material due to wear is applicable to the rails only.

Industry Standard Notes

See last page of Section 3.3 tables.

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-6: Auxiliary Systems - Service Water - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Bolting	PB	Steel	(E) Air-indoor uncontrolled	Cracking/cyclic loading, stress corrosion cracking	Bolting Integrity	VII.I-03	3.3.1-41	A
				Loss of material/general, pitting, and crevice corrosion	Bolting Integrity	VII.I-04	3.3.1-43	A
				Loss of preload/thermal effects, gasket creep, and self-loosening	Bolting Integrity	VII.I-05	3.3.1-45	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-02	3.3.1-89	A
Filter Housings (SW bearing lube water dual filters)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(I) Raw water	Loss of material/erosion	Open-Cycle Cooling Water System			H
				Loss of material/general, pitting, crevice, and microbiologically influenced corrosion, fouling, and lining-coating degradation	Open-Cycle Cooling Water System	VII.C1-19	3.3.1-76	B, 2
				Loss of material/selective leaching	Selective Leaching of Materials	VII.C1-11	3.3.1-85	A, S3
Filter Housings (SW to chlorination pumps)	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(I) Raw water	Loss of material/microbiologically influenced corrosion	Work Control Process			E
				Loss of material/pitting and crevice corrosion, and fouling	Work Control Process	VII.C1-15	3.3.1-79	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-6: Auxiliary Systems - Service Water - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Flex Connections	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(I) Raw water	Loss of material/microbiologically influenced corrosion	Open-Cycle Cooling Water System			H
				Loss of material/pitting and crevice corrosion, and fouling	Open-Cycle Cooling Water System	VII.C1-15	3.3.1-79	B
Flexible Hoses	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(I) Raw water	Loss of material/microbiologically influenced corrosion	Work Control Process			H
				Loss of material/pitting and crevice corrosion, and fouling	Work Control Process	VII.C1-15	3.3.1-79	E
Flow Elements	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Raw water	Loss of material/microbiologically influenced corrosion	Open-Cycle Cooling Water System			H
				Loss of material/pitting and crevice corrosion, and fouling	Open-Cycle Cooling Water System	VII.C1-15	3.3.1-79	B

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-6: Auxiliary Systems - Service Water - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Flow Switches	PB	Copper Alloys	(E) Air-indoor uncontrolled	Loss of material/pitting and crevice corrosion	External Surfaces Monitoring	A-046	3.3.1-25	E
			(I) Raw water	Loss of material/pitting, crevice, and microbiologically influenced corrosion, and fouling	Open-Cycle Cooling Water System	VII.C1-09	3.3.1-81	B, 1
					Work Control Process	VII.C1-09	3.3.1-81	E, 1
				Loss of material/selective leaching	Selective Leaching of Materials	VII.C1-10	3.3.1-84	A
Gage Glasses	PB	Glass	(E) Air-indoor uncontrolled	None	None	VII.J-08	3.3.1-93	A
			(I) Raw water	None	None	VII.J-11	3.3.1-93	A
Orifices	PB; RF	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Raw water	Loss of material/microbiologically influenced corrosion	Open-Cycle Cooling Water System			H, 1
					Work Control Process			H, 1
				Loss of material/pitting and crevice corrosion, and fouling	Open-Cycle Cooling Water System	VII.C1-15	3.3.1-79	B, 1
					Work Control Process	VII.C1-15	3.3.1-79	E, 1

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-6: Auxiliary Systems - Service Water - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Pipe	PB	Copper Alloys	(E) Air-indoor uncontrolled	Loss of material/pitting and crevice corrosion	External Surfaces Monitoring	A-046	3.3.1-25	E
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-12	3.3.1-88	A
			(I) Raw water	Loss of material/erosion	Open-Cycle Cooling Water System			H, 1
					Work Control Process			H, 1
				Loss of material/pitting, crevice, and microbiologically influenced corrosion, and fouling	Open-Cycle Cooling Water System	VII.C1-09	3.3.1-81	B, 1
					Work Control Process	VII.C1-09	3.3.1-81	E, 1
				Loss of material/selective leaching	Selective Leaching of Materials	VII.C1-10	3.3.1-84	A
		Non-Metallic	(E) Air-indoor uncontrolled	None	None			H
			(I) Raw water	None	None			H
		Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Raw water	Loss of material/microbiologically influenced corrosion	Open-Cycle Cooling Water System			H
				Loss of material/pitting and crevice corrosion, and fouling	Open-Cycle Cooling Water System	VII.C1-15	3.3.1-79	B

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-6: Auxiliary Systems - Service Water - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Pipe	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(E) Concrete	None	None	VII.J-21	3.3.1-96	A
			(I) Raw water	Loss of material/erosion	Open-Cycle Cooling Water System			H
				Loss of material/general, pitting, crevice, and microbiologically influenced corrosion, fouling, and lining-coating degradation	Open-Cycle Cooling Water System	VII.C1-19	3.3.1-76	B, 2
Service Water Chlorination Pumps	PB	Non-Metallic	(E) Air-indoor uncontrolled	None	None			H
			(I) Raw water	None	None			H

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-6: Auxiliary Systems - Service Water - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Service Water Pumps	PB	Stainless Steel	(E) Raw water	Loss of material/microbiologically influenced corrosion	Open-Cycle Cooling Water System			H
				Loss of material/pitting and crevice corrosion, and fouling	Open-Cycle Cooling Water System	VII.C1-15	3.3.1-79	B
			(I) Raw water	Loss of material/microbiologically influenced corrosion	Open-Cycle Cooling Water System			H
				Loss of material/pitting and crevice corrosion, and fouling	Open-Cycle Cooling Water System	VII.C1-15	3.3.1-79	B
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(I) Raw water	Loss of material/erosion	Open-Cycle Cooling Water System			H
				Loss of material/general, pitting, crevice, and microbiologically influenced corrosion, fouling, and lining-coating degradation	Open-Cycle Cooling Water System	VII.C1-19	3.3.1-76	B, 2
				Loss of material/selective leaching	Selective Leaching of Materials	VII.C1-11	3.3.1-85	A, S3

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-6: Auxiliary Systems - Service Water - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Sight Flow Indicators	PB	Copper Alloys	(E) Air-indoor uncontrolled	Loss of material/pitting and crevice corrosion	External Surfaces Monitoring	A-046	3.3.1-25	E
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-12	3.3.1-88	A
			(I) Raw water	Loss of material/pitting, crevice, and microbiologically influenced corrosion, and fouling	Open-Cycle Cooling Water System	VII.C1-09	3.3.1-81	B, 1
					Work Control Process	VII.C1-09	3.3.1-81	E, 1
				Loss of material/selective leaching	Selective Leaching of Materials	VII.C1-10	3.3.1-84	A
		Glass	(E) Air-indoor uncontrolled	None	None	VII.J-08	3.3.1-93	A
			(I) Raw water	None	None	VII.J-11	3.3.1-93	A
Spray Nozzles	PB; SP	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(I) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-6: Auxiliary Systems - Service Water - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Standpipes	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(I) Raw water	Loss of material/erosion	Open-Cycle Cooling Water System			H, 1
					Work Control Process			H, 1
				Loss of material/general, pitting, crevice, and microbiologically influenced corrosion, fouling, and lining-coating degradation	Open-Cycle Cooling Water System	VII.C1-19	3.3.1-76	B, 1, 2
					Work Control Process	VII.C1-19	3.3.1-76	E, 1, 2

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-6: Auxiliary Systems - Service Water - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Strainer Housings	PB	Copper Alloys	(E) Air-indoor uncontrolled	Loss of material/pitting and crevice corrosion	External Surfaces Monitoring	A-046	3.3.1-25	E
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-12	3.3.1-88	A
			(I) Raw water	Loss of material/erosion	Open-Cycle Cooling Water System			H, 1
					Work Control Process			H, 1
				Loss of material/pitting, crevice, and microbiologically influenced corrosion, and fouling	Open-Cycle Cooling Water System	VII.C1-09	3.3.1-81	B, 1
					Work Control Process	VII.C1-09	3.3.1-81	E, 1
				Loss of material/selective leaching	Selective Leaching of Materials	VII.C1-10	3.3.1-84	A
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(I) Raw water	Loss of material/erosion	Open-Cycle Cooling Water System			H, 1
					Work Control Process			H, 1
				Loss of material/general, pitting, crevice, and microbiologically influenced corrosion, fouling, and lining-coating degradation	Open-Cycle Cooling Water System	VII.C1-19	3.3.1-76	B, 1, 2
					Work Control Process	VII.C1-19	3.3.1-76	E, 1, 2
				Loss of material/selective leaching	Selective Leaching of Materials	VII.C1-11	3.3.1-85	A, S3

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-6: Auxiliary Systems - Service Water - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Tubing	PB	Copper Alloys	(E) Air-indoor uncontrolled	Loss of material/pitting and crevice corrosion	External Surfaces Monitoring	A-046	3.3.1-25	E
			(E) Borated water leakage	None	None	VII.J-05	3.3.1-99	A
			(I) Raw water	Loss of material/pitting, crevice, and microbiologically influenced corrosion, and fouling	Open-Cycle Cooling Water System	VII.C1-09	3.3.1-81	B, 1
					Work Control Process	VII.C1-09	3.3.1-81	E, 1
		Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Raw water	Loss of material/microbiologically influenced corrosion	Open-Cycle Cooling Water System			H, 1
					Work Control Process			H, 1
				Loss of material/pitting and crevice corrosion, and fouling	Open-Cycle Cooling Water System	VII.C1-15	3.3.1-79	B, 1
					Work Control Process	VII.C1-15	3.3.1-79	E, 1

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-6: Auxiliary Systems - Service Water - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Tubing	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(I) Raw water	Loss of material/general, pitting, crevice, and microbiologically influenced corrosion, fouling, and lining-coating degradation	Open-Cycle Cooling Water System	VII.C1-19	3.3.1-76	B, 1, 2
					Work Control Process	VII.C1-19	3.3.1-76	E, 1, 2
Valves	PB	Copper Alloys	(E) Air-indoor uncontrolled	Loss of material/pitting and crevice corrosion	External Surfaces Monitoring	A-046	3.3.1-25	E
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-12	3.3.1-88	A
			(I) Raw water	Loss of material/erosion	Open-Cycle Cooling Water System			H, 1
					Work Control Process			H, 1
				Loss of material/pitting, crevice, and microbiologically influenced corrosion, and fouling	Open-Cycle Cooling Water System	VII.C1-09	3.3.1-81	B, 1
					Work Control Process	VII.C1-09	3.3.1-81	E, 1
				Loss of material/selective leaching	Selective Leaching of Materials	VII.C1-10	3.3.1-84	A
		Non-Metallic	(E) Air-indoor uncontrolled	None	None			H
			(I) Raw water	None	None			H

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-6: Auxiliary Systems - Service Water - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Valves	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Raw water	Loss of material/microbiologically influenced corrosion	Open-Cycle Cooling Water System			H
					Work Control Process			H
				Loss of material/pitting and crevice corrosion, and fouling	Open-Cycle Cooling Water System	VII.C1-15	3.3.1-79	B, 1
					Work Control Process	VII.C1-15	3.3.1-79	E, 1
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(I) Raw water	Loss of material/erosion	Open-Cycle Cooling Water System			H, 1
					Work Control Process			H, 1
				Loss of material/general, pitting, crevice, and microbiologically influenced corrosion, fouling, and lining-coating degradation	Open-Cycle Cooling Water System	VII.C1-19	3.3.1-76	B, 1, 2
					Work Control Process	VII.C1-19	3.3.1-76	E, 1, 2
				Loss of material/selective leaching	Selective Leaching of Materials	VII.C1-11	3.3.1-85	A, S3

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-6 Notes:

Plant Standard Notes

Note - The following plant standard notes have generic applicability, but may or may not be used for each SSC:

S1. Thermal embrittlement is only applicable to CASS components that are subject to temperatures in excess of 482°F.

S2. Cracking due to SCC is only applicable to stainless steel components exposed to temperatures greater than 140°F.

S3. Selective leaching is applicable to the material group 'Steel,' but only for gray cast iron components.

System Specific Notes

1. Components that are not safety-related are managed by the Work Control Process. Components that are safety-related are managed by the Open-Cycle Cooling Water System Program.

2. There are no lined or coated piping, piping components, or piping elements in this system. Therefore, lining-coating degradation is not an applicable aging mechanism.

Industry Standard Notes

See last page of Section 3.3 tables.

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-7: Auxiliary Systems - Component Cooling - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Bolting	PB	Steel	(E) Air-indoor uncontrolled	Cracking/cyclic loading, stress corrosion cracking	Bolting Integrity	VII.I-03	3.3.1-41	A
				Loss of material/general, pitting, and crevice corrosion	Bolting Integrity	VII.I-04	3.3.1-43	A
				Loss of preload/thermal effects, gasket creep, and self-loosening	Bolting Integrity	VII.I-05	3.3.1-45	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-02	3.3.1-89	A
Component Cooling Heat Exchangers (Channel head)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(I) Raw water	Loss of material/erosion	Open-Cycle Cooling Water System			H
				Loss of material/general, pitting, crevice, galvanic, and microbiologically influenced corrosion, and fouling	Open-Cycle Cooling Water System	A-064	3.3.1-77	B

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-7: Auxiliary Systems - Component Cooling - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Component Cooling Heat Exchangers (Shell)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(I) Treated water-closed cycle cooling	Loss of material/general, pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	VII.C2-01	3.3.1-48	B
					Work Control Process	VII.C2-01	3.3.1-48	E
				Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H
					Work Control Process			H

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-7: Auxiliary Systems - Component Cooling - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Component Cooling Heat Exchangers (Tubes)	HT; PB	Copper Alloys	(E) Treated water-closed cycle cooling	Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H
					Work Control Process			H
				Loss of material/pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	AP-034	3.3.1-51	B
					Work Control Process	AP-034	3.3.1-51	E
				Reduction of heat transfer/fouling	Closed-Cycle Cooling Water System	VII.C2-02	3.3.1-52	B
					Work Control Process	VII.C2-02	3.3.1-52	E
			(I) Raw water	Loss of material/erosion	Open-Cycle Cooling Water System			H
				Loss of material/pitting, crevice, galvanic, and microbiologically influenced corrosion, and fouling	Open-Cycle Cooling Water System	A-065	3.3.1-82	B
				Reduction of heat transfer/fouling	Open-Cycle Cooling Water System	A-072	3.3.1-83	B

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-7: Auxiliary Systems - Component Cooling - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Component Cooling Heat Exchangers (Tubesheet)	PB	Steel	(E) Treated water-closed cycle cooling	Loss of material/general, pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	VII.C2-01	3.3.1-48	B
					Work Control Process	VII.C2-01	3.3.1-48	E
				Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H
					Work Control Process			H
			(I) Raw water	Loss of material/erosion	Open-Cycle Cooling Water System			H
				Loss of material/general, pitting, crevice, galvanic, and microbiologically influenced corrosion, and fouling	Open-Cycle Cooling Water System	A-064	3.3.1-77	B
Component Cooling Pumps	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(I) Treated water-closed cycle cooling	Loss of material/general, pitting, and crevice corrosion	Closed-Cycle Cooling Water System	VII.C2-14	3.3.1-47	B
					Work Control Process	VII.C2-14	3.3.1-47	E
				Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H
					Work Control Process			H

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-7: Auxiliary Systems - Component Cooling - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Component Cooling Surge Tank	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(I) Treated water-closed cycle cooling	Loss of material/general, pitting, and crevice corrosion	Closed-Cycle Cooling Water System	VII.C2-14	3.3.1-47	D
					Work Control Process	VII.C2-14	3.3.1-47	E
				Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H
					Work Control Process			H
Flow Elements	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Treated water-closed cycle cooling	Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H
					Work Control Process			H
				Loss of material/pitting and crevice corrosion	Closed-Cycle Cooling Water System	VII.C2-10	3.3.1-50	B
					Work Control Process	VII.C2-10	3.3.1-50	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-7: Auxiliary Systems - Component Cooling - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Flow Orifices	PB; RF	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Treated water-closed cycle cooling	Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H
					Work Control Process			H
				Loss of material/pitting and crevice corrosion	Closed-Cycle Cooling Water System	VII.C2-10	3.3.1-50	B
					Work Control Process	VII.C2-10	3.3.1-50	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-7: Auxiliary Systems - Component Cooling - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Pipe	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Treated water-closed cycle cooling	Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H
					Work Control Process			H
				Loss of material/pitting and crevice corrosion	Closed-Cycle Cooling Water System	VII.C2-10	3.3.1-50	B
					Work Control Process	VII.C2-10	3.3.1-50	E
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(I) Treated water-closed cycle cooling	Loss of material/general, pitting, and crevice corrosion	Closed-Cycle Cooling Water System	VII.C2-14	3.3.1-47	B
					Work Control Process	VII.C2-14	3.3.1-47	E
				Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H
					Work Control Process			H

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-7: Auxiliary Systems - Component Cooling - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Strainer Housings	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Treated water-closed cycle cooling	Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H
					Work Control Process			H
				Loss of material/pitting and crevice corrosion	Closed-Cycle Cooling Water System	VII.C2-10	3.3.1-50	B
					Work Control Process	VII.C2-10	3.3.1-50	E
Tubing	PB	Copper Alloys	(E) Air-indoor uncontrolled	Loss of material/pitting and crevice corrosion	External Surfaces Monitoring	A-046	3.3.1-25	E
			(E) Borated water leakage	None	None	VII.J-05	3.3.1-99	A
			(I) Treated water-closed cycle cooling	Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H
					Work Control Process			H
				Loss of material/pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	VII.C2-04	3.3.1-51	B
					Work Control Process	VII.C2-04	3.3.1-51	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-7: Auxiliary Systems - Component Cooling - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Tubing	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Treated water-closed cycle cooling	Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H
					Work Control Process			H
				Loss of material/pitting and crevice corrosion	Closed-Cycle Cooling Water System	VII.C2-10	3.3.1-50	B
					Work Control Process	VII.C2-10	3.3.1-50	E
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(I) Treated water-closed cycle cooling	Loss of material/general, pitting, and crevice corrosion	Closed-Cycle Cooling Water System	VII.C2-14	3.3.1-47	B
					Work Control Process	VII.C2-14	3.3.1-47	E
				Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H
					Work Control Process			H

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-7: Auxiliary Systems - Component Cooling - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Valves	PB	Copper Alloys	(E) Air-indoor uncontrolled	Loss of material/pitting and crevice corrosion	External Surfaces Monitoring	A-046	3.3.1-25	E
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-12	3.3.1-88	A
			(I) Treated water-closed cycle cooling	Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H
					Work Control Process			H
				Loss of material/pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	VII.C2-04	3.3.1-51	B
					Work Control Process	VII.C2-04	3.3.1-51	E
		Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Treated water-closed cycle cooling	Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H
					Work Control Process			H
				Loss of material/pitting and crevice corrosion	Closed-Cycle Cooling Water System	VII.C2-10	3.3.1-50	B
					Work Control Process	VII.C2-10	3.3.1-50	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-7: Auxiliary Systems - Component Cooling - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Valves	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(I) Treated water-closed cycle cooling	Loss of material/general, pitting, and crevice corrosion	Closed-Cycle Cooling Water System	VII.C2-14	3.3.1-47	B
					Work Control Process	VII.C2-14	3.3.1-47	E
				Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H
					Work Control Process			H

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-7 Notes:

Plant Standard Notes

Note - The following plant standard notes have generic applicability, but may or may not be used for each SSC:

S1. Thermal embrittlement is only applicable to CASS components that are subject to temperatures in excess of 482°F.

S2. Cracking due to SCC is only applicable to stainless steel components exposed to temperatures greater than 140°F.

S3. Selective leaching is applicable to the material group 'Steel,' but only for gray cast iron components.

Industry Standard Notes

See last page of Section 3.3 tables.

Table 3.3.2-8: Auxiliary Systems - Station and Instrument Air - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Accumulators	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	C
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	C
			(I) Air-dried	None	None	VII.J-18	3.3.1-98	C
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(I) Air-dried	None	None	VII.J-22	3.3.1-98	C
Aftercoolers (Channel heads)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(I) Air-moist	Loss of material/general and pitting corrosion	Compressed Air Monitoring	VII.D-02	3.3.1-53	B
Aftercoolers (Shell)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(I) Raw water	Loss of material/erosion	Work Control Process			H
				Loss of material/general, pitting, crevice, galvanic, and microbiologically influenced corrosion, and fouling	Work Control Process	A-064	3.3.1-77	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-8: Auxiliary Systems - Station and Instrument Air - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Aftercoolers (Tubes)	HT; PB	Copper Alloys	(E) Raw water	Loss of material/erosion	Work Control Process			H
				Loss of material/pitting, crevice, galvanic, and microbiologically influenced corrosion, and fouling	Work Control Process	A-065	3.3.1-82	E
				Reduction of heat transfer/fouling	Work Control Process	A-072	3.3.1-83	E
			(I) Air-moist	Loss of material/pitting and crevice corrosion	Compressed Air Monitoring	AP-078	3.3.1-28	E
Aftercoolers (Tubesheets)	PB	Steel	(E) Air-moist	Loss of material/general and pitting corrosion	Compressed Air Monitoring	VII.D-02	3.3.1-53	B
			(I) Raw water	Loss of material/erosion	Work Control Process			H
				Loss of material/general, pitting, crevice, galvanic, and microbiologically influenced corrosion, and fouling	Work Control Process	A-064	3.3.1-77	E
Air Dryers	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(I) Air-moist	Loss of material/general and pitting corrosion	Compressed Air Monitoring	VII.D-02	3.3.1-53	B
Air Receivers	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(I) Air-moist	Loss of material/general and pitting corrosion	Compressed Air Monitoring	VII.D-02	3.3.1-53	B

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-8: Auxiliary Systems - Station and Instrument Air - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Bolting	PB	Steel	(E) Air-indoor uncontrolled	Cracking/cyclic loading, stress corrosion cracking	Bolting Integrity	VII.I-03	3.3.1-41	A
				Loss of material/general, pitting, and crevice corrosion	Bolting Integrity	VII.D-01	3.3.1-44	A
				Loss of preload/thermal effects, gasket creep, and self-loosening	Bolting Integrity	VII.I-05	3.3.1-45	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-02	3.3.1-89	A
Compressors (Housing)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(I) Air-moist	Loss of material/general and pitting corrosion	Compressed Air Monitoring	VII.D-02	3.3.1-53	B
			(I) Lube oil	Loss of material/general, pitting, and crevice corrosion	Lubricating Oil Analysis	AP-030	3.3.1-14	A
					Work Control Process	AP-030	3.3.1-14	E
				Loss of material/selective leaching	Selective Leaching of Materials			H, S3
			(I) Raw water	Loss of material/erosion	Work Control Process			H
				Loss of material/general, pitting, crevice, galvanic, and microbiologically influenced corrosion, fouling, and lining-coating degradation	Work Control Process	A-038	3.3.1-76	E, 1

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-8: Auxiliary Systems - Station and Instrument Air - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Compressors (Oil Pump)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(I) Lube oil	Loss of material/general, pitting, and crevice corrosion	Lubricating Oil Analysis	AP-030	3.3.1-14	A
					Work Control Process	AP-030	3.3.1-14	E
Compressors (Oil Sightglass)	PB	Glass	(E) Air-indoor uncontrolled	None	None	VII.J-08	3.3.1-93	A
			(I) Lube oil	None	None	VII.J-10	3.3.1-93	A
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(I) Lube oil	Loss of material/general, pitting, and crevice corrosion	Lubricating Oil Analysis	AP-030	3.3.1-14	A
					Work Control Process	AP-030	3.3.1-14	E
Compressors (Oil Strainer)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(I) Lube oil	Loss of material/general, pitting, and crevice corrosion	Lubricating Oil Analysis	AP-030	3.3.1-14	A
					Work Control Process	AP-030	3.3.1-14	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-8: Auxiliary Systems - Station and Instrument Air - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Filter Housings	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Air-dried	None	None	VII.J-18	3.3.1-98	A
			(I) Air-moist	Loss of material/pitting and crevice corrosion	Compressed Air Monitoring	VII.D-04	3.3.1-54	B
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(I) Air-dried	None	None	VII.J-22	3.3.1-98	A
			(I) Air-moist	Loss of material/general and pitting corrosion	Compressed Air Monitoring	VII.D-02	3.3.1-53	B
Filter/Regulators	FLT; PB	Aluminum	(E) Air-indoor uncontrolled	None	None	EP-003	3.2.1-50	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	AP-001	3.3.1-88	A
			(I) Air-dried	None	None			H

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-8: Auxiliary Systems - Station and Instrument Air - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Filter/Regulators	FLT; PB	Copper Alloys	(E) Air-indoor uncontrolled	None	None	SP-006	3.4.1-41	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-12	3.3.1-88	A
			(I) Air-dried	None	None	VII.J-03	3.3.1-98	A
		Glass	(E) Air-indoor uncontrolled	None	None	VII.J-08	3.3.1-93	A
			(I) Air-dried	None	None			H
		Non-Metallic	(E) Air-dried	Loss of strength/hydrolysis	Work Control Process			H
		Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Air-dried	None	None	VII.J-18	3.3.1-98	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-8: Auxiliary Systems - Station and Instrument Air - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Filter/Regulators	FLT; PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(I) Air-dried	None	None	VII.J-22	3.3.1-98	A
Filter-Silencer Housings	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(I) Air-moist	Loss of material/general and pitting corrosion	Compressed Air Monitoring	VII.D-02	3.3.1-53	B
Flow Indicators	PB	Glass	(E) Air-indoor uncontrolled	None	None	VII.J-08	3.3.1-93	A
			(I) Air-dried	None	None			H
		Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Air-dried	None	None	VII.J-18	3.3.1-98	A
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(I) Air-dried	None	None	VII.J-22	3.3.1-98	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-8: Auxiliary Systems - Station and Instrument Air - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Flow Meters	PB	Glass	(E) Air-indoor uncontrolled	None	None	VII.J-08	3.3.1-93	A
			(I) Air-moist	None	None			H
		Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(I) Air-moist	Loss of material/pitting and crevice corrosion	Compressed Air Monitoring	VII.D-04	3.3.1-54	B
Hoses	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Air-dried	None	None	VII.J-18	3.3.1-98	A
Lubricators	PB	Non-Metallic	(E) Air-indoor uncontrolled	None	None			H
			(I) Air-dried	None	None			H
			(I) Lube oil	None	None			H
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
Moisture Separators	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(I) Air-moist	Loss of material/general and pitting corrosion	Compressed Air Monitoring	VII.D-02	3.3.1-53	B

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-8: Auxiliary Systems - Station and Instrument Air - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Oilers	PB	Non-Metallic	(E) Air-indoor uncontrolled	None	None			H
			(I) Air-dried	None	None			H
			(I) Lube oil	None	None			H
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
Orifices	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(I) Air-dried	None	None	VII.J-18	3.3.1-98	A
Pipe	PB	Copper Alloys	(E) Air-indoor uncontrolled	None	None	SP-006	3.4.1-41	A
			(E) Borated water leakage	None	None	VII.J-05	3.3.1-99	A
			(I) Air-dried	None	None	VII.J-03	3.3.1-98	A
			(I) Air-moist	Loss of material/pitting and crevice corrosion	Compressed Air Monitoring	AP-078	3.3.1-28	E
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(I) Air-moist	Loss of material/general and pitting corrosion	Compressed Air Monitoring	VII.D-02	3.3.1-53	B

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-8: Auxiliary Systems - Station and Instrument Air - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
SFP Gate Inflatable Seal IA Rubber Hoses	PB	Elastomers	(E) Air-indoor uncontrolled	Change in material properties/thermal exposure	Work Control Process			H
				Cracking/thermal exposure	Work Control Process			H
			(I) Gas-inert	None	None			H
Signal Converters	PB	Copper Alloys	(E) Air-indoor uncontrolled	None	None	SP-006	3.4.1-41	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-12	3.3.1-88	A
			(I) Air-dried	None	None	VII.J-03	3.3.1-98	A
		Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Air-dried	None	None	VII.J-18	3.3.1-98	A
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(I) Air-dried	None	None	VII.J-22	3.3.1-98	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-8: Auxiliary Systems - Station and Instrument Air - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Strainer Housings	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(I) Air-dried	None	None	VII.J-22	3.3.1-98	A
Traps	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(I) Air-moist	Loss of material/general and pitting corrosion	Work Control Process	VII.D-02	3.3.1-53	E
			(I) Raw water	Loss of material/general, pitting, crevice, galvanic, and microbiologically influenced corrosion, fouling, and lining-coating degradation	Work Control Process	A-038	3.3.1-76	E, 1

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-8: Auxiliary Systems - Station and Instrument Air - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Tubing	PB	Copper Alloys	(E) Air-indoor uncontrolled	None	None	SP-006	3.4.1-41	A
			(E) Borated water leakage	None	None	VII.J-05	3.3.1-99	A
			(I) Air-dried	None	None	VII.J-03	3.3.1-98	A
			(I) Air-moist	Loss of material/pitting and crevice corrosion	Compressed Air Monitoring	AP-078	3.3.1-28	E
			(I) Lube oil	Loss of material/pitting and crevice corrosion	Lubricating Oil Analysis	AP-047	3.3.1-26	A
					Work Control Process	AP-047	3.3.1-26	E
		Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Air-dried	None	None	VII.J-18	3.3.1-98	A
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(I) Air-dried	None	None	VII.J-22	3.3.1-98	A
			(I) Air-moist	Loss of material/general and pitting corrosion	Compressed Air Monitoring	VII.D-02	3.3.1-53	B
			(I) Lube oil	Loss of material/general, pitting, and crevice corrosion	Lubricating Oil Analysis	AP-030	3.3.1-14	A
					Work Control Process	AP-030	3.3.1-14	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-8: Auxiliary Systems - Station and Instrument Air - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Valves	PB	Copper Alloys	(E) Air-indoor uncontrolled	None	None	SP-006	3.4.1-41	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-12	3.3.1-88	A
			(I) Air-dried	None	None	VII.J-03	3.3.1-98	A
			(I) Air-moist	Loss of material/pitting and crevice corrosion	Compressed Air Monitoring	AP-078	3.3.1-28	E
		Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Air-dried	None	None	VII.J-18	3.3.1-98	A
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(I) Air-dried	None	None	VII.J-22	3.3.1-98	A
			(I) Air-moist	Loss of material/general and pitting corrosion	Compressed Air Monitoring	VII.D-02	3.3.1-53	B
			(I) Lube oil	Loss of material/general, pitting, and crevice corrosion	Lubricating Oil Analysis	AP-030	3.3.1-14	A
					Work Control Process	AP-030	3.3.1-14	E
				Loss of material/selective leaching	Selective Leaching of Materials			H, S3

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-8: Auxiliary Systems - Station and Instrument Air - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Volume Boosters	PB	Copper Alloys	(E) Air-indoor uncontrolled	None	None	SP-006	3.4.1-41	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-12	3.3.1-88	A
			(I) Air-dried	None	None	VII.J-03	3.3.1-98	A
		Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(I) Air-dried	None	None	VII.J-18	3.3.1-98	A

Table 3.3.2-8 Notes:

Plant Standard Notes

Note - The following plant standard notes have generic applicability, but may or may not be used for each SSC:

S1. Thermal embrittlement is only applicable to CASS components that are subject to temperatures in excess of 482°F.

S2. Cracking due to SCC is only applicable to stainless steel components exposed to temperatures greater than 140°F.

S3. Selective leaching is applicable to the material group 'Steel,' but only for gray cast iron components.

System Specific Notes

1. There are no lined or coated piping, piping components, or piping elements in this system. Therefore, lining-coating degradation is not an applicable aging mechanism.

Industry Standard Notes

See last page of Section 3.3 tables.

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-9: Auxiliary Systems - Chemical and Volume Control - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Absorption Tower	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Treated water-primary	Cracking/stress corrosion cracking	Primary Water Chemistry	VII.E1-20	3.3.1-90	A, S2
					Work Control Process	VII.E1-20	3.3.1-90	E, S2
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	VII.E1-17	3.3.1-91	A
					Work Control Process	VII.E1-17	3.3.1-91	E
Batching Tank	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	C
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	C
			(I) Treated water-primary	Cracking/stress corrosion cracking	Primary Water Chemistry	VII.E1-20	3.3.1-90	A, S2
					Work Control Process	VII.E1-20	3.3.1-90	E, S2
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	EP-041	3.2.1-49	A
					Work Control Process	EP-041	3.2.1-49	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-9: Auxiliary Systems - Chemical and Volume Control - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Bolting	PB	Steel	(E) Air-indoor uncontrolled	Cracking/cyclic loading, stress corrosion cracking	Bolting Integrity	VII.I-03	3.3.1-41	A
				Loss of material/general, pitting, and crevice corrosion	Bolting Integrity	VII.I-04	3.3.1-43	A
				Loss of preload/thermal effects, gasket creep, and self-loosening	Bolting Integrity	VII.I-05	3.3.1-45	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-02	3.3.1-89	A
Boric Acid Blender	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Treated water-primary	Loss of material/pitting and crevice corrosion	Primary Water Chemistry	VII.E1-17	3.3.1-91	A
					Work Control Process	VII.E1-17	3.3.1-91	E
Boric Acid Evaporator Distillate Sample Cooler (Shell)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(I) Raw water	Loss of material/erosion	Work Control Process			H
				Loss of material/general, pitting, crevice, galvanic, and microbiologically influenced corrosion, and fouling	Work Control Process	A-064	3.3.1-77	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-9: Auxiliary Systems - Chemical and Volume Control - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Boric Acid Evaporator Distillate Sample Cooler (Tubing)	PB	Stainless Steel	(E) Raw water	Loss of material/erosion	Work Control Process			H
				Loss of material/microbiologically influenced corrosion	Work Control Process			H
				Loss of material/pitting, crevice, and microbiologically influenced corrosion, and fouling	Work Control Process	E-020	3.2.1-39	E
			(I) Treated water-primary	Cracking/stress corrosion cracking	Primary Water Chemistry	VII.E1-20	3.3.1-90	C, S2
					Work Control Process	VII.E1-20	3.3.1-90	E, S2
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	S-022	3.4.1-16	A
					Work Control Process	S-022	3.4.1-16	E
Boric Acid Tanks	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	C
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	C
			(I) Treated water-primary	Cracking/stress corrosion cracking	Primary Water Chemistry	VII.E1-20	3.3.1-90	A, S2
					Work Control Process	VII.E1-20	3.3.1-90	E, S2
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	EP-041	3.2.1-49	A
					Work Control Process	EP-041	3.2.1-49	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-9: Auxiliary Systems - Chemical and Volume Control - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Chemical Mixing Tank	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	C
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	C
			(I) Treated water-primary	Loss of material/pitting and crevice corrosion	Primary Water Chemistry	EP-041	3.2.1-49	A
					Work Control Process	EP-041	3.2.1-49	E
Concentrates Holding Tank	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	C
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	C
			(I) Treated water-primary	Cracking/stress corrosion cracking	Primary Water Chemistry	VII.E1-20	3.3.1-90	A, S2
					Work Control Process	VII.E1-20	3.3.1-90	E, S2
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	EP-041	3.2.1-49	A
					Work Control Process	EP-041	3.2.1-49	E
Conductivity Probes	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Treated water-primary	Cracking/stress corrosion cracking	Primary Water Chemistry	VII.E1-20	3.3.1-90	A, S2
					Work Control Process	VII.E1-20	3.3.1-90	E, S2
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	VII.E1-17	3.3.1-91	A
					Work Control Process	VII.E1-17	3.3.1-91	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-9: Auxiliary Systems - Chemical and Volume Control - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Demineralizers and Ion Exchangers	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	C
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	C
			(I) Treated water-primary	Loss of material/pitting and crevice corrosion	Primary Water Chemistry	EP-041	3.2.1-49	A
					Work Control Process	EP-041	3.2.1-49	E
Distillate Cooler (Channel Head)	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	C
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	C
			(I) Treated water-primary	Cracking/stress corrosion cracking	Primary Water Chemistry	VII.E1-20	3.3.1-90	C, S2
					Work Control Process	VII.E1-20	3.3.1-90	E, S2
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	S-022	3.4.1-16	A
					Work Control Process	S-022	3.4.1-16	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-9: Auxiliary Systems - Chemical and Volume Control - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Distillate Cooler (Shell)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(I) Treated water-closed cycle cooling	Loss of material/general, pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	VII.E1-06	3.3.1-48	B
					Work Control Process	VII.E1-06	3.3.1-48	E
				Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H
					Work Control Process			H

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-9: Auxiliary Systems - Chemical and Volume Control - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Distillate Cooler (Tube Sheet)	PB	Stainless Steel	(E) Treated water-closed cycle cooling	Cracking/stress corrosion cracking	Closed-Cycle Cooling Water System	AP-060	3.3.1-46	D, S2
					Work Control Process	AP-060	3.3.1-46	E, S2
				Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H
					Work Control Process			H
				Loss of material/pitting and crevice corrosion	Closed-Cycle Cooling Water System	E-019	3.2.1-28	B
					Work Control Process	E-019	3.2.1-28	E
			(I) Treated water-primary	Cracking/stress corrosion cracking	Primary Water Chemistry	VII.E1-20	3.3.1-90	C, S2
					Work Control Process	VII.E1-20	3.3.1-90	E, S2
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	S-022	3.4.1-16	A
					Work Control Process	S-022	3.4.1-16	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-9: Auxiliary Systems - Chemical and Volume Control - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Distillate Cooler (Tubing)	PB	Stainless Steel	(E) Treated water-closed cycle cooling	Cracking/stress corrosion cracking	Closed-Cycle Cooling Water System	AP-060	3.3.1-46	D, S2
					Work Control Process	AP-060	3.3.1-46	E, S2
				Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H
					Work Control Process			H
				Loss of material/pitting and crevice corrosion	Closed-Cycle Cooling Water System	E-019	3.2.1-28	B
					Work Control Process	E-019	3.2.1-28	E
			(I) Treated water-primary	Cracking/stress corrosion cracking	Primary Water Chemistry	VII.E1-20	3.3.1-90	C, S2
					Work Control Process	VII.E1-20	3.3.1-90	E, S2
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	S-022	3.4.1-16	A
					Work Control Process	S-022	3.4.1-16	E
Eductors	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Treated water-primary	Cracking/stress corrosion cracking	Primary Water Chemistry	VII.E1-20	3.3.1-90	A, S2
					Work Control Process	VII.E1-20	3.3.1-90	E, S2
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	VII.E1-17	3.3.1-91	A
					Work Control Process	VII.E1-17	3.3.1-91	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-9: Auxiliary Systems - Chemical and Volume Control - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Evaporator (Channel Head)	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	C
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	C
			(I) Treated water and/or steam-secondary	Cracking/stress corrosion cracking	Secondary Water Chemistry	SP-044	3.4.1-39	C, S2
					Work Control Process	SP-044	3.4.1-39	E, S2
				Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	SP-043	3.4.1-37	C
					Work Control Process	SP-043	3.4.1-37	E
Evaporator (Shell)	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	C
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	C
			(I) Treated water-primary	Cracking/stress corrosion cracking	Primary Water Chemistry	VII.E1-20	3.3.1-90	C, S2
					Work Control Process	VII.E1-20	3.3.1-90	E, S2
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	S-022	3.4.1-16	A
					Work Control Process	S-022	3.4.1-16	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-9: Auxiliary Systems - Chemical and Volume Control - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Evaporator (Tube Sheet)	PB	Stainless Steel	(E) Treated water-primary	Cracking/stress corrosion cracking	Primary Water Chemistry	VII.E1-20	3.3.1-90	C, S2
					Work Control Process	VII.E1-20	3.3.1-90	E, S2
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	S-022	3.4.1-16	A
					Work Control Process	S-022	3.4.1-16	E
			(I) Treated water and/or steam-secondary	Cracking/stress corrosion cracking	Secondary Water Chemistry	SP-044	3.4.1-39	C, S2
					Work Control Process	SP-044	3.4.1-39	E, S2
				Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	SP-043	3.4.1-37	C
					Work Control Process	SP-043	3.4.1-37	E
Evaporator (Tubes)	PB	Stainless Steel	(E) Treated water-primary	Cracking/stress corrosion cracking	Primary Water Chemistry	VII.E1-20	3.3.1-90	C, S2
					Work Control Process	VII.E1-20	3.3.1-90	E, S2
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	S-022	3.4.1-16	A
					Work Control Process	S-022	3.4.1-16	E
			(I) Treated water and/or steam-secondary	Cracking/stress corrosion cracking	Secondary Water Chemistry	SP-044	3.4.1-39	C, S2
					Work Control Process	SP-044	3.4.1-39	E, S2
				Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	SP-043	3.4.1-37	C
					Work Control Process	SP-043	3.4.1-37	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-9: Auxiliary Systems - Chemical and Volume Control - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Evaporator Condenser (Channel Head)	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	C
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	C
			(I) Treated water-closed cycle cooling	Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H
					Work Control Process			H
				Loss of material/pitting and crevice corrosion	Closed-Cycle Cooling Water System	E-019	3.2.1-28	B
					Work Control Process	E-019	3.2.1-28	E
Evaporator Condenser (Shell)	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	C
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	C
			(I) Treated water-primary	Cracking/stress corrosion cracking	Primary Water Chemistry	VII.E1-20	3.3.1-90	C, S2
					Work Control Process	VII.E1-20	3.3.1-90	E, S2
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	S-022	3.4.1-16	A
					Work Control Process	S-022	3.4.1-16	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-9: Auxiliary Systems - Chemical and Volume Control - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Evaporator Condenser (Tube Sheet)	PB	Stainless Steel	(E) Treated water-primary	Cracking/stress corrosion cracking	Primary Water Chemistry	VII.E1-20	3.3.1-90	C, S2
					Work Control Process	VII.E1-20	3.3.1-90	E, S2
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	S-022	3.4.1-16	A
					Work Control Process	S-022	3.4.1-16	E
			(I) Treated water-closed cycle cooling	Cracking/stress corrosion cracking	Closed-Cycle Cooling Water System	AP-060	3.3.1-46	D, S2
					Work Control Process	AP-060	3.3.1-46	E, S2
				Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H
					Work Control Process			H
				Loss of material/pitting and crevice corrosion	Closed-Cycle Cooling Water System	E-019	3.2.1-28	B
					Work Control Process	E-019	3.2.1-28	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-9: Auxiliary Systems - Chemical and Volume Control - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Evaporator Condenser (Tubing)	PB	Stainless Steel	(E) Treated water-primary	Cracking/stress corrosion cracking	Primary Water Chemistry	VII.E1-20	3.3.1-90	C, S2
					Work Control Process	VII.E1-20	3.3.1-90	E, S2
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	S-022	3.4.1-16	A
					Work Control Process	S-022	3.4.1-16	E
			(I) Treated water-closed cycle cooling	Cracking/stress corrosion cracking	Closed-Cycle Cooling Water System	AP-060	3.3.1-46	D, S2
					Work Control Process	AP-060	3.3.1-46	E, S2
				Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H
					Work Control Process			H
				Loss of material/pitting and crevice corrosion	Closed-Cycle Cooling Water System	E-019	3.2.1-28	B
					Work Control Process	E-019	3.2.1-28	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-9: Auxiliary Systems - Chemical and Volume Control - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Excess Letdown Heat Exchanger (Channel Head)	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	C
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	C
			(I) Treated water-primary	Cracking/stress corrosion cracking	Primary Water Chemistry	VII.E1-20	3.3.1-90	C, S2
					Work Control Process	VII.E1-20	3.3.1-90	E, S2
				Cumulative fatigue damage/fatigue	TLAA	VII.E1-04	3.3.1-02	A
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	S-022	3.4.1-16	A
					Work Control Process	S-022	3.4.1-16	E
Excess Letdown Heat Exchanger (Shell)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(I) Treated water-closed cycle cooling	Loss of material/general, pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	VII.E1-06	3.3.1-48	B
					Work Control Process	VII.E1-06	3.3.1-48	E
				Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H
					Work Control Process			H

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-9: Auxiliary Systems - Chemical and Volume Control - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Excess Letdown Heat Exchanger (Tube Sheet)	PB	Stainless Steel	(E) Treated water-closed cycle cooling	Cracking/stress corrosion cracking	Closed-Cycle Cooling Water System	AP-060	3.3.1-46	D, S2
					Work Control Process	AP-060	3.3.1-46	E, S2
				Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H
					Work Control Process			H
				Loss of material/pitting and crevice corrosion	Closed-Cycle Cooling Water System	E-019	3.2.1-28	B
					Work Control Process	E-019	3.2.1-28	E
			(I) Treated water-primary	Cracking/stress corrosion cracking	Primary Water Chemistry	VII.E1-20	3.3.1-90	C, S2
					Work Control Process	VII.E1-20	3.3.1-90	E, S2
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	S-022	3.4.1-16	A
					Work Control Process	S-022	3.4.1-16	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-9: Auxiliary Systems - Chemical and Volume Control - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Excess Letdown Heat Exchanger (Tubing)	HT; PB	Stainless Steel	(E) Treated water-closed cycle cooling	Cracking/stress corrosion cracking	Closed-Cycle Cooling Water System	AP-060	3.3.1-46	D, S2
					Work Control Process	AP-060	3.3.1-46	E, S2
				Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H
					Work Control Process			H
				Loss of material/pitting and crevice corrosion	Closed-Cycle Cooling Water System	E-019	3.2.1-28	B
					Work Control Process	E-019	3.2.1-28	E
				Reduction of heat transfer/fouling	Closed-Cycle Cooling Water System	AP-063	3.3.1-52	B
					Work Control Process	AP-063	3.3.1-52	E
			(I) Treated water-primary	Cracking/stress corrosion cracking	Primary Water Chemistry	VII.E1-20	3.3.1-90	C, S2
					Work Control Process	VII.E1-20	3.3.1-90	E, S2
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	S-022	3.4.1-16	A
					Work Control Process	S-022	3.4.1-16	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-9: Auxiliary Systems - Chemical and Volume Control - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Feed Preheater (Channel Head)	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	C
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	C
			(I) Treated water-primary	Cracking/stress corrosion cracking	Primary Water Chemistry	VII.E1-20	3.3.1-90	C, S2
					Work Control Process	VII.E1-20	3.3.1-90	E, S2
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	S-022	3.4.1-16	A
					Work Control Process	S-022	3.4.1-16	E
Feed Preheater (Shell)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(I) Treated water and/or steam-secondary	Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	S-007	3.4.1-37	C
					Work Control Process	S-007	3.4.1-37	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-9: Auxiliary Systems - Chemical and Volume Control - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Feed Preheater (Tube Sheet)	PB	Stainless Steel	(E) Treated water and/or steam-secondary	Cracking/stress corrosion cracking	Secondary Water Chemistry	SP-044	3.4.1-39	C, S2
					Work Control Process	SP-044	3.4.1-39	E, S2
				Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	SP-043	3.4.1-37	C
					Work Control Process	SP-043	3.4.1-37	E
			(I) Treated water-primary	Cracking/stress corrosion cracking	Primary Water Chemistry	VII.E1-20	3.3.1-90	C, S2
					Work Control Process	VII.E1-20	3.3.1-90	E, S2
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	S-022	3.4.1-16	A
					Work Control Process	S-022	3.4.1-16	E
Feed Preheater (Tubes)	PB	Stainless Steel	(E) Treated water and/or steam-secondary	Cracking/stress corrosion cracking	Secondary Water Chemistry	SP-044	3.4.1-39	A, S2
					Work Control Process	SP-044	3.4.1-39	E, S2
				Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	SP-043	3.4.1-37	A
					Work Control Process	SP-043	3.4.1-37	E
			(I) Treated water-primary	Cracking/stress corrosion cracking	Primary Water Chemistry	VII.E1-20	3.3.1-90	C, S2
					Work Control Process	VII.E1-20	3.3.1-90	E, S2
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	S-022	3.4.1-16	A
					Work Control Process	S-022	3.4.1-16	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-9: Auxiliary Systems - Chemical and Volume Control - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Filter Housings	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Treated water-primary	Cracking/stress corrosion cracking	Primary Water Chemistry	VII.E1-20	3.3.1-90	A, S2
					Work Control Process	VII.E1-20	3.3.1-90	E, S2
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	VII.E1-17	3.3.1-91	A
					Work Control Process	VII.E1-17	3.3.1-91	E
Flow Elements	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Treated water-primary	Cracking/stress corrosion cracking	Primary Water Chemistry	VII.E1-20	3.3.1-90	A, S2
					Work Control Process	VII.E1-20	3.3.1-90	E, S2
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	VII.E1-17	3.3.1-91	A
					Work Control Process	VII.E1-17	3.3.1-91	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-9: Auxiliary Systems - Chemical and Volume Control - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Flow Indicators	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Treated water-primary	Cracking/stress corrosion cracking	Primary Water Chemistry	VII.E1-20	3.3.1-90	A, S2
					Work Control Process	VII.E1-20	3.3.1-90	E, S2
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	VII.E1-17	3.3.1-91	A
					Work Control Process	VII.E1-17	3.3.1-91	E
Flow Orifices	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Treated water-primary	Cracking/stress corrosion cracking	Primary Water Chemistry	VII.E1-20	3.3.1-90	A, S2
					Work Control Process	VII.E1-20	3.3.1-90	E, S2
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	VII.E1-17	3.3.1-91	A
					Work Control Process	VII.E1-17	3.3.1-91	E
Holdup Tanks	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	C
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	C
			(I) Treated water-primary	Loss of material/pitting and crevice corrosion	Primary Water Chemistry	EP-041	3.2.1-49	A
					Work Control Process	EP-041	3.2.1-49	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-9: Auxiliary Systems - Chemical and Volume Control - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Letdown Heat Exchanger (Channel Head)	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	C
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	C
			(I) Treated water-primary	Cracking/stress corrosion cracking, cyclic loading	Primary Water Chemistry	VII.E1-09	3.3.1-07	A, S2
					Work Control Process	VII.E1-09	3.3.1-07	E, S2
				Cumulative fatigue damage/fatigue	TLAA	VII.E1-04	3.3.1-02	A
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	S-022	3.4.1-16	A
					Work Control Process	S-022	3.4.1-16	E
Letdown Heat Exchanger (Shell)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(I) Treated water-closed cycle cooling	Loss of material/general, pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	VII.E1-06	3.3.1-48	B
					Work Control Process	VII.E1-06	3.3.1-48	E
				Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H
					Work Control Process			H

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-9: Auxiliary Systems - Chemical and Volume Control - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Letdown Heat Exchanger (Tube Sheet)	PB	Stainless Steel	(E) Treated water-closed cycle cooling	Cracking/stress corrosion cracking	Closed-Cycle Cooling Water System	AP-060	3.3.1-46	D, S2
					Work Control Process	AP-060	3.3.1-46	E, S2
				Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H
					Work Control Process			H
				Loss of material/pitting and crevice corrosion	Closed-Cycle Cooling Water System	E-019	3.2.1-28	B
					Work Control Process	E-019	3.2.1-28	E
			(I) Treated water-primary	Cracking/stress corrosion cracking, cyclic loading	Primary Water Chemistry	VII.E1-09	3.3.1-07	A, S2
					Work Control Process	VII.E1-09	3.3.1-07	E, S2
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	S-022	3.4.1-16	A
					Work Control Process	S-022	3.4.1-16	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-9: Auxiliary Systems - Chemical and Volume Control - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Letdown Heat Exchanger (Tubes)	HT; PB	Stainless Steel	(E) Treated water-closed cycle cooling	Loss of material/fretting	Work Control Process			H
				Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H
					Work Control Process			H
				Loss of material/pitting and crevice corrosion	Closed-Cycle Cooling Water System	E-019	3.2.1-28	B
					Work Control Process	E-019	3.2.1-28	E
				Reduction of heat transfer/fouling	Closed-Cycle Cooling Water System	AP-063	3.3.1-52	B
					Work Control Process	AP-063	3.3.1-52	E
			(I) Treated water-primary	Cracking/stress corrosion cracking, cyclic loading	Primary Water Chemistry	VII.E1-09	3.3.1-07	A, S2
					Work Control Process	VII.E1-09	3.3.1-07	E, S2
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	S-022	3.4.1-16	A
					Work Control Process	S-022	3.4.1-16	E
Monitor Tanks	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	C
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	C
			(I) Treated water-primary	Loss of material/pitting and crevice corrosion	Primary Water Chemistry	EP-041	3.2.1-49	A
					Work Control Process	EP-041	3.2.1-49	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-9: Auxiliary Systems - Chemical and Volume Control - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Pipe	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Gas-inert	None	None	VII.J-19	3.3.1-97	A
			(I) Treated water-primary	Cracking/stress corrosion cracking	Primary Water Chemistry	VII.E1-20	3.3.1-90	A, S2
					Work Control Process	VII.E1-20	3.3.1-90	E, S2
				Cumulative fatigue damage/fatigue	TLAA	VII.E1-16	3.3.1-02	A
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	VII.E1-17	3.3.1-91	A
					Work Control Process	VII.E1-17	3.3.1-91	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-9: Auxiliary Systems - Chemical and Volume Control - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Pipe (Class 1)	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Treated water-primary	Cracking/stress corrosion cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	R-002	3.1.1-70	B, S2
					Primary Water Chemistry	R-002	3.1.1-70	A, S2
				Cumulative fatigue damage/fatigue	TLAA	VII.E1-16	3.3.1-02	A
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	VII.E1-17	3.3.1-91	A
					Work Control Process	VII.E1-17	3.3.1-91	E
Pulsation Dampeners	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Treated water-primary	Loss of material/pitting and crevice corrosion	Primary Water Chemistry	VII.E1-17	3.3.1-91	A
					Work Control Process	VII.E1-17	3.3.1-91	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-9: Auxiliary Systems - Chemical and Volume Control - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Pumps	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Treated water-primary	Cracking/stress corrosion cracking, cyclic loading	Work Control Process	VII.E1-07	3.3.1-09	E
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	VII.E1-17	3.3.1-91	A
					Work Control Process	VII.E1-17	3.3.1-91	E
Regenerative Heat Exchanger (Channel Head)	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	C
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	C
			(I) Treated water-primary	Cracking/stress corrosion cracking, cyclic loading	Primary Water Chemistry	VII.E1-05	3.3.1-08	A, S2
					Work Control Process	VII.E1-05	3.3.1-08	E, S2
				Cumulative fatigue damage/fatigue	TLAA	VII.E1-04	3.3.1-02	A
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	S-022	3.4.1-16	A
					Work Control Process	S-022	3.4.1-16	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-9: Auxiliary Systems - Chemical and Volume Control - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Regenerative Heat Exchanger (Shell)	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	C
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	C
			(I) Treated water-primary	Cracking/stress corrosion cracking, cyclic loading	Primary Water Chemistry	VII.E1-05	3.3.1-08	A, S2
					Work Control Process	VII.E1-05	3.3.1-08	E, S2
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	S-022	3.4.1-16	A
					Work Control Process	S-022	3.4.1-16	E
Regenerative Heat Exchanger (Tube Sheet)	PB	Stainless Steel	(E) Treated water-primary	Cracking/stress corrosion cracking, cyclic loading	Primary Water Chemistry	VII.E1-05	3.3.1-08	A, S2
					Work Control Process	VII.E1-05	3.3.1-08	E, S2
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	S-022	3.4.1-16	A
					Work Control Process	S-022	3.4.1-16	E
			(I) Treated water-primary	Cracking/stress corrosion cracking, cyclic loading	Primary Water Chemistry	VII.E1-05	3.3.1-08	A, S2
					Work Control Process	VII.E1-05	3.3.1-08	E, S2
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	S-022	3.4.1-16	A
					Work Control Process	S-022	3.4.1-16	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-9: Auxiliary Systems - Chemical and Volume Control - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Regenerative Heat Exchanger (Tubes)	HT; PB	Stainless Steel	(E) Treated water-primary	Cracking/stress corrosion cracking, cyclic loading	Primary Water Chemistry	VII.E1-05	3.3.1-08	A, S2
					Work Control Process	VII.E1-05	3.3.1-08	E, S2
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	S-022	3.4.1-16	A
					Work Control Process	S-022	3.4.1-16	E
			(I) Treated water-primary	Cracking/stress corrosion cracking, cyclic loading	Primary Water Chemistry	VII.E1-05	3.3.1-08	A, S2
					Work Control Process	VII.E1-05	3.3.1-08	E, S2
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	S-022	3.4.1-16	A
					Work Control Process	S-022	3.4.1-16	E
Seal Water Heat Exchanger (Channel Head)	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	C
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	C
			(I) Treated water-primary	Cracking/stress corrosion cracking	Primary Water Chemistry	VII.E1-20	3.3.1-90	C, S2
					Work Control Process	VII.E1-20	3.3.1-90	E, S2
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	S-022	3.4.1-16	A
					Work Control Process	S-022	3.4.1-16	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-9: Auxiliary Systems - Chemical and Volume Control - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Seal Water Heat Exchanger (Shell)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(I) Treated water-closed cycle cooling	Loss of material/general, pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	VII.E1-06	3.3.1-48	B
					Work Control Process	VII.E1-06	3.3.1-48	E
				Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H
					Work Control Process			H

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-9: Auxiliary Systems - Chemical and Volume Control - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Seal Water Heat Exchanger (Tube Sheet)	PB	Stainless Steel	(E) Treated water-closed cycle cooling	Cracking/stress corrosion cracking	Closed-Cycle Cooling Water System	AP-060	3.3.1-46	D, S2
					Work Control Process	AP-060	3.3.1-46	E, S2
				Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H
					Work Control Process			H
				Loss of material/pitting and crevice corrosion	Closed-Cycle Cooling Water System	E-019	3.2.1-28	B
					Work Control Process	E-019	3.2.1-28	E
			(I) Treated water-primary	Cracking/stress corrosion cracking	Primary Water Chemistry	VII.E1-20	3.3.1-90	C, S2
					Work Control Process	VII.E1-20	3.3.1-90	E, S2
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	S-022	3.4.1-16	A
					Work Control Process	S-022	3.4.1-16	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-9: Auxiliary Systems - Chemical and Volume Control - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Seal Water Heat Exchanger (Tubes)	PB	Stainless Steel	(E) Treated water-closed cycle cooling	Cracking/stress corrosion cracking	Closed-Cycle Cooling Water System	AP-060	3.3.1-46	D, S2
					Work Control Process	AP-060	3.3.1-46	E, S2
				Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H
					Work Control Process			H
				Loss of material/pitting and crevice corrosion	Closed-Cycle Cooling Water System	E-019	3.2.1-28	B
					Work Control Process	E-019	3.2.1-28	E
			(I) Treated water-primary	Cracking/stress corrosion cracking	Primary Water Chemistry	VII.E1-20	3.3.1-90	C, S2
					Work Control Process	VII.E1-20	3.3.1-90	E, S2
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	S-022	3.4.1-16	A
					Work Control Process	S-022	3.4.1-16	E
Standpipes	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Treated water-primary	Loss of material/pitting and crevice corrosion	Primary Water Chemistry	VII.E1-17	3.3.1-91	A
					Work Control Process	VII.E1-17	3.3.1-91	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-9: Auxiliary Systems - Chemical and Volume Control - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Stripping Column	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Treated water-primary	Cracking/stress corrosion cracking	Primary Water Chemistry	VII.E1-20	3.3.1-90	A, S2
					Work Control Process	VII.E1-20	3.3.1-90	E, S2
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	VII.E1-17	3.3.1-91	A
					Work Control Process	VII.E1-17	3.3.1-91	E
Suction Stabilizers	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Treated water-primary	Loss of material/pitting and crevice corrosion	Primary Water Chemistry	VII.E1-17	3.3.1-91	A
					Work Control Process	VII.E1-17	3.3.1-91	E
Tank Heaters	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Treated water-primary	Cracking/stress corrosion cracking	Primary Water Chemistry	VII.E1-20	3.3.1-90	A, S2
					Work Control Process	VII.E1-20	3.3.1-90	E, S2
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	VII.E1-17	3.3.1-91	A
					Work Control Process	VII.E1-17	3.3.1-91	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-9: Auxiliary Systems - Chemical and Volume Control - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Tubing	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Lube oil	Loss of material/pitting, crevice, and microbiologically influenced corrosion	Lubricating Oil Analysis	VII.E1-15	3.3.1-33	A
					Work Control Process	VII.E1-15	3.3.1-33	E
			(I) Treated water-primary	Cracking/stress corrosion cracking	Primary Water Chemistry	VII.E1-20	3.3.1-90	A, S2
					Work Control Process	VII.E1-20	3.3.1-90	E, S2
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	VII.E1-17	3.3.1-91	A
					Work Control Process	VII.E1-17	3.3.1-91	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-9: Auxiliary Systems - Chemical and Volume Control - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Valves	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Gas-inert	None	None	VII.J-19	3.3.1-97	A
			(I) Treated water-primary	Cracking/stress corrosion cracking	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	VII.E1-20	3.3.1-90	B, S2, 1
					Primary Water Chemistry	VII.E1-20	3.3.1-90	A, S2
					Work Control Process	VII.E1-20	3.3.1-90	E, S2, 2
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	VII.E1-17	3.3.1-91	A
					Work Control Process	VII.E1-17	3.3.1-91	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-9: Auxiliary Systems - Chemical and Volume Control - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Vent Condenser (Channel Head)	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	C
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	C
			(I) Treated water-closed cycle cooling	Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H
					Work Control Process			H
				Loss of material/pitting and crevice corrosion	Closed-Cycle Cooling Water System	E-019	3.2.1-28	B
					Work Control Process	E-019	3.2.1-28	E
Vent Condenser (Shell)	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	C
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	C
			(I) Treated water-primary	Cracking/stress corrosion cracking	Primary Water Chemistry	VII.E1-20	3.3.1-90	C, S2
					Work Control Process	VII.E1-20	3.3.1-90	E, S2
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	S-022	3.4.1-16	A
					Work Control Process	S-022	3.4.1-16	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-9: Auxiliary Systems - Chemical and Volume Control - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Vent Condenser (Tube Sheet)	PB	Stainless Steel	(E) Treated water-primary	Cracking/stress corrosion cracking	Primary Water Chemistry	VII.E1-20	3.3.1-90	C, S2
					Work Control Process	VII.E1-20	3.3.1-90	E, S2
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	S-022	3.4.1-16	A
					Work Control Process	S-022	3.4.1-16	E
			(I) Treated water-closed cycle cooling	Cracking/stress corrosion cracking	Closed-Cycle Cooling Water System	AP-060	3.3.1-46	D, S2
					Work Control Process	AP-060	3.3.1-46	E, S2
				Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H
					Work Control Process			H
				Loss of material/pitting and crevice corrosion	Closed-Cycle Cooling Water System	E-019	3.2.1-28	B
					Work Control Process	E-019	3.2.1-28	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-9: Auxiliary Systems - Chemical and Volume Control - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Vent Condenser (Tubes)	PB	Stainless Steel	(E) Treated water-primary	Cracking/stress corrosion cracking	Primary Water Chemistry	VII.E1-20	3.3.1-90	C, S2
					Work Control Process	VII.E1-20	3.3.1-90	E, S2
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	S-022	3.4.1-16	A
					Work Control Process	S-022	3.4.1-16	E
			(I) Treated water-closed cycle cooling	Cracking/stress corrosion cracking	Closed-Cycle Cooling Water System	AP-060	3.3.1-46	D, S2
					Work Control Process	AP-060	3.3.1-46	E, S2
				Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H
					Work Control Process			H
				Loss of material/pitting and crevice corrosion	Closed-Cycle Cooling Water System	E-019	3.2.1-28	B
					Work Control Process	E-019	3.2.1-28	E
Volume Control Tank	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	C
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	C
			(I) Gas-inert	None	None	VII.J-19	3.3.1-97	C
			(I) Treated water-primary	Loss of material/pitting and crevice corrosion	Primary Water Chemistry	EP-041	3.2.1-49	A
					Work Control Process	EP-041	3.2.1-49	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-9 Notes:

Plant Standard Notes

Note - The following plant standard notes have generic applicability, but may or may not be used for each SSC:

S1. Thermal embrittlement is only applicable to CASS components that are subject to temperatures in excess of 482°F.

S2. Cracking due to SCC is only applicable to stainless steel components exposed to temperatures greater than 140°F.

S3. Selective leaching is applicable to the material group 'Steel,' but only for gray cast iron components.

System Specific Notes

1. Only applicable to ASME Class 1 components.

2. Applicable to Non-Class 1 components.

Industry Standard Notes

See last page of Section 3.3 tables.

Table 3.3.2-10: Auxiliary Systems - Control Room Air Conditioning - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Air Handling Units (Cooling Coils/Fins)	HT; PB	Aluminum	(E) Air-moist	Loss of material/pitting and crevice corrosion	Work Control Process	VII.F1-14	3.3.1-27	E
				Reduction of heat transfer/fouling	Work Control Process			H
		Copper Alloys	(E) Air-moist	Loss of material/pitting and crevice corrosion	Work Control Process	AP-078	3.3.1-28	E
				Reduction of heat transfer/fouling	Work Control Process			H
			(I) Treated water-closed cycle cooling	Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H
					Work Control Process			H
				Loss of material/pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	VII.F1-08	3.3.1-51	B
					Work Control Process	VII.F1-08	3.3.1-51	E
				Reduction of heat transfer/fouling	Closed-Cycle Cooling Water System	VII.F1-12	3.3.1-52	B
					Work Control Process	VII.F1-12	3.3.1-52	E
Air Handling Units (Housing)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.F1-02	3.3.1-56	A
			(I) Air-moist	Loss of material/general, pitting, crevice, and (for drip pans and drain lines) microbiologically influenced corrosion	Work Control Process	VII.F1-03	3.3.1-72	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-10: Auxiliary Systems - Control Room Air Conditioning - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Bolting	PB	Steel	(E) Air-indoor uncontrolled	Cracking/cyclic loading, stress corrosion cracking	Bolting Integrity	VII.I-03	3.3.1-41	A
				Loss of material/general, pitting, and crevice corrosion	Bolting Integrity	VII.I-04	3.3.1-43	A
				Loss of preload/thermal effects, gasket creep, and self-loosening	Bolting Integrity	VII.I-05	3.3.1-45	A
Chiller Pumps	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(I) Treated water-closed cycle cooling	Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H
					Work Control Process			H
				Loss of material/pitting and crevice corrosion	Closed-Cycle Cooling Water System	A-052	3.3.1-50	B
					Work Control Process	A-052	3.3.1-50	E
Compressor Casings	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.F1-02	3.3.1-56	A
			(I) Gas-inert	None	None	VII.J-23	3.3.1-97	C

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-10: Auxiliary Systems - Control Room Air Conditioning - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Condensers (Channel Head)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.F1-02	3.3.1-56	A
			(I) Raw water	Loss of material/erosion	Open-Cycle Cooling Water System			H
				Loss of material/general, pitting, crevice, galvanic, and microbiologically influenced corrosion, and fouling	Open-Cycle Cooling Water System	A-064	3.3.1-77	B
Condensers (Shell)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general, pitting, and crevice corrosion	External Surfaces Monitoring	VII.F1-10	3.3.1-59	A
			(I) Gas-inert	None	None	VII.J-23	3.3.1-97	C
Condensers (Tube Sheet)	PB	Steel	(E) Gas-inert	None	None	VII.J-23	3.3.1-97	C
			(I) Raw water	Loss of material/erosion	Open-Cycle Cooling Water System			H
				Loss of material/general, pitting, crevice, galvanic, and microbiologically influenced corrosion, and fouling	Open-Cycle Cooling Water System	A-064	3.3.1-77	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-10: Auxiliary Systems - Control Room Air Conditioning - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Condensers (Tubes)	HT; PB	Copper Alloys	(E) Gas-inert	None	None	VII.J-04	3.3.1-97	C
			(I) Raw water	Loss of material/erosion	Open-Cycle Cooling Water System			H
				Loss of material/pitting, crevice, and microbiologically influenced corrosion, and fouling	Open-Cycle Cooling Water System	A-044	3.3.1-81	B
				Reduction of heat transfer/fouling	Open-Cycle Cooling Water System	A-072	3.3.1-83	B
CRPA Recirculation Filter Assemblies	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.F1-02	3.3.1-56	A
			(I) Air-indoor controlled	None	None	VII.J-20	3.3.1-95	A
Damper Housings	EQB; FB; PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.F1-02	3.3.1-56	A
			(I) Air-indoor controlled	None	None	VII.J-20	3.3.1-95	A
			(I) Air-moist	Loss of material/general, pitting, crevice, and (for drip pans and drain lines) microbiologically influenced corrosion	Work Control Process	VII.F1-03	3.3.1-72	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-10: Auxiliary Systems - Control Room Air Conditioning - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Ductwork	EQB; PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.F1-02	3.3.1-56	A
			(I) Air-indoor controlled	None	None	VII.J-20	3.3.1-95	A
			(I) Air-moist	Loss of material/general, pitting, crevice, and (for drip pans and drain lines) microbiologically influenced corrosion	Work Control Process	VII.F1-03	3.3.1-72	E
Evaporator (Channel Head)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general, pitting, and crevice corrosion	External Surfaces Monitoring	VII.F1-10	3.3.1-59	A
			(I) Gas-inert	None	None	VII.J-23	3.3.1-97	C
Evaporator (Shell)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general, pitting, and crevice corrosion	External Surfaces Monitoring	VII.F1-10	3.3.1-59	A
			(I) Treated water-closed cycle cooling	Loss of material/general, pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	VII.F1-11	3.3.1-48	B
					Work Control Process	VII.F1-11	3.3.1-48	E
Evaporator (Tube Sheet)	PB	Steel	(E) Treated water-closed cycle cooling	Loss of material/general, pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	VII.F1-11	3.3.1-48	B
					Work Control Process	VII.F1-11	3.3.1-48	E
			(I) Gas-inert	None	None	VII.J-23	3.3.1-97	C

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-10: Auxiliary Systems - Control Room Air Conditioning - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Evaporator (Tubes)	HT; PB	Copper Alloys	(E) Treated water-closed cycle cooling	Loss of material/pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	VII.F1-08	3.3.1-51	B
					Work Control Process	VII.F1-08	3.3.1-51	E
			(I) Gas-inert	None	None	VII.J-04	3.3.1-97	C
Expansion Tanks	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.F1-02	3.3.1-56	A
			(I) Treated water-closed cycle cooling	Loss of material/general, pitting, and crevice corrosion	Closed-Cycle Cooling Water System	VII.F1-20	3.3.1-47	B
					Work Control Process	VII.F1-20	3.3.1-47	E
				Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H
					Work Control Process			H
Fan/blower Housings	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.F1-02	3.3.1-56	A
			(I) Air-moist	Loss of material/general, pitting, crevice, and (for drip pans and drain lines) microbiologically influenced corrosion	Work Control Process	VII.F1-03	3.3.1-72	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-10: Auxiliary Systems - Control Room Air Conditioning - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Flexible Connections	PB	Elastomers	(E) Air-indoor uncontrolled	Change in material properties/thermal exposure	External Surfaces Monitoring			H
				Cracking/thermal exposure	External Surfaces Monitoring			H
				Cracking; Delamination/vibration	External Surfaces Monitoring			H
				Hardening and loss of strength/elastomer degradation	External Surfaces Monitoring	VII.F1-07	3.3.1-11	E
				Loss of material/wear	External Surfaces Monitoring	VII.F1-05	3.3.1-34	E
			(I) Air-indoor controlled	Hardening and loss of strength/elastomer degradation	Work Control Process			H
			(I) Air-indoor uncontrolled	Loss of material/wear	Work Control Process	VII.F1-06	3.3.1-34	E
			(I) Air-moist	Hardening and loss of strength/elastomer degradation	Work Control Process			H

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-10: Auxiliary Systems - Control Room Air Conditioning - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Pipe	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(I) Treated water-closed cycle cooling	Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H
					Work Control Process			H
				Loss of material/pitting and crevice corrosion	Closed-Cycle Cooling Water System	A-052	3.3.1-50	B
					Work Control Process	A-052	3.3.1-50	E
		Steel	(E) Air-indoor uncontrolled	Loss of material/general, pitting, and crevice corrosion	External Surfaces Monitoring	VII.F1-10	3.3.1-59	C
			(I) Gas-inert	None	None	VII.J-23	3.3.1-97	A
			(I) Treated water-closed cycle cooling	Loss of material/general, pitting, and crevice corrosion	Closed-Cycle Cooling Water System	VII.F1-20	3.3.1-47	B
					Work Control Process	VII.F1-20	3.3.1-47	E
				Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H
					Work Control Process			H
Smoke Detector	PB	Steel	(E) Air-moist	Loss of material/general, pitting, crevice, and (for drip pans and drain lines) microbiologically influenced corrosion	Work Control Process	VII.F1-03	3.3.1-72	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-10: Auxiliary Systems - Control Room Air Conditioning - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Steam Humidifier Sparger	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(I) Treated water and/or steam-secondary	Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	SP-043	3.4.1-37	A
					Work Control Process	SP-043	3.4.1-37	E
Temperature Elements	EQB; PB	Stainless Steel	(E) Air-indoor controlled	None	None			H
			(E) Air-moist	Loss of material/pitting and crevice corrosion	Work Control Process	VII.F1-01	3.3.1-27	E
Tubing	PB	Copper Alloys	(E) Air-indoor uncontrolled	Loss of material/pitting and crevice corrosion	External Surfaces Monitoring	VII.F1-16	3.3.1-25	E
			(I) Air-indoor controlled	None	None			H
			(I) Air-moist	Loss of material/pitting and crevice corrosion	Work Control Process	AP-078	3.3.1-28	E
			(I) Gas-inert	None	None	VII.J-04	3.3.1-97	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-10: Auxiliary Systems - Control Room Air Conditioning - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Valves	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.F1-02	3.3.1-56	A
			(I) Gas-inert	None	None	VII.J-23	3.3.1-97	A
			(I) Treated water-closed cycle cooling	Loss of material/general, pitting, and crevice corrosion	Closed-Cycle Cooling Water System	VII.F1-20	3.3.1-47	B
					Work Control Process	VII.F1-20	3.3.1-47	E
				Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H
					Work Control Process			H
				Loss of material/selective leaching	Selective Leaching of Materials	A-050	3.3.1-85	A, S3

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-10 Notes:

Plant Standard Notes

Note - The following plant standard notes have generic applicability, but may or may not be used for each SSC:

S1. Thermal embrittlement is only applicable to CASS components that are subject to temperatures in excess of 482°F.

S2. Cracking due to SCC is only applicable to stainless steel components exposed to temperatures greater than 140°F.

S3. Selective leaching is applicable to the material group 'Steel,' but only for gray cast iron components.

Industry Standard Notes

See last page of Section 3.3 tables.

Table 3.3.2-11: Auxiliary Systems - Auxiliary Building Air Conditioning - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Bolting	PB	Steel	(E) Air-indoor uncontrolled	Cracking/cyclic loading, stress corrosion cracking	Bolting Integrity	VII.I-03	3.3.1-41	A
				Loss of material/general, pitting, and crevice corrosion	Bolting Integrity	VII.I-04	3.3.1-43	A
				Loss of preload/thermal effects, gasket creep, and self-loosening	Bolting Integrity	VII.I-05	3.3.1-45	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-02	3.3.1-89	A
Condensers (Channel Head)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(I) Raw water	Loss of material/erosion	Open-Cycle Cooling Water System			H
				Loss of material/general, pitting, crevice, galvanic, and microbiologically influenced corrosion, and fouling	Open-Cycle Cooling Water System	A-064	3.3.1-77	B
Condensers (Shell)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(I) Gas-inert	None	None	VII.J-23	3.3.1-97	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-11: Auxiliary Systems - Auxiliary Building Air Conditioning - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Damper Housings	EQB; FB; PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(I) Air-indoor controlled	None	None	VII.J-20	3.3.1-95	A, 1
			(I) Air-moist	Loss of material/general, pitting, crevice, and (for drip pans and drain lines) microbiologically influenced corrosion	Work Control Process	VII.F2-03	3.3.1-72	A, 1
Ductwork	EQB; PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(I) Air-indoor controlled	None	None	VII.J-20	3.3.1-95	A, 1
			(I) Air-moist	Loss of material/general, pitting, crevice, and (for drip pans and drain lines) microbiologically influenced corrosion	Work Control Process	VII.F2-03	3.3.1-72	A, 1

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-11: Auxiliary Systems - Auxiliary Building Air Conditioning - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Fan/Blower Housings	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(I) Air-moist	Loss of material/general, pitting, crevice, and (for drip pans and drain lines) microbiologically influenced corrosion	Work Control Process	VII.F2-03	3.3.1-72	A, 1
Flexible Connections	PB	Elastomers	(E) Air-indoor uncontrolled	Change in material properties/thermal exposure	External Surfaces Monitoring			H
				Cracking/thermal exposure	External Surfaces Monitoring			H
				Cracking; Delamination/vibration	External Surfaces Monitoring			H
				Hardening and loss of strength/elastomer degradation	External Surfaces Monitoring	VII.F2-07	3.3.1-11	E
				Loss of material/wear	External Surfaces Monitoring	VII.F2-05	3.3.1-34	E
			(I) Air-indoor controlled	Hardening and loss of strength/elastomer degradation	Work Control Process			H, 1
			(I) Air-indoor uncontrolled	Loss of material/wear	Work Control Process	VII.F2-06	3.3.1-34	E
			(I) Air-moist	Hardening and loss of strength/elastomer degradation	Work Control Process			H, 1

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-11: Auxiliary Systems - Auxiliary Building Air Conditioning - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Temperature Elements	EQB; PB	Stainless Steel	(E) Air-indoor controlled	None	None			H, 1

Table 3.3.2-11 Notes:

Plant Standard Notes

Note - The following plant standard notes have generic applicability, but may or may not be used for each SSC:

S1. Thermal embrittlement is only applicable to CASS components that are subject to temperatures in excess of 482°F.

S2. Cracking due to SCC is only applicable to stainless steel components exposed to temperatures greater than 140°F.

S3. Selective leaching is applicable to the material group 'Steel,' but only for gray cast iron components.

System Specific Notes

1. Air-moist is the environment upstream of the outlet of the air handling units. Air-indoor controlled is the environment downstream of the air handling units.

Industry Standard Notes

See last page of Section 3.3 tables.

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-12: Auxiliary Systems - Auxiliary Building Special Ventilation and Steam Exclusion - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Bolting	PB	Steel	(E) Air-indoor uncontrolled	Cracking/cyclic loading, stress corrosion cracking	Bolting Integrity	VII.I-03	3.3.1-41	A
				Loss of material/general, pitting, and crevice corrosion	Bolting Integrity	VII.I-04	3.3.1-43	A
				Loss of preload/thermal effects, gasket creep, and self-loosening	Bolting Integrity	VII.I-05	3.3.1-45	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-02	3.3.1-89	A
Damper Housings	EQB; FB; PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(I) Air-moist	Loss of material/general, pitting, crevice, and (for drip pans and drain lines) microbiologically influenced corrosion	Work Control Process	VII.F2-03	3.3.1-72	E
Ductwork	EQB; PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(I) Air-moist	Loss of material/general, pitting, crevice, and (for drip pans and drain lines) microbiologically influenced corrosion	Work Control Process	VII.F2-03	3.3.1-72	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-12: Auxiliary Systems - Auxiliary Building Special Ventilation and Steam Exclusion - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Fan/blower Housings	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(I) Air-moist	Loss of material/general, pitting, crevice, and (for drip pans and drain lines) microbiologically influenced corrosion	Work Control Process	VII.F2-03	3.3.1-72	E
Flexible Connections	PB	Elastomers	(E) Air-indoor uncontrolled	Change in material properties/thermal exposure	External Surfaces Monitoring			H
				Cracking/thermal exposure	External Surfaces Monitoring			H
				Cracking; Delamination/vibration	External Surfaces Monitoring			H
				Hardening and loss of strength/elastomer degradation	External Surfaces Monitoring	VII.F2-07	3.3.1-11	E
				Loss of material/wear	External Surfaces Monitoring	VII.F2-05	3.3.1-34	E
			(I) Air-indoor uncontrolled	Loss of material/wear	Work Control Process	VII.F2-06	3.3.1-34	E
			(I) Air-moist	Hardening and loss of strength/elastomer degradation	Work Control Process			H

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-12: Auxiliary Systems - Auxiliary Building Special Ventilation and Steam Exclusion - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Tubing	PB	Copper Alloys	(E) Air-indoor uncontrolled	None	None	SP-006	3.4.1-41	A
			(E) Borated water leakage	None	None	VII.J-05	3.3.1-99	A
			(I) Air-moist	Loss of material/pitting and crevice corrosion	Work Control Process	AP-078	3.3.1-28	E
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(I) Air-moist	Loss of material/general, pitting, crevice, and (for drip pans and drain lines) microbiologically influenced corrosion	Work Control Process	VII.F2-03	3.3.1-72	E
Zone SV Exhaust Filter Assemblies	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(I) Air-moist	Loss of material/general, pitting, crevice, and (for drip pans and drain lines) microbiologically influenced corrosion	Work Control Process	VII.F2-03	3.3.1-72	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-12 Notes:

Plant Standard Notes

Note - The following plant standard notes have generic applicability, but may or may not be used for each SSC:

S1. Thermal embrittlement is only applicable to CASS components that are subject to temperatures in excess of 482°F.

S2. Cracking due to SCC is only applicable to stainless steel components exposed to temperatures greater than 140°F.

S3. Selective leaching is applicable to the material group 'Steel,' but only for gray cast iron components.

Industry Standard Notes

See last page of Section 3.3 tables.

Table 3.3.2-13: Auxiliary Systems - Auxiliary Building Ventilation - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Auxiliary Building Vent	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(I) Air-moist	Loss of material/general, pitting, crevice, and (for drip pans and drain lines) microbiologically influenced corrosion	Work Control Process	VII.F2-03	3.3.1-72	E
Bolting	PB	Steel	(E) Air-indoor uncontrolled	Cracking/cyclic loading, stress corrosion cracking	Bolting Integrity	VII.I-03	3.3.1-41	A
				Loss of material/general, pitting, and crevice corrosion	Bolting Integrity	VII.I-04	3.3.1-43	A
				Loss of preload/thermal effects, gasket creep, and self-loosening	Bolting Integrity	VII.I-05	3.3.1-45	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-02	3.3.1-89	A
Damper Housings	EQB; FB; PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(I) Air-moist	Loss of material/general, pitting, crevice, and (for drip pans and drain lines) microbiologically influenced corrosion	Work Control Process	VII.F2-03	3.3.1-72	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-13: Auxiliary Systems - Auxiliary Building Ventilation - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Ductwork	EQB; PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(I) Air-moist	Loss of material/general, pitting, crevice, and (for drip pans and drain lines) microbiologically influenced corrosion	Work Control Process	VII.F2-03	3.3.1-72	E
Fan Coil Units (Cooling Coils/Fins)	HT; PB	Aluminum	(E) Air-moist	Loss of material/pitting and crevice corrosion	Work Control Process	VII.F2-12	3.3.1-27	E
				Reduction of heat transfer/fouling	Work Control Process			H
		Copper Alloys	(E) Air-moist	Loss of material/pitting and crevice corrosion	Work Control Process	AP-078	3.3.1-28	E
				Reduction of heat transfer/fouling	Work Control Process			H
			(I) Raw water	Loss of material/erosion	Open-Cycle Cooling Water System			H
				Loss of material/pitting, crevice, galvanic, and microbiologically influenced corrosion, and fouling	Open-Cycle Cooling Water System	A-065	3.3.1-82	B
				Reduction of heat transfer/fouling	Open-Cycle Cooling Water System	A-072	3.3.1-83	B

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-13: Auxiliary Systems - Auxiliary Building Ventilation - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Fan Coil Units (Drip Pans)	PB	Steel	(E) Air-moist	Loss of material/general, pitting, crevice, and (for drip pans and drain lines) microbiologically influenced corrosion	Work Control Process	VII.F2-03	3.3.1-72	E
			(E) Raw water	Loss of material/general, pitting, crevice, and microbiologically influenced corrosion, and fouling	Work Control Process	A-033	3.3.1-68	E
Fan Coil Units (Housing)	PB	Stainless Steel	(E) Air-indoor uncontrolled	Loss of material/pitting and crevice corrosion	External Surfaces Monitoring	VII.F2-01	3.3.1-27	E
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	C
			(I) Air-moist	Loss of material/pitting and crevice corrosion	Work Control Process	VII.F2-01	3.3.1-27	E
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(I) Air-moist	Loss of material/general, pitting, crevice, and (for drip pans and drain lines) microbiologically influenced corrosion	Work Control Process	VII.F2-03	3.3.1-72	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-13: Auxiliary Systems - Auxiliary Building Ventilation - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Fan/blower Housings	PB	Stainless Steel	(E) Air-indoor uncontrolled	Loss of material/pitting and crevice corrosion	External Surfaces Monitoring	VII.F2-01	3.3.1-27	E
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	C
			(I) Air-moist	Loss of material/pitting and crevice corrosion	Work Control Process	VII.F2-01	3.3.1-27	E
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(I) Air-moist	Loss of material/general, pitting, crevice, and (for drip pans and drain lines) microbiologically influenced corrosion	Work Control Process	VII.F2-03	3.3.1-72	E
Filter Assemblies	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(I) Air-moist	Loss of material/general, pitting, crevice, and (for drip pans and drain lines) microbiologically influenced corrosion	Work Control Process	VII.F2-03	3.3.1-72	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-13: Auxiliary Systems - Auxiliary Building Ventilation - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Flexible Connections	PB	Elastomers	(E) Air-indoor uncontrolled	Change in material properties/thermal exposure	External Surfaces Monitoring			H
				Cracking/thermal exposure	External Surfaces Monitoring			H
				Cracking; Delamination/vibration	External Surfaces Monitoring			H
				Hardening and loss of strength/elastomer degradation	External Surfaces Monitoring	VII.F2-07	3.3.1-11	E
				Loss of material/wear	External Surfaces Monitoring	VII.F2-05	3.3.1-34	E
			(I) Air-indoor uncontrolled	Loss of material/wear	Work Control Process	VII.F2-06	3.3.1-34	E
			(I) Air-moist	Hardening and loss of strength/elastomer degradation	Work Control Process			H
Heating Coils	PB	Copper Alloys	(E) Air-indoor uncontrolled	Loss of material/pitting and crevice corrosion	External Surfaces Monitoring	VII.F2-14	3.3.1-25	A, 1
			(E) Air-moist	Loss of material/pitting and crevice corrosion	Work Control Process	AP-078	3.3.1-28	E
			(E) Borated water leakage	None	None	VII.J-05	3.3.1-99	C, 1
			(I) Treated water and/or steam-secondary	Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	SP-061	3.4.1-15	A
					Work Control Process	SP-061	3.4.1-15	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-13: Auxiliary Systems - Auxiliary Building Ventilation - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Temperature Elements	EQB; PB	Stainless Steel	(E) Air-indoor uncontrolled	Loss of material/pitting and crevice corrosion	Work Control Process	VII.F2-01	3.3.1-27	E
Tubing	PB	Copper Alloys	(E) Air-indoor uncontrolled	Loss of material/pitting and crevice corrosion	External Surfaces Monitoring	VII.F2-14	3.3.1-25	E
			(E) Borated water leakage	None	None	VII.J-05	3.3.1-99	A
			(I) Air-moist	Loss of material/pitting and crevice corrosion	Work Control Process	AP-078	3.3.1-28	E
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(I) Air-moist	Loss of material/general, pitting, crevice, and (for drip pans and drain lines) microbiologically influenced corrosion	Work Control Process	VII.F2-03	3.3.1-72	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-13 Notes:

Plant Standard Notes

Note - The following plant standard notes have generic applicability, but may or may not be used for each SSC:

S1. Thermal embrittlement is only applicable to CASS components that are subject to temperatures in excess of 482°F.

S2. Cracking due to SCC is only applicable to stainless steel components exposed to temperatures greater than 140°F.

S3. Selective leaching is applicable to the material group 'Steel,' but only for gray cast iron components.

System Specific Notes

1. This portion of the copper heating coil extends beyond the air handling unit/duct.

Industry Standard Notes

See last page of Section 3.3 tables.

Table 3.3.2-14: Auxiliary Systems - Reactor Building Ventilation - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Bolting	PB	Steel	(E) Air-indoor uncontrolled	Cracking/cyclic loading, stress corrosion cracking	Bolting Integrity	VII.I-03	3.3.1-41	A
				Loss of material/general, pitting, and crevice corrosion	Bolting Integrity	VII.I-04	3.3.1-43	A
				Loss of preload/thermal effects, gasket creep, and self-loosening	Bolting Integrity	VII.I-05	3.3.1-45	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-02	3.3.1-89	A
Containment Fan Coil Units (Cooling Coils)	EN; HT; PB	Copper Alloys	(E) Air-moist	Loss of material/pitting and crevice corrosion	Work Control Process	AP-078	3.3.1-28	E
				Reduction of heat transfer/fouling	Work Control Process			H
			(I) Raw water	Loss of material/erosion	Open-Cycle Cooling Water System			H
				Loss of material/pitting, crevice, galvanic, and microbiologically influenced corrosion, and fouling	Open-Cycle Cooling Water System	A-065	3.3.1-82	B
				Reduction of heat transfer/fouling	Open-Cycle Cooling Water System	A-072	3.3.1-83	B
		Steel	(E) Air-moist	Loss of material/general, pitting, crevice, and (for drip pans and drain lines) microbiologically influenced corrosion	Work Control Process	VII.F3-03	3.3.1-72	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-14: Auxiliary Systems - Reactor Building Ventilation - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Containment Fan Coil Units (Drip Pan)	EN; PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Raw water	Loss of material/pitting and crevice corrosion	Work Control Process	A-053	3.3.1-78	E
Containment Fan Coil Units (Housing)	EN; PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.F3-02	3.3.1-56	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(I) Air-moist	Loss of material/general, pitting, crevice, and (for drip pans and drain lines) microbiologically influenced corrosion	Work Control Process	VII.F3-03	3.3.1-72	E
Damper Housings	FB; PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.F3-02	3.3.1-56	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(I) Air-moist	Loss of material/general, pitting, and crevice corrosion	Work Control Process	A-023	3.3.1-71	E
Drip Pans (Shroud Cooling Coils)	EN	Steel	(E) Air-moist	Loss of material/general, pitting, crevice, and (for drip pans and drain lines) microbiologically influenced corrosion	Work Control Process	VII.F3-03	3.3.1-72	E
			(E) Raw water	Loss of material/general, pitting, crevice, and microbiologically influenced corrosion, and fouling	Work Control Process	A-033	3.3.1-68	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-14: Auxiliary Systems - Reactor Building Ventilation - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Ductwork	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.F3-02	3.3.1-56	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(I) Air-moist	Loss of material/general, pitting, crevice, and (for drip pans and drain lines) microbiologically influenced corrosion	Work Control Process	VII.F3-03	3.3.1-72	E
Electric Heater Housings	PB	Aluminum	(E) Air-indoor uncontrolled	Loss of material/pitting and crevice corrosion	External Surfaces Monitoring	VII.F3-14	3.3.1-27	E
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	AP-001	3.3.1-88	A
			(I) Air-moist	Loss of material/pitting and crevice corrosion	Work Control Process	VII.F3-14	3.3.1-27	E
Fan/blower Housings	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.F3-02	3.3.1-56	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(I) Air-moist	Loss of material/general, pitting, crevice, and (for drip pans and drain lines) microbiologically influenced corrosion	Work Control Process	VII.F3-03	3.3.1-72	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-14: Auxiliary Systems - Reactor Building Ventilation - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Filter Assemblies	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.F3-02	3.3.1-56	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(I) Air-moist	Loss of material/general, pitting, crevice, and (for drip pans and drain lines) microbiologically influenced corrosion	Work Control Process	VII.F3-03	3.3.1-72	E
Flexible Connections	PB	Elastomers	(E) Air-indoor uncontrolled	Change in material properties/thermal exposure	External Surfaces Monitoring			H
				Cracking/thermal exposure	External Surfaces Monitoring			H
				Cracking; Delamination/vibration	External Surfaces Monitoring			H
				Hardening and loss of strength/elastomer degradation	External Surfaces Monitoring	VII.F3-07	3.3.1-11	E
				Loss of material/wear	External Surfaces Monitoring	VII.F3-05	3.3.1-34	E
			(I) Air-indoor uncontrolled	Loss of material/wear	Work Control Process	VII.F3-06	3.3.1-34	E
			(I) Air-moist	Hardening and loss of strength/elastomer degradation	Work Control Process			H

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-14: Auxiliary Systems - Reactor Building Ventilation - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Flow Elements	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
Pipe	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(I) Raw water	Loss of material/pitting and crevice corrosion	Work Control Process	A-053	3.3.1-78	E
Shroud Cooling Coils (Cooling coils)	PB	Copper Alloys	(E) Air-indoor uncontrolled	Reduction of heat transfer/fouling	Work Control Process			H
			(E) Air-moist	Loss of material/pitting and crevice corrosion	Work Control Process	AP-078	3.3.1-28	E
			(I) Raw water	Loss of material/erosion	Open-Cycle Cooling Water System			H
				Loss of material/pitting, crevice, galvanic, and microbiologically influenced corrosion, and fouling	Open-Cycle Cooling Water System	A-065	3.3.1-82	B

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-14: Auxiliary Systems - Reactor Building Ventilation - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Shroud Cooling Coils (Housing)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.F3-02	3.3.1-56	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(I) Air-moist	Loss of material/general, pitting, crevice, and (for drip pans and drain lines) microbiologically influenced corrosion	Work Control Process	VII.F3-03	3.3.1-72	E
Tubing	PB	Copper Alloys	(E) Air-indoor uncontrolled	Loss of material/pitting and crevice corrosion	External Surfaces Monitoring	VII.F3-16	3.3.1-25	A
			(E) Borated water leakage	None	None	VII.J-05	3.3.1-99	A
			(I) Air-moist	Loss of material/pitting and crevice corrosion	Work Control Process	AP-078	3.3.1-28	E
		Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-14: Auxiliary Systems - Reactor Building Ventilation - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Valves	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.F3-02	3.3.1-56	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(I) Air-moist	Loss of material/general, pitting, and crevice corrosion	Work Control Process	A-023	3.3.1-71	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-14 Notes:

Plant Standard Notes

Note - The following plant standard notes have generic applicability, but may or may not be used for each SSC:

S1. Thermal embrittlement is only applicable to CASS components that are subject to temperatures in excess of 482°F.

S2. Cracking due to SCC is only applicable to stainless steel components exposed to temperatures greater than 140°F.

S3. Selective leaching is applicable to the material group 'Steel,' but only for gray cast iron components.

Industry Standard Notes

See last page of Section 3.3 tables.

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-15: Auxiliary Systems - Turbine Building and Screenhouse Ventilation - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Bolting	PB	Steel	(E) Air-indoor uncontrolled	Cracking/cyclic loading, stress corrosion cracking	Bolting Integrity	VII.I-03	3.3.1-41	A
				Loss of material/general, pitting, and crevice corrosion	Bolting Integrity	VII.I-04	3.3.1-43	A
				Loss of preload/thermal effects, gasket creep, and self-loosening	Bolting Integrity	VII.I-05	3.3.1-45	A
Damper Housings	EQB; FB; PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.F4-01	3.3.1-56	A
			(E) Concrete	None	None	VII.J-21	3.3.1-96	A
			(I) Air-moist	Loss of material/general, pitting, crevice, and (for drip pans and drain lines) microbiologically influenced corrosion	Work Control Process	VII.F4-02	3.3.1-72	E
Ductwork	EQB; PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.F4-01	3.3.1-56	A
			(I) Air-moist	Loss of material/general, pitting, crevice, and (for drip pans and drain lines) microbiologically influenced corrosion	Work Control Process	VII.F4-02	3.3.1-72	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-15: Auxiliary Systems - Turbine Building and Screenhouse Ventilation - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Fan Coil Units (Cooling Coils/Fins)	HT; PB	Aluminum	(E) Air-moist	Loss of material/pitting and crevice corrosion	Work Control Process	VII.F4-10	3.3.1-27	E
				Reduction of heat transfer/fouling	Work Control Process			H
		Copper Alloys	(E) Air-indoor uncontrolled	Loss of material/pitting and crevice corrosion	Work Control Process	VII.F4-12	3.3.1-25	E
			(E) Air-moist	Loss of material/pitting and crevice corrosion	Work Control Process	AP-078	3.3.1-28	E
				Reduction of heat transfer/fouling	Work Control Process			H
			(I) Raw water	Loss of material/erosion	Open-Cycle Cooling Water System			H, 1
					Work Control Process			H, 1
				Loss of material/pitting, crevice, galvanic, and microbiologically influenced corrosion, and fouling	Open-Cycle Cooling Water System	A-065	3.3.1-82	B, 1
					Work Control Process	A-065	3.3.1-82	E, 1
				Reduction of heat transfer/fouling	Open-Cycle Cooling Water System	A-072	3.3.1-83	B, 1
					Work Control Process	A-072	3.3.1-83	E, 1

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-15: Auxiliary Systems - Turbine Building and Screenhouse Ventilation - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Fan Coil Units (Drip Pans)	PB	Steel	(E) Air-moist	Loss of material/general, pitting, crevice, and (for drip pans and drain lines) microbiologically influenced corrosion	Work Control Process	VII.F4-02	3.3.1-72	E
			(E) Raw water	Loss of material/general, pitting, crevice, and microbiologically influenced corrosion, and fouling	Work Control Process	A-033	3.3.1-68	E
Fan Coil Units (Housings)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.F4-01	3.3.1-56	A
			(I) Air-moist	Loss of material/general, pitting, crevice, and (for drip pans and drain lines) microbiologically influenced corrosion	Work Control Process	VII.F4-02	3.3.1-72	E
Fan/blower Housings	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.F4-01	3.3.1-56	A
			(I) Air-moist	Loss of material/general, pitting, crevice, and (for drip pans and drain lines) microbiologically influenced corrosion	Work Control Process	VII.F4-02	3.3.1-72	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-15: Auxiliary Systems - Turbine Building and Screenhouse Ventilation - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Flexible Connections	PB	Elastomers	(E) Air-indoor uncontrolled	Change in material properties/thermal exposure	External Surfaces Monitoring			H
				Cracking/thermal exposure	External Surfaces Monitoring			H
				Cracking; Delamination/vibration	External Surfaces Monitoring			H
				Hardening and loss of strength/elastomer degradation	External Surfaces Monitoring	VII.F4-06	3.3.1-11	E
				Loss of material/wear	External Surfaces Monitoring	VII.F4-04	3.3.1-34	E
			(I) Air-indoor uncontrolled	Loss of material/wear	Work Control Process	VII.F4-05	3.3.1-34	E
			(I) Air-moist	Hardening and loss of strength/elastomer degradation	Work Control Process			H
Flow Elements	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.F4-01	3.3.1-56	A
			(I) Air-moist	Loss of material/general, pitting, crevice, and (for drip pans and drain lines) microbiologically influenced corrosion	Work Control Process	VII.F4-02	3.3.1-72	E
Temperature Elements	EQB; PB	Stainless Steel	(E) Air-moist	Loss of material/pitting and crevice corrosion	Work Control Process	A-009	3.3.1-27	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-15 Notes:

Plant Standard Notes

Note - The following plant standard notes have generic applicability, but may or may not be used for each SSC:

S1. Thermal embrittlement is only applicable to CASS components that are subject to temperatures in excess of 482°F.

S2. Cracking due to SCC is only applicable to stainless steel components exposed to temperatures greater than 140°F.

S3. Selective leaching is applicable to the material group 'Steel,' but only for gray cast iron components.

System Specific Notes

1. Components that are not safety-related are managed by the Work Control Process. Components that are safety-related are managed by the Open-Cycle Cooling Water System Program.

Industry Standard Notes

See last page of Section 3.3 tables.

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-16: Auxiliary Systems - Shield Building Ventilation - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Bolting	PB	Steel	(E) Air-indoor uncontrolled	Cracking/cyclic loading, stress corrosion cracking	Bolting Integrity	VII.I-03	3.3.1-41	A
				Loss of material/general, pitting, and crevice corrosion	Bolting Integrity	VII.I-04	3.3.1-43	A
				Loss of preload/thermal effects, gasket creep, and self-loosening	Bolting Integrity	VII.I-05	3.3.1-45	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-02	3.3.1-89	A
Damper Housings	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	A-010	3.3.1-56	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(I) Air-moist	Loss of material/general, pitting, and crevice corrosion	Work Control Process	A-023	3.3.1-71	E
Ductwork	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	A-010	3.3.1-56	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(I) Air-moist	Loss of material/general, pitting, and crevice corrosion	Work Control Process	A-023	3.3.1-71	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-16: Auxiliary Systems - Shield Building Ventilation - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Fan/Blower Housings	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	A-010	3.3.1-56	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(I) Air-moist	Loss of material/general, pitting, and crevice corrosion	Work Control Process	A-023	3.3.1-71	E
Flexible Connections	PB	Elastomers	(E) Air-indoor uncontrolled	Change in material properties/thermal exposure	External Surfaces Monitoring			H
				Cracking/thermal exposure	External Surfaces Monitoring			H
				Cracking; Delamination/vibration	External Surfaces Monitoring			H
				Hardening and loss of strength/elastomer degradation	External Surfaces Monitoring	A-017	3.3.1-11	E
				Loss of material/wear	External Surfaces Monitoring	A-073	3.3.1-34	E
			(I) Air-indoor uncontrolled	Loss of material/wear	Work Control Process	A-018	3.3.1-34	E
			(I) Air-moist	Hardening and loss of strength/elastomer degradation	Work Control Process			H
Reactor Building Discharge Vent	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	A-010	3.3.1-56	A
			(I) Air-moist	Loss of material/general, pitting, and crevice corrosion	Work Control Process	A-023	3.3.1-71	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-16: Auxiliary Systems - Shield Building Ventilation - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Shield Building Vent Filter Assemblies	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	A-010	3.3.1-56	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(I) Air-moist	Loss of material/general, pitting, and crevice corrosion	Work Control Process	A-023	3.3.1-71	E
Tubing	PB	Copper Alloys	(E) Air-indoor uncontrolled	Loss of material/pitting and crevice corrosion	External Surfaces Monitoring	A-046	3.3.1-25	E
			(E) Borated water leakage	None	None	VII.J-05	3.3.1-99	A
			(I) Air-moist	Loss of material/pitting and crevice corrosion	Work Control Process	AP-078	3.3.1-28	E
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	A-010	3.3.1-56	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(I) Air-moist	Loss of material/general, pitting, and crevice corrosion	Work Control Process	A-023	3.3.1-71	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-16 Notes:

Plant Standard Notes

Note - The following plant standard notes have generic applicability, but may or may not be used for each SSC:

S1. Thermal embrittlement is only applicable to CASS components that are subject to temperatures in excess of 482°F.

S2. Cracking due to SCC is only applicable to stainless steel components exposed to temperatures greater than 140°F.

S3. Selective leaching is applicable to the material group 'Steel,' but only for gray cast iron components.

Industry Standard Notes

See last page of Section 3.3 tables.

Table 3.3.2-17: Auxiliary Systems - Technical Support Center Ventilation - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Air Conditioning Units (Battery Room Cooling Coils/Fins)	HT; PB	Aluminum	(E) Air-moist	Loss of material/pitting and crevice corrosion	Work Control Process	AP-074	3.3.1-27	E
				Reduction of heat transfer/fouling	Work Control Process			H
		Copper Alloys	(E) Air-moist	Loss of material/pitting and crevice corrosion	Work Control Process	AP-078	3.3.1-28	E
				Reduction of heat transfer/fouling	Work Control Process			H
			(I) Gas-inert	None	None	VII.J-04	3.3.1-97	C
Air Conditioning Units (Compressor)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	Work Control Process	VII.I-08	3.3.1-58	E
			(I) Gas-inert	None	None	VII.J-23	3.3.1-97	C
Air Conditioning Units (Condenser Drip Pan)	PB	Steel	(E) Air-moist	Loss of material/general, pitting, crevice, and (for drip pans and drain lines) microbiologically influenced corrosion	Work Control Process	A-008	3.3.1-72	E
			(E) Raw water	Loss of material/general, pitting, crevice, and microbiologically influenced corrosion, and fouling	Work Control Process	A-033	3.3.1-68	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-17: Auxiliary Systems - Technical Support Center Ventilation - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Air Conditioning Units (Condenser/Fins)	HT; PB	Aluminum	(E) Air-moist	Loss of material/pitting and crevice corrosion	Work Control Process	AP-074	3.3.1-27	E
				Reduction of heat transfer/fouling	Work Control Process			H
		Copper Alloys	(E) Air-moist	Loss of material/pitting and crevice corrosion	Work Control Process	AP-078	3.3.1-28	E
				Reduction of heat transfer/fouling	Work Control Process			H
			(I) Gas-inert	None	None	VII.J-04	3.3.1-97	C
Air Conditioning Units (Housing)	PB	Steel	(E) Air-outdoor	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-09	3.3.1-58	A
			(I) Air-moist	Loss of material/general, pitting, crevice, and (for drip pans and drain lines) microbiologically influenced corrosion	Work Control Process	A-008	3.3.1-72	E
Air Handling Units (Battery Room Coil Drip Pan)	PB	Steel	(E) Air-moist	Loss of material/general, pitting, crevice, and (for drip pans and drain lines) microbiologically influenced corrosion	Work Control Process	A-008	3.3.1-72	E
			(E) Raw water	Loss of material/general, pitting, crevice, and microbiologically influenced corrosion, and fouling	Work Control Process	A-033	3.3.1-68	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-17: Auxiliary Systems - Technical Support Center Ventilation - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Air Handling Units (Battery Room Housing)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(I) Air-moist	Loss of material/general, pitting, crevice, and (for drip pans and drain lines) microbiologically influenced corrosion	Work Control Process	A-008	3.3.1-72	E
Air Handling Units (Equipment Room Housing)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(I) Air-moist	Loss of material/general, pitting, crevice, and (for drip pans and drain lines) microbiologically influenced corrosion	Work Control Process	A-008	3.3.1-72	E
Bolting	PB	Steel	(E) Air-indoor uncontrolled	Cracking/cyclic loading, stress corrosion cracking	Bolting Integrity	VII.I-03	3.3.1-41	A
				Loss of material/general, pitting, and crevice corrosion	Bolting Integrity	VII.I-04	3.3.1-43	A
				Loss of preload/thermal effects, gasket creep, and self-loosening	Bolting Integrity	VII.I-05	3.3.1-45	A
			(E) Air-outdoor	Loss of material/general, pitting, and crevice corrosion	Bolting Integrity	VII.I-01	3.3.1-43	A
Damper Housings	FB; PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(I) Air-moist	Loss of material/general, pitting, crevice, and (for drip pans and drain lines) microbiologically influenced corrosion	Work Control Process	A-008	3.3.1-72	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-17: Auxiliary Systems - Technical Support Center Ventilation - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Ductwork	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(I) Air-moist	Loss of material/general, pitting, crevice, and (for drip pans and drain lines) microbiologically influenced corrosion	Work Control Process	A-008	3.3.1-72	E
Fan/blower Housings	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(I) Air-moist	Loss of material/general, pitting, crevice, and (for drip pans and drain lines) microbiologically influenced corrosion	Work Control Process	A-008	3.3.1-72	E
Flexible Connections	PB	Elastomers	(E) Air-indoor uncontrolled	Change in material properties/thermal exposure	External Surfaces Monitoring			H
				Cracking/thermal exposure	External Surfaces Monitoring			H
				Cracking; Delamination/vibration	External Surfaces Monitoring			H
				Hardening and loss of strength/elastomer degradation	External Surfaces Monitoring	A-017	3.3.1-11	E
				Loss of material/wear	External Surfaces Monitoring	A-073	3.3.1-34	E
			(I) Air-indoor uncontrolled	Loss of material/wear	Work Control Process	A-018	3.3.1-34	E
			(I) Air-moist	Hardening and loss of strength/elastomer degradation	Work Control Process			H

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-17: Auxiliary Systems - Technical Support Center Ventilation - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Tubing	PB	Copper Alloys	(E) Air-indoor uncontrolled	Loss of material/pitting and crevice corrosion	External Surfaces Monitoring	A-046	3.3.1-25	E
			(I) Gas-inert	None	None	VII.J-04	3.3.1-97	A

Table 3.3.2-17 Notes:

Plant Standard Notes

Note - The following plant standard notes have generic applicability, but may or may not be used for each SSC:

S1. Thermal embrittlement is only applicable to CASS components that are subject to temperatures in excess of 482°F.

S2. Cracking due to SCC is only applicable to stainless steel components exposed to temperatures greater than 140°F.

S3. Selective leaching is applicable to the material group 'Steel,' but only for gray cast iron components.

Industry Standard Notes

See last page of Section 3.3 tables.

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-18: Auxiliary Systems - Fire Protection - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Bolting	PB	Steel	(E) Air-indoor uncontrolled	Cracking/cyclic loading, stress corrosion cracking	Bolting Integrity	VII.I-03	3.3.1-41	A
				Loss of material/general, pitting, and crevice corrosion	Bolting Integrity	VII.I-04	3.3.1-43	A
				Loss of preload/thermal effects, gasket creep, and self-loosening	Bolting Integrity	VII.I-05	3.3.1-45	A
			(E) Air-outdoor	Loss of material/general, pitting, and crevice corrosion	Bolting Integrity	VII.I-01	3.3.1-43	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-02	3.3.1-89	A
			(E) Soil	Loss of material/general, pitting, crevice, and microbiologically influenced corrosion	Buried Piping and Tanks Inspection	VII.G-25	3.3.1-19	C
CO2 Storage Tank	PB	Steel	(E) Air-indoor controlled	None	None	VII.J-20	3.3.1-95	C, 1
			(I) Air-moist	Loss of material/general, pitting, and crevice corrosion	Fire Protection	VII.G-23	3.3.1-71	E
CO2 Storage Tank Compressor	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(I) Air-moist	Loss of material/general, pitting, and crevice corrosion	Work Control Process	VII.G-23	3.3.1-71	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-18: Auxiliary Systems - Fire Protection - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Drip Funnel	EN	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(I) Raw water	Loss of material/general, pitting, crevice, and microbiologically influenced corrosion, and fouling	Fire Protection	VII.G-24	3.3.1-68	E
Drip Pans and Enclosures	EN	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Lube oil	Loss of material/pitting, crevice, and microbiologically influenced corrosion	Fire Protection	VII.G-18	3.3.1-33	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-18: Auxiliary Systems - Fire Protection - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Fire Hydrants	PB	Copper Alloys	(E) Air-outdoor	Loss of material/pitting and crevice corrosion	External Surfaces Monitoring			H, 2
			(I) Air-moist	Loss of material/pitting and crevice corrosion	Fire Protection	VII.G-09	3.3.1-28	E, 2
			(I) Raw water	Loss of material/pitting, crevice, and microbiologically influenced corrosion, and fouling	Fire Protection	VII.G-12	3.3.1-70	E, 2
				Loss of material/selective leaching	Selective Leaching of Materials	VII.G-13	3.3.1-84	A, 2
		Steel	(E) Air-outdoor	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-09	3.3.1-58	A
			(I) Raw water	Loss of material/general, pitting, crevice, and microbiologically influenced corrosion, and fouling	Fire Protection	VII.G-24	3.3.1-68	E
				Loss of material/selective leaching	Selective Leaching of Materials	VII.G-14	3.3.1-85	A, S3

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-18: Auxiliary Systems - Fire Protection - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Fire Pumps	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(E) Raw water	Loss of material/general, pitting, crevice, and microbiologically influenced corrosion, and fouling	Fire Protection	VII.G-24	3.3.1-68	E
				Loss of material/selective leaching	Selective Leaching of Materials	VII.G-14	3.3.1-85	A, S3
			(I) Raw water	Loss of material/general, pitting, crevice, and microbiologically influenced corrosion, and fouling	Fire Protection	VII.G-24	3.3.1-68	E
				Loss of material/selective leaching	Selective Leaching of Materials	VII.G-14	3.3.1-85	A, S3
Flame Arrestor	FB; PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(I) Lube oil	Loss of material/general, pitting, and crevice corrosion	Work Control Process	VII.G-26	3.3.1-15	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-18: Auxiliary Systems - Fire Protection - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Flexible Hoses	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Air-moist	Loss of material/pitting and crevice corrosion	Work Control Process	AP-081	3.3.1-54	E
			(I) Lube oil	Loss of material/pitting, crevice, and microbiologically influenced corrosion	Work Control Process	VII.G-18	3.3.1-33	E
Halon Cylinders	PB	Steel	(E) Air-indoor controlled	None	None	VII.J-20	3.3.1-95	A
			(I) Air-moist	Loss of material/general, pitting, and crevice corrosion	Fire Protection	VII.G-23	3.3.1-71	E
Hose Reels/Stations	PB	Steel	(E) Air-indoor controlled	None	None	VII.J-20	3.3.1-95	A
			(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-18: Auxiliary Systems - Fire Protection - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Hose Valve Head	PB	Copper Alloys	(E) Air-outdoor	Loss of material/pitting and crevice corrosion	External Surfaces Monitoring			H
			(I) Air-moist	Loss of material/pitting and crevice corrosion	Fire Protection	VII.G-09	3.3.1-28	E
			(I) Raw water	Loss of material/pitting, crevice, and microbiologically influenced corrosion, and fouling	Fire Protection	VII.G-12	3.3.1-70	E
				Loss of material/selective leaching	Selective Leaching of Materials	VII.G-13	3.3.1-84	A
Jockey Pump	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(I) Raw water	Loss of material/general, pitting, crevice, and microbiologically influenced corrosion, and fouling	Fire Protection	VII.G-24	3.3.1-68	E
				Loss of material/selective leaching	Selective Leaching of Materials	VII.G-14	3.3.1-85	A, S3

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-18: Auxiliary Systems - Fire Protection - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Nozzles	FD; PB	Aluminum	(E) Air-indoor uncontrolled	None	None	EP-003	3.2.1-50	A
			(I) Air-indoor uncontrolled	None	None	EP-003	3.2.1-50	A
		Copper Alloys	(E) Air-indoor uncontrolled	None	None	SP-006	3.4.1-41	A
			(I) Air-indoor uncontrolled	None	None	SP-006	3.4.1-41	A
		Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(I) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
Odorizers	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(I) Air-moist	Loss of material/general, pitting, and crevice corrosion	Fire Protection	VII.G-23	3.3.1-71	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-18: Auxiliary Systems - Fire Protection - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Pipe	PB	Steel	(E) Air-indoor controlled	None	None	VII.J-20	3.3.1-95	A
			(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(E) Concrete	None	None	VII.J-21	3.3.1-96	A
			(E) Soil	Loss of material/general, pitting, crevice, and microbiologically influenced corrosion	Buried Piping and Tanks Inspection	VII.G-25	3.3.1-19	A
				Loss of material/selective leaching	Selective Leaching of Materials	VII.G-15	3.3.1-85	A, S3
			(I) Air-moist	Loss of material/general, pitting, and crevice corrosion	Work Control Process	VII.G-23	3.3.1-71	E
			(I) Lube oil	Loss of material/general, pitting, and crevice corrosion	Work Control Process	VII.G-26	3.3.1-15	E
			(I) Raw water	Loss of material/general, pitting, crevice, and microbiologically influenced corrosion, and fouling	Fire Protection	VII.G-24	3.3.1-68	E
				Loss of material/selective leaching	Selective Leaching of Materials	VII.G-14	3.3.1-85	A, S3

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-18: Auxiliary Systems - Fire Protection - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Reactor Coolant Pump Oil Collection Tank	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(I) Air-moist	Loss of material/general, pitting, and crevice corrosion	Work Control Process	VII.G-23	3.3.1-71	E
			(I) Lube oil	Loss of material/general, pitting, and crevice corrosion	Fire Protection	VII.G-27	3.3.1-16	E
Retarding Chambers	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(I) Air-moist	Loss of material/general, pitting, and crevice corrosion	Fire Protection	VII.G-23	3.3.1-71	E
			(I) Raw water	Loss of material/general, pitting, crevice, and microbiologically influenced corrosion, and fouling	Fire Protection	VII.G-24	3.3.1-68	E
Sight Glasses	PB	Glass	(E) Air-indoor uncontrolled	None	None	VII.J-08	3.3.1-93	A
			(I) Air-indoor uncontrolled	None	None	VII.J-07	3.3.1-93	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-18: Auxiliary Systems - Fire Protection - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Sprinkler Heads	SP	Copper Alloys	(E) Air-indoor uncontrolled	None	None	SP-006	3.4.1-41	A
			(I) Raw water	Loss of material/pitting, crevice, and microbiologically influenced corrosion, and fouling	Fire Protection	VII.G-12	3.3.1-70	E
				Loss of material/selective leaching	Selective Leaching of Materials	VII.G-13	3.3.1-84	A
Strainers (Fire Pump Suction)	FLT	Stainless Steel	(I) Raw water	Loss of material/microbiologically influenced corrosion	Fire Protection			H
				Loss of material/pitting and crevice corrosion, and fouling	Fire Protection	VII.G-19	3.3.1-69	E
Tubing	PB	Copper Alloys	(E) Air-indoor uncontrolled	None	None	SP-006	3.4.1-41	A
			(E) Borated water leakage	None	None	VII.J-05	3.3.1-99	A
			(I) Air-moist	Loss of material/pitting and crevice corrosion	Work Control Process	VII.G-09	3.3.1-28	E
			(I) Raw water	Loss of material/pitting, crevice, and microbiologically influenced corrosion, and fouling	Fire Protection	VII.G-12	3.3.1-70	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-18: Auxiliary Systems - Fire Protection - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Tubing	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Air-moist	Loss of material/pitting and crevice corrosion	Work Control Process	AP-081	3.3.1-54	E
			(I) Raw water	Loss of material/microbiologically influenced corrosion	Fire Protection			H
				Loss of material/pitting and crevice corrosion, and fouling	Fire Protection	VII.G-19	3.3.1-69	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-18: Auxiliary Systems - Fire Protection - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Tubing	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(I) Air-moist	Loss of material/general, pitting, and crevice corrosion	Work Control Process	VII.G-23	3.3.1-71	E
			(I) Raw water	Loss of material/general, pitting, crevice, and microbiologically influenced corrosion, and fouling	Fire Protection	VII.G-24	3.3.1-68	E
Turbine Bearing Fire Protection CO2 Vaporizer (Shell Side)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general, pitting, and crevice corrosion	External Surfaces Monitoring	VII.G-05	3.3.1-59	A
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	S-019	3.4.1-03	A
					Work Control Process	S-019	3.4.1-03	E
Turbine Bearing Fire Protection CO2 Vaporizer (Tube Side)	PB	Steel	(E) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	S-019	3.4.1-03	A
					Work Control Process	S-019	3.4.1-03	E
			(I) Air-moist	Loss of material/general, pitting, and crevice corrosion	Work Control Process	VII.G-23	3.3.1-71	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-18: Auxiliary Systems - Fire Protection - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Valves	PB	Copper Alloys	(E) Air-indoor uncontrolled	None	None	SP-006	3.4.1-41	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-12	3.3.1-88	A
			(I) Air-moist	Loss of material/pitting and crevice corrosion	Work Control Process	VII.G-09	3.3.1-28	E
			(I) Raw water	Loss of material/pitting, crevice, and microbiologically influenced corrosion, and fouling	Fire Protection	VII.G-12	3.3.1-70	E
				Loss of material/selective leaching	Selective Leaching of Materials	VII.G-13	3.3.1-84	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-18: Auxiliary Systems - Fire Protection - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Valves	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(I) Air-moist	Loss of material/pitting and crevice corrosion	Work Control Process	AP-081	3.3.1-54	E
			(I) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Raw water	Loss of material/microbiologically influenced corrosion	Fire Protection			H
				Loss of material/pitting and crevice corrosion, and fouling	Fire Protection	VII.G-19	3.3.1-69	E
		Steel	(E) Air-indoor controlled	None	None	VII.J-20	3.3.1-95	A
			(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(E) Soil	Loss of material/general, pitting, crevice, and microbiologically influenced corrosion	Buried Piping and Tanks Inspection	VII.G-25	3.3.1-19	A
				Loss of material/selective leaching	Selective Leaching of Materials	VII.G-15	3.3.1-85	A, S3
			(I) Air-moist	Loss of material/general, pitting, and crevice corrosion	Work Control Process	VII.G-23	3.3.1-71	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-18: Auxiliary Systems - Fire Protection - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Valves	PB	Steel	(I) Lube oil	Loss of material/general, pitting, and crevice corrosion	Work Control Process	VII.G-26	3.3.1-15	E
			(I) Raw water	Loss of material/general, pitting, crevice, and microbiologically influenced corrosion, and fouling	Fire Protection	VII.G-24	3.3.1-68	E
				Loss of material/selective leaching	Selective Leaching of Materials	VII.G-14	3.3.1-85	A, S3

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-18 Notes:

Plant Standard Notes

Note - The following plant standard notes have generic applicability, but may or may not be used for each SSC:

S1. Thermal embrittlement is only applicable to CASS components that are subject to temperatures in excess of 482°F.

S2. Cracking due to SCC is only applicable to stainless steel components exposed to temperatures greater than 140°F.

S3. Selective leaching is applicable to the material group 'Steel,' but only for gray cast iron components.

System Specific Notes

1. Tank is insulated by 8" of insulation in a sheet steel housing. Therefore, an air-indoor controlled environment is assigned as the external environment.

2. The component type "Fire Hydrants" includes the copper alloy siamese hydrant fixture that is external to the Screenhouse structure.

Industry Standard Notes

See last page of Section 3.3 tables.

Table 3.3.2-19: Auxiliary Systems - Diesel Generator - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Air Dryers	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-11	3.3.1-58	A, 2
			(I) Air-dried	None	None	VII.J-22	3.3.1-98	A, 2
			(I) Air-moist	Loss of material/general, pitting, and crevice corrosion	Compressed Air Monitoring	VII.H2-21	3.3.1-71	E, 2
Bolting	PB	Steel	(E) Air-indoor uncontrolled	Cracking/cyclic loading, stress corrosion cracking	Bolting Integrity	VII.I-03	3.3.1-41	A
				Loss of material/general, pitting, and crevice corrosion	Bolting Integrity	VII.I-04	3.3.1-43	A
				Loss of preload/thermal effects, gasket creep, and self-loosening	Bolting Integrity	VII.I-05	3.3.1-45	A
			(E) Air-outdoor	Loss of material/general, pitting, and crevice corrosion	Bolting Integrity	VII.I-01	3.3.1-43	A
Compressor Casings	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A, 2
			(I) Air-moist	Loss of material/general, pitting, and crevice corrosion	Compressed Air Monitoring	VII.H2-21	3.3.1-71	A, 2
Diesel Generator Cooling Water Heat Exchangers (Channel head)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general, pitting, and crevice corrosion	External Surfaces Monitoring	VII.H2-03	3.3.1-59	A, 2
			(I) Raw water	Loss of material/erosion	Open-Cycle Cooling Water System			H, 2
				Loss of material/general, pitting, crevice, galvanic, and microbiologically influenced corrosion, and fouling	Open-Cycle Cooling Water System	A-064	3.3.1-77	B, 2

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-19: Auxiliary Systems - Diesel Generator - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Diesel Generator Cooling Water Heat Exchangers (Shell)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general, pitting, and crevice corrosion	External Surfaces Monitoring	VII.H2-03	3.3.1-59	A, 2
			(I) Treated water-closed cycle cooling	Loss of material/general, pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	A-063	3.3.1-48	B, 2
					Work Control Process	A-063	3.3.1-48	E, 2
				Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H, 2
					Work Control Process			H, 2

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-19: Auxiliary Systems - Diesel Generator - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Diesel Generator Cooling Water Heat Exchangers (Tubes)	HT; PB	Copper Alloys	(E) Treated water-closed cycle cooling	Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H, 2
					Work Control Process			H, 2
				Loss of material/pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	AP-034	3.3.1-51	B, 2
					Work Control Process	AP-034	3.3.1-51	E, 2
				Loss of material/selective leaching	Selective Leaching of Materials	EP-037	3.2.1-41	A, 2
			(I) Raw water	Loss of material/erosion	Open-Cycle Cooling Water System			H, 2
				Loss of material/pitting, crevice, galvanic, and microbiologically influenced corrosion, and fouling	Open-Cycle Cooling Water System	A-065	3.3.1-82	B, 2
				Loss of material/selective leaching	Selective Leaching of Materials	A-066	3.3.1-84	A, 2
				Reduction of heat transfer/fouling	Open-Cycle Cooling Water System	A-072	3.3.1-83	B, 2

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-19: Auxiliary Systems - Diesel Generator - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Diesel Generator Cooling Water Heat Exchangers (Tubesheet)	PB	Copper Alloys	(E) Treated water-closed cycle cooling	Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H, 2
					Work Control Process			H, 2
				Loss of material/pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	AP-034	3.3.1-51	B, 2
					Work Control Process	AP-034	3.3.1-51	E, 2
				Loss of material/selective leaching	Selective Leaching of Materials	EP-037	3.2.1-41	A, 2
			(I) Raw water	Loss of material/erosion	Open-Cycle Cooling Water System			H, 2
				Loss of material/pitting, crevice, galvanic, and microbiologically influenced corrosion, and fouling	Open-Cycle Cooling Water System	A-065	3.3.1-82	B, 2
				Loss of material/selective leaching	Selective Leaching of Materials	A-066	3.3.1-84	A, 2
Diesel Generator Fuel Oil Day Tanks	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(I) Fuel oil	Loss of material/general, pitting, crevice, and microbiologically influenced corrosion, and fouling	Fuel Oil Chemistry	VII.H1-10	3.3.1-20	B
					Work Control Process	VII.H1-10	3.3.1-20	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-19: Auxiliary Systems - Diesel Generator - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Diesel Generator Fuel Oil Storage Tanks	PB	Steel	(E) Soil	Loss of material/general, pitting, crevice, and microbiologically influenced corrosion	Buried Piping and Tanks Inspection	VII.H1-09	3.3.1-19	A
			(I) Fuel oil	Loss of material/general, pitting, crevice, and microbiologically influenced corrosion, and fouling	Fuel Oil Chemistry	VII.H1-10	3.3.1-20	B
					Fuel Oil Tank Inspections	VII.H1-10	3.3.1-20	E
Exhaust Manifold	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(I) Diesel exhaust	Loss of material/general (steel only), pitting and crevice corrosion	Work Control Process	VII.H2-02	3.3.1-18	E
Exhaust Mufflers and Silencers	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A, 2
			(E) Air-outdoor	Loss of material/general, pitting, and crevice corrosion	External Surfaces Monitoring	VII.H1-08	3.3.1-60	A, 1
			(I) Diesel exhaust	Loss of material/general (steel only), pitting and crevice corrosion	Work Control Process	VII.H2-02	3.3.1-18	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-19: Auxiliary Systems - Diesel Generator - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Expansion Tanks	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A, 2
			(E) Air-outdoor	Loss of material/general, pitting, and crevice corrosion	External Surfaces Monitoring	VII.H1-11	3.3.1-40	A, 1
			(I) Treated water-closed cycle cooling	Loss of material/general, pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	VII.H2-23	3.3.1-47	B, 3
					Work Control Process	VII.H2-23	3.3.1-47	E, 3
				Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H, 3
					Work Control Process			H, 3

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-19: Auxiliary Systems - Diesel Generator - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Filter Housings	PB	Aluminum	(E) Air-indoor uncontrolled	None	None	EP-003	3.2.1-50	A
			(I) Air-moist	Loss of material/pitting and crevice corrosion	Work Control Process	AP-074	3.3.1-27	E, 2
		Non-Metallic	(E) Air-indoor uncontrolled	None	None			H, 2
			(I) Air-dried	None	None			H, 2
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(I) Air-dried	None	None	VII.J-22	3.3.1-98	A, 2
			(I) Air-moist	Loss of material/general, pitting, and crevice corrosion	Compressed Air Monitoring	VII.H2-21	3.3.1-71	E, 2
			(I) Fuel oil	Loss of material/general, pitting, crevice, and microbiologically influenced corrosion, and fouling	Fuel Oil Chemistry	VII.H1-10	3.3.1-20	B
					Work Control Process	VII.H1-10	3.3.1-20	E
			(I) Lube oil	Loss of material/general, pitting, and crevice corrosion	Lubricating Oil Analysis	VII.H2-20	3.3.1-14	A
					Work Control Process	VII.H2-20	3.3.1-14	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-19: Auxiliary Systems - Diesel Generator - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Flame Arrestors, Hoods and Caps	EN; FB; PB	Aluminum	(E) Air-outdoor	Loss of material/pitting, crevice, and galvanic corrosion	External Surfaces Monitoring			H
			(I) Air-outdoor	Loss of material/pitting, crevice, and galvanic corrosion	Work Control Process			H
		Stainless Steel	(E) Air-outdoor	Loss of material/pitting and crevice corrosion	External Surfaces Monitoring			H
			(I) Air-outdoor	Loss of material/pitting and crevice corrosion	Work Control Process			H
Flexible Connections (includes braided hoses)	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Air-outdoor	Loss of material/pitting and crevice corrosion	External Surfaces Monitoring			H
			(I) Diesel exhaust	Cracking/stress corrosion cracking	Work Control Process	VII.H2-01	3.3.1-06	E, S2
				Loss of material/general (steel only), pitting and crevice corrosion	Work Control Process	VII.H2-02	3.3.1-18	E
			(I) Fuel oil	Loss of material/pitting, crevice, and microbiologically influenced corrosion	Fuel Oil Chemistry	VII.H1-06	3.3.1-32	B
					Work Control Process	VII.H1-06	3.3.1-32	E
			(I) Treated water-closed cycle cooling	Loss of material/microbiologically influenced corrosion	Work Control Process			H, 1, 3
				Loss of material/pitting and crevice corrosion	Work Control Process	A-052	3.3.1-50	E, 1, 3

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-19: Auxiliary Systems - Diesel Generator - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Flexible Connections (includes braided hoses)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(E) Air-outdoor	Loss of material/general, pitting, and crevice corrosion	External Surfaces Monitoring	VII.H1-08	3.3.1-60	A
			(I) Diesel exhaust	Loss of material/general (steel only), pitting and crevice corrosion	Work Control Process	VII.H2-02	3.3.1-18	E
			(I) Fuel oil	Loss of material/general, pitting, crevice, and microbiologically influenced corrosion, and fouling	Fuel Oil Chemistry	VII.H1-10	3.3.1-20	B
					Work Control Process	VII.H1-10	3.3.1-20	E
			(I) Lube oil	Loss of material/general, pitting, and crevice corrosion	Lubricating Oil Analysis	VII.H2-20	3.3.1-14	A, 1
					Work Control Process	VII.H2-20	3.3.1-14	E, 1
Float Chamber	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A, 1
			(I) Fuel oil	Loss of material/pitting, crevice, and microbiologically influenced corrosion	Fuel Oil Chemistry	VII.H1-06	3.3.1-32	B, 1
					Work Control Process	VII.H1-06	3.3.1-32	E, 1

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-19: Auxiliary Systems - Diesel Generator - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Heater	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(I) Treated water-closed cycle cooling	Loss of material/general, pitting, and crevice corrosion	Closed-Cycle Cooling Water System	VII.H2-23	3.3.1-47	B, 3
					Work Control Process	VII.H2-23	3.3.1-47	E, 3
				Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H, 3
					Work Control Process			H, 3
Lube Oil Coolers (Lube oil cooler channel head)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-11	3.3.1-58	A
			(I) Treated water-closed cycle cooling	Loss of material/general, pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	A-063	3.3.1-48	B, 3
					Work Control Process	A-063	3.3.1-48	E, 3
				Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H, 3
					Work Control Process			H, 3

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-19: Auxiliary Systems - Diesel Generator - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Lube Oil Coolers (Lube oil cooler shell)	PB	Copper Alloys	(E) Air-indoor uncontrolled	None	None	SP-006	3.4.1-41	C, 2
			(I) Lube oil	Loss of material/pitting and crevice corrosion	Lubricating Oil Analysis	VII.H2-10	3.3.1-26	C, 2
					Work Control Process	VII.H2-10	3.3.1-26	E, 2
		Steel	(E) Air-indoor uncontrolled	Loss of material/general, pitting, and crevice corrosion	External Surfaces Monitoring	VII.H2-03	3.3.1-59	A, 1
			(I) Lube oil	Loss of material/general, pitting, crevice, and microbiologically influenced corrosion, and fouling	Lubricating Oil Analysis	VII.H2-05	3.3.1-21	A, 1
					Work Control Process	VII.H2-05	3.3.1-21	E, 1
Lube Oil Coolers (Lube oil cooler tubes)	HT; PB	Copper Alloys	(E) Lube oil	Loss of material/pitting and crevice corrosion	Lubricating Oil Analysis	VII.H2-10	3.3.1-26	C
					Work Control Process	VII.H2-10	3.3.1-26	E
				Reduction of heat transfer/fouling	Lubricating Oil Analysis	EP-047	3.2.1-09	A
					Work Control Process	EP-047	3.2.1-09	E
			(I) Treated water-closed cycle cooling	Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H, 3
					Work Control Process			H, 3
				Loss of material/pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	AP-034	3.3.1-51	B, 3
					Work Control Process	AP-034	3.3.1-51	E, 3
				Loss of material/selective leaching	Selective Leaching of Materials	EP-037	3.2.1-41	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-19: Auxiliary Systems - Diesel Generator - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Lube Oil Coolers (Lube oil cooler tubesheet)	PB	Copper Alloys	(E) Lube oil	Loss of material/pitting and crevice corrosion	Lubricating Oil Analysis	VII.H2-10	3.3.1-26	C
					Work Control Process	VII.H2-10	3.3.1-26	E
			(I) Treated water-closed cycle cooling	Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H, 3
					Work Control Process			H, 3
				Loss of material/pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	AP-034	3.3.1-51	B, 3
					Work Control Process	AP-034	3.3.1-51	E, 3
				Loss of material/selective leaching	Selective Leaching of Materials	EP-037	3.2.1-41	A
Oil Sumps	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(I) Lube oil	Loss of material/general, pitting, and crevice corrosion	Lubricating Oil Analysis	VII.H2-20	3.3.1-14	A
					Work Control Process	VII.H2-20	3.3.1-14	E
Oilers	PB	Aluminum	(E) Air-indoor uncontrolled	None	None	EP-003	3.2.1-50	A, 2
			(I) Air-dried	None	None			H, 2
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A, 2
			(I) Lube oil	Loss of material/general, pitting, and crevice corrosion	Lubricating Oil Analysis	VII.H2-20	3.3.1-14	A, 2
					Work Control Process	VII.H2-20	3.3.1-14	E, 2

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-19: Auxiliary Systems - Diesel Generator - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Pipe	PB	Copper Alloys	(E) Air-indoor uncontrolled	None	None	SP-006	3.4.1-41	A
			(E) Air-outdoor	Loss of material/pitting and crevice corrosion	External Surfaces Monitoring			H
			(I) Air-dried	None	None	VII.J-03	3.3.1-98	A, 2
			(I) Air-moist	Loss of material/pitting and crevice corrosion	Compressed Air Monitoring	AP-078	3.3.1-28	E, 2
			(I) Fuel oil	Loss of material/pitting, crevice, and microbiologically influenced corrosion	Fuel Oil Chemistry	VII.H1-03	3.3.1-32	B
					Work Control Process	VII.H1-03	3.3.1-32	E
			(I) Lube oil	Loss of material/pitting and crevice corrosion	Lubricating Oil Analysis	VII.H2-10	3.3.1-26	A
					Work Control Process	VII.H2-10	3.3.1-26	E
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(E) Air-outdoor	Loss of material/general, pitting, and crevice corrosion	External Surfaces Monitoring	VII.H1-08	3.3.1-60	A
			(E) Concrete	None	None	VII.J-21	3.3.1-96	A
			(E) Soil	Loss of material/general, pitting, crevice, and microbiologically influenced corrosion	Buried Piping and Tanks Inspection	VII.H1-09	3.3.1-19	A
			(I) Air-dried	None	None	VII.J-22	3.3.1-98	A, 2
			(I) Air-moist	Loss of material/general, pitting, and crevice corrosion	Compressed Air Monitoring	VII.H2-21	3.3.1-71	E, 2

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-19: Auxiliary Systems - Diesel Generator - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Pipe	PB	Steel	(I) Diesel exhaust	Loss of material/general (steel only), pitting and crevice corrosion	Work Control Process	VII.H2-02	3.3.1-18	E
			(I) Fuel oil	Loss of material/general, pitting, crevice, and microbiologically influenced corrosion, and fouling	Fuel Oil Chemistry	VII.H1-10	3.3.1-20	B
					Work Control Process	VII.H1-10	3.3.1-20	E
			(I) Lube oil	Loss of material/general, pitting, and crevice corrosion	Lubricating Oil Analysis	VII.H2-20	3.3.1-14	A
					Work Control Process	VII.H2-20	3.3.1-14	E
			(I) Raw water	Loss of material/general, pitting, crevice, and microbiologically influenced corrosion, fouling, and lining-coating degradation	Work Control Process	VII.H2-22	3.3.1-76	E, 2, 4
			(I) Treated water-closed cycle cooling	Loss of material/general, pitting, and crevice corrosion	Closed-Cycle Cooling Water System	VII.H2-23	3.3.1-47	B, 3
					Work Control Process	VII.H2-23	3.3.1-47	E, 3
				Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H, 3
					Work Control Process			H, 3
Primary/Reserve Air Start Receivers	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-11	3.3.1-58	A, 2
			(I) Air-dried	None	None	VII.J-22	3.3.1-98	C, 2

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-19: Auxiliary Systems - Diesel Generator - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Pumps (Fuel oil)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(E) Air-outdoor	Loss of material/general, pitting, and crevice corrosion	External Surfaces Monitoring	VII.H1-08	3.3.1-60	A
			(I) Fuel oil	Loss of material/general, pitting, crevice, and microbiologically influenced corrosion, and fouling	Fuel Oil Chemistry	VII.H1-10	3.3.1-20	B
					Work Control Process	VII.H1-10	3.3.1-20	E, 3
Pumps (Jacket water cooling)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-11	3.3.1-58	A, 1
			(I) Treated water-closed cycle cooling	Loss of material/general, pitting, and crevice corrosion	Work Control Process	VII.H2-23	3.3.1-47	E, 1, 3
				Loss of material/microbiologically influenced corrosion	Work Control Process			H, 1, 3
Pumps (Lube oil)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(I) Lube oil	Loss of material/general, pitting, and crevice corrosion	Lubricating Oil Analysis	VII.H2-20	3.3.1-14	A
					Work Control Process	VII.H2-20	3.3.1-14	E
Radiator (Frame)	PB	Steel	(E) Air-outdoor	Loss of material/general, pitting, and crevice corrosion	External Surfaces Monitoring	VII.H2-04	3.3.1-59	A, 1

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-19: Auxiliary Systems - Diesel Generator - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Radiator (Tubes)	HT; PB	Copper Alloys	(E) Air-outdoor	Loss of material/pitting and crevice corrosion	Work Control Process			H, 1
			(I) Treated water-closed cycle cooling	Loss of material/microbiologically influenced corrosion	Work Control Process			H, 1, 3
				Loss of material/pitting, crevice, and galvanic corrosion	Work Control Process	VII.H2-08	3.3.1-51	E, 1, 3
				Loss of material/selective leaching	Selective Leaching of Materials	EP-037	3.2.1-41	A, 1
Regulators	PB	Aluminum	(E) Air-indoor uncontrolled	None	None	EP-003	3.2.1-50	A, 2
			(I) Air-dried	None	None			H, 2
		Copper Alloys	(E) Air-indoor uncontrolled	None	None	SP-006	3.4.1-41	A, 2
			(I) Air-dried	None	None	VII.J-03	3.3.1-98	A, 2

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-19: Auxiliary Systems - Diesel Generator - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Sight Glass	PB	Glass	(E) Air-outdoor	None	None			H, 1
			(I) Treated water-closed cycle cooling	None	None			H, 1
		Stainless Steel	(E) Air-outdoor	Loss of material/pitting and crevice corrosion	External Surfaces Monitoring			H, 1
			(I) Treated water-closed cycle cooling	Loss of material/microbiologically influenced corrosion	Work Control Process			H, 1, 3
				Loss of material/pitting and crevice corrosion	Work Control Process	A-052	3.3.1-50	E, 1, 3
Snow Screen	EN	Steel	(E) Air-outdoor	Loss of material/general, pitting, and crevice corrosion	External Surfaces Monitoring	VII.H1-08	3.3.1-60	A, 1
Standpipes	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(I) Fuel oil	Loss of material/general, pitting, crevice, and microbiologically influenced corrosion, and fouling	Fuel Oil Chemistry	VII.H1-10	3.3.1-20	B
					Work Control Process	VII.H1-10	3.3.1-20	E
Starting Air Precoolers and Aftercoolers (Frame)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-11	3.3.1-58	A, 2
			(I) Air-moist	Loss of material/general, pitting, and crevice corrosion	Work Control Process	VII.H2-21	3.3.1-71	E, 2

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-19: Auxiliary Systems - Diesel Generator - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Starting Air Precoolers and Aftercoolers (Tubes)	PB	Copper Alloys	(E) Air-indoor uncontrolled	None	None	SP-006	3.4.1-41	A, 2
			(I) Air-moist	Loss of material/pitting and crevice corrosion	Compressed Air Monitoring	AP-078	3.3.1-28	E, 2
Strainer Housings	PB	Aluminum	(E) Air-indoor uncontrolled	None	None	EP-003	3.2.1-50	A, 2
			(I) Lube oil	Loss of material/pitting and/or crevice corrosion	Lubricating Oil Analysis			H, 2
					Work Control Process			H, 2
		Copper Alloys	(E) Air-indoor uncontrolled	None	None	SP-006	3.4.1-41	A
			(I) Fuel oil	Loss of material/pitting, crevice, and microbiologically influenced corrosion	Fuel Oil Chemistry	VII.H1-03	3.3.1-32	B
					Work Control Process	VII.H1-03	3.3.1-32	E
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(I) Fuel oil	Loss of material/general, pitting, crevice, and microbiologically influenced corrosion, and fouling	Fuel Oil Chemistry	VII.H1-10	3.3.1-20	B
					Work Control Process	VII.H1-10	3.3.1-20	E
			(I) Lube oil	Loss of material/general, pitting, and crevice corrosion	Lubricating Oil Analysis	VII.H2-20	3.3.1-14	A
					Work Control Process	VII.H2-20	3.3.1-14	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-19: Auxiliary Systems - Diesel Generator - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Traps	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(I) Air-moist	Loss of material/general, pitting, and crevice corrosion	Compressed Air Monitoring	VII.H2-21	3.3.1-71	E
			(I) Raw water	Loss of material/general, pitting, crevice, and microbiologically influenced corrosion, fouling, and lining-coating degradation	Compressed Air Monitoring	VII.H2-22	3.3.1-76	E, 4
Tubing	PB	Copper Alloys	(E) Air-indoor uncontrolled	None	None	SP-006	3.4.1-41	A
			(I) Air-dried	None	None	VII.J-03	3.3.1-98	A, 2
			(I) Fuel oil	Loss of material/pitting, crevice, and microbiologically influenced corrosion	Fuel Oil Chemistry	VII.H1-03	3.3.1-32	B
					Work Control Process	VII.H1-03	3.3.1-32	E
			(I) Lube oil	Loss of material/pitting and crevice corrosion	Lubricating Oil Analysis	VII.H2-10	3.3.1-26	A
					Work Control Process	VII.H2-10	3.3.1-26	E
			(I) Treated water-closed cycle cooling	Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H, 3
					Work Control Process			H, 3
				Loss of material/pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	VII.H2-08	3.3.1-51	B, 3
					Work Control Process	VII.H2-08	3.3.1-51	E, 3

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-19: Auxiliary Systems - Diesel Generator - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Tubing	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(I) Air-dried	None	None	VII.J-18	3.3.1-98	A, 2
			(I) Air-moist	Loss of material/pitting and crevice corrosion	Compressed Air Monitoring	AP-081	3.3.1-54	B, 2
			(I) Fuel oil	Loss of material/pitting, crevice, and microbiologically influenced corrosion	Fuel Oil Chemistry	VII.H1-06	3.3.1-32	B
					Work Control Process	VII.H1-06	3.3.1-32	E
			(I) Lube oil	Loss of material/pitting, crevice, and microbiologically influenced corrosion	Lubricating Oil Analysis	VII.H2-17	3.3.1-33	A
					Work Control Process	VII.H2-17	3.3.1-33	E
			(I) Treated water-closed cycle cooling	Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H, 3
					Work Control Process			H, 3
				Loss of material/pitting and crevice corrosion	Closed-Cycle Cooling Water System	A-052	3.3.1-50	B, 3
					Work Control Process	A-052	3.3.1-50	E, 3

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-19: Auxiliary Systems - Diesel Generator - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Tubing	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(I) Air-dried	None	None	VII.J-22	3.3.1-98	A, 2
			(I) Fuel oil	Loss of material/general, pitting, crevice, and microbiologically influenced corrosion, and fouling	Fuel Oil Chemistry	VII.H1-10	3.3.1-20	B
					Work Control Process	VII.H1-10	3.3.1-20	E
			(I) Lube oil	Loss of material/general, pitting, and crevice corrosion	Lubricating Oil Analysis	VII.H2-20	3.3.1-14	A
					Work Control Process	VII.H2-20	3.3.1-14	E
			(I) Treated water-closed cycle cooling	Loss of material/general, pitting, and crevice corrosion	Closed-Cycle Cooling Water System	VII.H2-23	3.3.1-47	B, 3
					Work Control Process	VII.H2-23	3.3.1-47	E, 3
				Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H, 3
					Work Control Process			H, 3
Turbocharger Aftercoolers (Channel head)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general, pitting, and crevice corrosion	External Surfaces Monitoring	VII.H2-03	3.3.1-59	A, 2
			(I) Treated water-closed cycle cooling	Loss of material/general, pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	A-063	3.3.1-48	B, 2
					Work Control Process	A-063	3.3.1-48	E, 2
				Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H, 2
					Work Control Process			H, 2

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-19: Auxiliary Systems - Diesel Generator - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Turbocharger Aftercoolers (Cooling fins)	HT; PB	Aluminum	(E) Air-moist	Loss of material/pitting and crevice corrosion	Work Control Process	AP-074	3.3.1-27	E, 2
				Reduction of heat transfer/fouling	Work Control Process			H, 2
Turbocharger Aftercoolers (Shell)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general, pitting, and crevice corrosion	External Surfaces Monitoring	VII.H2-03	3.3.1-59	A, 2
			(I) Air-moist	Loss of material/general, pitting, and crevice corrosion	Work Control Process	VII.H2-21	3.3.1-71	E, 2
Turbocharger Aftercoolers (Tubes)	HT; PB	Steel	(E) Air-moist	Loss of material/general, pitting, and crevice corrosion	Work Control Process	VII.H2-21	3.3.1-71	E, 2
			(I) Treated water-closed cycle cooling	Loss of material/general, pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	A-063	3.3.1-48	B, 2
					Work Control Process	A-063	3.3.1-48	E, 2
				Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H, 2
					Work Control Process			H, 2
				Reduction of heat transfer/fouling	Closed-Cycle Cooling Water System	AP-077	3.3.1-52	B, 2
					Work Control Process	AP-077	3.3.1-52	E, 2

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-19: Auxiliary Systems - Diesel Generator - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Turbocharger Aftercoolers (Tubesheet)	PB	Steel	(E) Air-moist	Loss of material/general, pitting, and crevice corrosion	Work Control Process	VII.H2-21	3.3.1-71	E, 2
			(I) Treated water-closed cycle cooling	Loss of material/general, pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	A-063	3.3.1-48	B, 2
					Work Control Process	A-063	3.3.1-48	E, 2
				Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H, 2
					Work Control Process			H, 2
Turbocharger Casings	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(I) Air-moist	Loss of material/general, pitting, and crevice corrosion	Work Control Process	VII.H2-21	3.3.1-71	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-19: Auxiliary Systems - Diesel Generator - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Valves	PB	Copper Alloys	(E) Air-indoor uncontrolled	None	None	SP-006	3.4.1-41	A
			(I) Air-dried	None	None	VII.J-03	3.3.1-98	A, 2
			(I) Air-moist	Loss of material/pitting and crevice corrosion	Compressed Air Monitoring	AP-078	3.3.1-28	E, 2
			(I) Fuel oil	Loss of material/pitting, crevice, and microbiologically influenced corrosion	Fuel Oil Chemistry	VII.H1-03	3.3.1-32	B
					Work Control Process	VII.H1-03	3.3.1-32	E
			(I) Lube oil	Loss of material/pitting and crevice corrosion	Lubricating Oil Analysis	VII.H2-10	3.3.1-26	A
					Work Control Process	VII.H2-10	3.3.1-26	E
			(I) Treated water-closed cycle cooling	Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H, 3
					Work Control Process			H, 3
				Loss of material/pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	VII.H2-08	3.3.1-51	B, 3
					Work Control Process	VII.H2-08	3.3.1-51	E, 3
				Loss of material/selective leaching	Selective Leaching of Materials	VII.H2-12	3.3.1-84	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-19: Auxiliary Systems - Diesel Generator - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Valves	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(I) Air-dried	None	None	VII.J-18	3.3.1-98	A, 2
			(I) Air-moist	Loss of material/pitting and crevice corrosion	Compressed Air Monitoring	AP-081	3.3.1-54	B, 2
			(I) Fuel oil	Loss of material/pitting, crevice, and microbiologically influenced corrosion	Fuel Oil Chemistry	VII.H1-06	3.3.1-32	B
					Work Control Process	VII.H1-06	3.3.1-32	E
			(I) Lube oil	Loss of material/pitting, crevice, and microbiologically influenced corrosion	Lubricating Oil Analysis	VII.H2-17	3.3.1-33	A
					Work Control Process	VII.H2-17	3.3.1-33	E
			(I) Treated water-closed cycle cooling	Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H, 3
					Work Control Process			H, 3
				Loss of material/pitting and crevice corrosion	Closed-Cycle Cooling Water System	A-052	3.3.1-50	B, 3
					Work Control Process	A-052	3.3.1-50	E, 3

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-19: Auxiliary Systems - Diesel Generator - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Valves	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(E) Air-outdoor	Loss of material/general, pitting, and crevice corrosion	External Surfaces Monitoring	VII.H1-08	3.3.1-60	A
			(I) Air-dried	None	None	VII.J-22	3.3.1-98	A, 2
			(I) Air-moist	Loss of material/general, pitting, and crevice corrosion	Compressed Air Monitoring	VII.H2-21	3.3.1-71	E, 2
			(I) Fuel oil	Loss of material/general, pitting, crevice, and microbiologically influenced corrosion, and fouling	Fuel Oil Chemistry	VII.H1-10	3.3.1-20	B
					Work Control Process	VII.H1-10	3.3.1-20	E
			(I) Lube oil	Loss of material/general, pitting, and crevice corrosion	Lubricating Oil Analysis	VII.H2-20	3.3.1-14	A
					Work Control Process	VII.H2-20	3.3.1-14	E
			(I) Treated water-closed cycle cooling	Loss of material/general, pitting, and crevice corrosion	Closed-Cycle Cooling Water System	VII.H2-23	3.3.1-47	B, 3
					Work Control Process	VII.H2-23	3.3.1-47	E, 3
				Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H, 3
					Work Control Process			H, 3

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-19 Notes:

Plant Standard Notes

Note - The following plant standard notes have generic applicability, but may or may not be used for each SSC:

S1. Thermal embrittlement is only applicable to CASS components that are subject to temperatures in excess of 482°F.

S2. Cracking due to SCC is only applicable to stainless steel components exposed to temperatures greater than 140°F.

S3. Selective leaching is applicable to the material group 'Steel,' but only for gray cast iron components.

System Specific Notes

1. Applicable to TSC diesel generator only.

2. Applicable to the emergency diesel generators only.

3. Aging effects for the internal surfaces of the TSC diesel generator cooling water components are managed by the Work Control Process. Aging effects for the internal surfaces of the emergency diesel generator cooling water components are managed by the Closed Cycle Cooling Water System aging management program, which is confirmed by the Work Control Process.

4. There are no lined or coated piping, piping components, or piping elements in this system. Therefore, lining-coating degradation is not an applicable aging mechanism.

Industry Standard Notes

See last page of Section 3.3 tables.

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-20: Auxiliary Systems - Circulating Water - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Bolting	PB	Steel	(E) Air-indoor uncontrolled	Cracking/cyclic loading, stress corrosion cracking	Bolting Integrity	VII.I-03	3.3.1-41	A
				Loss of material/general, pitting, and crevice corrosion	Bolting Integrity	VII.I-04	3.3.1-43	A
				Loss of preload/thermal effects, gasket creep, and self-loosening	Bolting Integrity	VII.I-05	3.3.1-45	A
Chlorine Monitoring Water Pump	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(I) Raw water	Loss of material/erosion	Work Control Process			H
				Loss of material/general, pitting, crevice, and microbiologically influenced corrosion, fouling, and lining-coating degradation	Work Control Process	VII.C3-10	3.3.1-76	E, 3
				Loss of material/selective leaching	Selective Leaching of Materials	VII.C3-04	3.3.1-85	A, S3
Circulating Water Pumps	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(E) Concrete	None	None	VII.J-21	3.3.1-96	A
			(I) Raw water	Loss of material/erosion	Work Control Process			H
				Loss of material/general, pitting, crevice, and microbiologically influenced corrosion, fouling, and lining-coating degradation	Work Control Process	VII.C3-10	3.3.1-76	E, 3
				Loss of material/selective leaching	Selective Leaching of Materials	VII.C3-04	3.3.1-85	A, S3

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-20: Auxiliary Systems - Circulating Water - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Condensers (Shell)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	S-019	3.4.1-03	A
					Work Control Process	S-019	3.4.1-03	E
Condensers (Waterboxes)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(I) Raw water	Loss of material/erosion	Work Control Process			H
				Loss of material/general, pitting, crevice, and microbiologically influenced corrosion, fouling, and lining-coating degradation	Work Control Process	VII.C3-10	3.3.1-76	E, 3
Flow Elements	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(I) Raw water	Loss of material/microbiologically influenced corrosion	Work Control Process			H
				Loss of material/pitting and crevice corrosion	Work Control Process	VII.C3-07	3.3.1-78	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-20: Auxiliary Systems - Circulating Water - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Flow Indicators	PB	Copper Alloys	(E) Air-indoor uncontrolled	Loss of material/pitting and crevice corrosion	External Surfaces Monitoring	A-046	3.3.1-25	E
			(I) Raw water	Loss of material/pitting, crevice, and microbiologically influenced corrosion, and fouling	Work Control Process	A-044	3.3.1-81	E
				Loss of material/selective leaching	Selective Leaching of Materials	VII.C3-03	3.3.1-84	A
		Glass	(E) Air-indoor uncontrolled	None	None	VII.J-08	3.3.1-93	A
			(I) Raw water	None	None	VII.J-11	3.3.1-93	A
		Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(I) Raw water	Loss of material/microbiologically influenced corrosion	Work Control Process			H
				Loss of material/pitting and crevice corrosion	Work Control Process	VII.C3-07	3.3.1-78	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-20: Auxiliary Systems - Circulating Water - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Pipe	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Air-outdoor	Loss of material/pitting and crevice corrosion	External Surfaces Monitoring			H
			(E) Soil	Loss of material/microbiologically influenced corrosion	Buried Piping and Tanks Inspection			H, 1
				Loss of material/pitting and crevice corrosion	Buried Piping and Tanks Inspection	VII.C3-08	3.3.1-29	E, 1
			(I) Raw water	Loss of material/microbiologically influenced corrosion	Work Control Process			H
				Loss of material/pitting and crevice corrosion	Work Control Process	VII.C3-07	3.3.1-78	E
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(E) Concrete	None	None	VII.J-21	3.3.1-96	A
			(E) Soil	Loss of material/general, pitting, crevice, and microbiologically influenced corrosion	Buried Piping and Tanks Inspection	VII.C3-09	3.3.1-19	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-20: Auxiliary Systems - Circulating Water - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Pipe	PB	Steel	(I) Raw water	Loss of material/erosion	Open-Cycle Cooling Water System			H, 2
					Work Control Process			H, 2
				Loss of material/general, pitting, crevice, and microbiologically influenced corrosion, fouling, and lining-coating degradation	Open-Cycle Cooling Water System	VII.C3-10	3.3.1-76	B, 2, 3
					Work Control Process	VII.C3-10	3.3.1-76	E, 2, 3
Recirculating Water Pump	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(I) Raw water	Loss of material/erosion	Work Control Process			H
				Loss of material/general, pitting, crevice, and microbiologically influenced corrosion, fouling, and lining-coating degradation	Work Control Process	VII.C3-10	3.3.1-76	E, 3
				Loss of material/selective leaching	Selective Leaching of Materials	VII.C3-04	3.3.1-85	A, S3
Recirculation Line Distribution Pipe	FD; PB	Steel	(E) Raw water	Loss of material/general, pitting, crevice, and microbiologically influenced corrosion, fouling, and lining-coating degradation	Open-Cycle Cooling Water System	VII.C3-10	3.3.1-76	B, 3
			(I) Raw water	Loss of material/general, pitting, crevice, and microbiologically influenced corrosion, fouling, and lining-coating degradation	Open-Cycle Cooling Water System	VII.C3-10	3.3.1-76	B, 3

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-20: Auxiliary Systems - Circulating Water - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Tubing	PB	Copper Alloys	(E) Air-indoor uncontrolled	Loss of material/pitting and crevice corrosion	External Surfaces Monitoring	A-046	3.3.1-25	E
			(I) Raw water	Loss of material/pitting, crevice, and microbiologically influenced corrosion, and fouling	Work Control Process	A-044	3.3.1-81	E
		Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(I) Raw water	Loss of material/microbiologically influenced corrosion	Work Control Process			H
				Loss of material/pitting and crevice corrosion	Work Control Process	VII.C3-07	3.3.1-78	E
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(I) Raw water	Loss of material/general, pitting, crevice, and microbiologically influenced corrosion, fouling, and lining-coating degradation	Work Control Process	VII.C3-10	3.3.1-76	E, 3
Valves	PB	Copper Alloys	(E) Air-indoor uncontrolled	Loss of material/pitting and crevice corrosion	External Surfaces Monitoring	A-046	3.3.1-25	E
			(I) Raw water	Loss of material/erosion	Work Control Process			H
				Loss of material/pitting, crevice, and microbiologically influenced corrosion, and fouling	Work Control Process	A-044	3.3.1-81	E
				Loss of material/selective leaching	Selective Leaching of Materials	VII.C3-03	3.3.1-84	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-20: Auxiliary Systems - Circulating Water - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Valves	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Soil	Loss of material/microbiologically influenced corrosion	Buried Piping and Tanks Inspection			H, 1
				Loss of material/pitting and crevice corrosion	Buried Piping and Tanks Inspection	VII.C3-08	3.3.1-29	E, 1
			(I) Raw water	Loss of material/microbiologically influenced corrosion	Open-Cycle Cooling Water System			B, 2
					Work Control Process			E, 2
				Loss of material/pitting and crevice corrosion	Open-Cycle Cooling Water System	VII.C3-07	3.3.1-78	B, 2
					Work Control Process	VII.C3-07	3.3.1-78	E, 2
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(I) Raw water	Loss of material/erosion	Work Control Process			H
				Loss of material/general, pitting, crevice, and microbiologically influenced corrosion, fouling, and lining-coating degradation	Work Control Process	VII.C3-10	3.3.1-76	E, 3
				Loss of material/selective leaching	Selective Leaching of Materials	VII.C3-04	3.3.1-85	A, S3

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-20 Notes:

Plant Standard Notes

Note - The following plant standard notes have generic applicability, but may or may not be used for each SSC:

S1. Thermal embrittlement is only applicable to CASS components that are subject to temperatures in excess of 482°F.

S2. Cracking due to SCC is only applicable to stainless steel components exposed to temperatures greater than 140°F.

S3. Selective leaching is applicable to the material group 'Steel,' but only for gray cast iron components.

System Specific Notes

1. A two-inch stainless steel vent line and associated stainless steel isolation valve have been installed in the high point of the 30-inch recirculation line that connects the Discharge Structure to the Forebay. The pipe and valve are buried.

2. Components that are not safety-related are inspected by the Work Control Process. Components that are safety-related are inspected by the Open-Cycle Cooling Water System Program.

3. There are no lined or coated piping, piping components, or piping elements in this system. Therefore, lining-coating degradation is not an applicable aging mechanism.

Industry Standard Notes

See last page of Section 3.3 tables.

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-21: Auxiliary Systems - Gaseous Waste Processing and Discharge - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Bolting	PB	Steel	(E) Air-indoor uncontrolled	Cracking/cyclic loading, stress corrosion cracking	Bolting Integrity	VII.I-03	3.3.1-41	A
				Loss of material/general, pitting, and crevice corrosion	Bolting Integrity	VII.I-04	3.3.1-43	A
				Loss of preload/thermal effects, gasket creep, and self-loosening	Bolting Integrity	VII.I-05	3.3.1-45	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-02	3.3.1-89	A
Filter Housings	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Air-moist	Loss of material/pitting and crevice corrosion	Work Control Process	AP-081	3.3.1-54	E
Gas Decay Tanks	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	A-080	3.3.1-57	C
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(I) Air-moist	Loss of material/general, pitting, and crevice corrosion	Work Control Process	A-023	3.3.1-71	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-21: Auxiliary Systems - Gaseous Waste Processing and Discharge - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Heat Exchangers (Channel Head)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(I) Treated water-closed cycle cooling	Loss of material/general, pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	A-063	3.3.1-48	B
					Work Control Process	A-063	3.3.1-48	E
				Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H
					Work Control Process			H
Heat Exchangers (Shell)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(I) Raw water	Loss of material/erosion	Work Control Process			H
				Loss of material/general, pitting, crevice, and microbiologically influenced corrosion, and fouling	Work Control Process	A-033	3.3.1-68	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-21: Auxiliary Systems - Gaseous Waste Processing and Discharge - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Heat Exchangers (Tubes)	HT; PB	Copper Alloys	(E) Raw water	Loss of material/erosion	Work Control Process			H
				Loss of material/pitting, crevice, and microbiologically influenced corrosion, and fouling	Work Control Process	A-044	3.3.1-81	E
			(I) Treated water-closed cycle cooling	Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H
					Work Control Process			H
				Loss of material/pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	AP-034	3.3.1-51	B
					Work Control Process	AP-034	3.3.1-51	E
				Reduction of heat transfer/fouling	Closed-Cycle Cooling Water System	AP-080	3.3.1-52	B
					Work Control Process	AP-080	3.3.1-52	E
Heat Exchangers (Tubesheet)	PB	Steel	(E) Raw water	Loss of material/erosion	Work Control Process			H
				Loss of material/general, pitting, crevice, and microbiologically influenced corrosion, and fouling	Work Control Process	A-033	3.3.1-68	E
			(I) Treated water-closed cycle cooling	Loss of material/general, pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	A-063	3.3.1-48	B
					Work Control Process	A-063	3.3.1-48	E
				Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H
					Work Control Process			H

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-21: Auxiliary Systems - Gaseous Waste Processing and Discharge - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Moisture Separators	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(I) Air-moist	Loss of material/general, pitting, and crevice corrosion	Work Control Process	A-023	3.3.1-71	E
			(I) Raw water	Loss of material/erosion	Work Control Process			H
				Loss of material/general, pitting, crevice, and microbiologically influenced corrosion, and fouling	Work Control Process	A-033	3.3.1-68	E
Orifices	PB; RF	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Air-moist	Loss of material/pitting and crevice corrosion	Work Control Process	AP-081	3.3.1-54	E
			(I) Raw water	Loss of material/erosion	Work Control Process			H
				Loss of material/pitting, crevice, and microbiologically influenced corrosion	Work Control Process	AP-055	3.3.1-80	E
			(I) Treated water-primary	Loss of material/pitting and crevice corrosion	Primary Water Chemistry	AP-079	3.3.1-91	A
					Work Control Process	AP-079	3.3.1-91	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-21: Auxiliary Systems - Gaseous Waste Processing and Discharge - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Pipe	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Air-moist	Loss of material/pitting and crevice corrosion	Work Control Process	AP-081	3.3.1-54	E
			(I) Raw water	Loss of material/erosion	Work Control Process			H
				Loss of material/pitting, crevice, and microbiologically influenced corrosion	Work Control Process	AP-055	3.3.1-80	E
			(I) Treated water-primary	Loss of material/pitting and crevice corrosion	Primary Water Chemistry	AP-079	3.3.1-91	A
					Work Control Process	AP-079	3.3.1-91	E
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(I) Air-moist	Loss of material/general, pitting, and crevice corrosion	Work Control Process	A-023	3.3.1-71	E
Sight Glass	PB	Glass	(E) Air-indoor uncontrolled	None	None	VII.J-08	3.3.1-93	A
			(I) Air-moist	None	None			H
			(I) Raw water	None	None	VII.J-11	3.3.1-93	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-21: Auxiliary Systems - Gaseous Waste Processing and Discharge - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Strainer Housings	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Raw water	Loss of material/erosion	Work Control Process			H
				Loss of material/pitting, crevice, and microbiologically influenced corrosion	Work Control Process	AP-055	3.3.1-80	E
Tubing	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Air-moist	Loss of material/pitting and crevice corrosion	Work Control Process	AP-081	3.3.1-54	E
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(I) Air-moist	Loss of material/general, pitting, and crevice corrosion	Work Control Process	A-023	3.3.1-71	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-21: Auxiliary Systems - Gaseous Waste Processing and Discharge - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Valves	PB	Copper Alloys	(E) Air-indoor uncontrolled	None	None	SP-006	3.4.1-41	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-12	3.3.1-88	A
			(I) Raw water	Loss of material/erosion	Work Control Process			H
				Loss of material/pitting, crevice, and microbiologically influenced corrosion, and fouling	Work Control Process	A-044	3.3.1-81	E
		Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Air-moist	Loss of material/pitting and crevice corrosion	Work Control Process	AP-081	3.3.1-54	E
			(I) Raw water	Loss of material/erosion	Work Control Process			H
				Loss of material/pitting, crevice, and microbiologically influenced corrosion	Work Control Process	AP-055	3.3.1-80	E
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(I) Air-moist	Loss of material/general, pitting, and crevice corrosion	Work Control Process	A-023	3.3.1-71	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-21: Auxiliary Systems - Gaseous Waste Processing and Discharge - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Waste Gas Compressors	PB	Copper Alloys	(E) Air-indoor uncontrolled	None	None	SP-006	3.4.1-41	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-12	3.3.1-88	A
			(I) Air-moist	Loss of material/pitting and crevice corrosion	Work Control Process	AP-078	3.3.1-28	E
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(I) Air-moist	Loss of material/general, pitting, and crevice corrosion	Work Control Process	A-023	3.3.1-71	E
			(I) Raw water	Loss of material/general, pitting, crevice, and microbiologically influenced corrosion, and fouling	Work Control Process	A-033	3.3.1-68	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-21 Notes:

Plant Standard Notes

Note - The following plant standard notes have generic applicability, but may or may not be used for each SSC:

S1. Thermal embrittlement is only applicable to CASS components that are subject to temperatures in excess of 482°F.

S2. Cracking due to SCC is only applicable to stainless steel components exposed to temperatures greater than 140°F.

S3. Selective leaching is applicable to the material group 'Steel,' but only for gray cast iron components.

Industry Standard Notes

See last page of Section 3.3 tables.

Table 3.3.2-22: Auxiliary Systems - Liquid Waste Processing and Discharge - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Bolting	PB	Steel	(E) Air-indoor uncontrolled	Cracking/cyclic loading, stress corrosion cracking	Bolting Integrity	VII.I-03	3.3.1-41	A
				Loss of material/general, pitting, and crevice corrosion	Bolting Integrity	VII.I-04	3.3.1-43	A
				Loss of preload/thermal effects, gasket creep, and self-loosening	Bolting Integrity	VII.I-05	3.3.1-45	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-02	3.3.1-89	A
Deaerated Drains Tank	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	C
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	C
			(I) Raw water	Loss of material/erosion	Work Control Process			H
				Loss of material/pitting, crevice, and microbiologically influenced corrosion	Work Control Process	AP-055	3.3.1-80	E
Deaerated Drains Tank Pump	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Raw water	Loss of material/erosion	Work Control Process			H
				Loss of material/pitting, crevice, and microbiologically influenced corrosion	Work Control Process	AP-055	3.3.1-80	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-22: Auxiliary Systems - Liquid Waste Processing and Discharge - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Distillate Cooler (Shell Only)	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	C, 1
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	C, 1
			(I) Air-moist	Loss of material/pitting and crevice corrosion	Work Control Process	AP-081	3.3.1-54	E, 1
Evaporator Condenser (Shell Only)	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	C, 1
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	C, 1
			(I) Air-moist	Loss of material/pitting and crevice corrosion	Work Control Process	AP-081	3.3.1-54	E, 1
Filter Housings	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Raw water	Loss of material/erosion	Work Control Process			H
				Loss of material/pitting, crevice, and microbiologically influenced corrosion	Work Control Process	AP-055	3.3.1-80	E
			(I) Treated water-primary	Loss of material/pitting and crevice corrosion	Primary Water Chemistry	AP-079	3.3.1-91	A
					Work Control Process	AP-079	3.3.1-91	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-22: Auxiliary Systems - Liquid Waste Processing and Discharge - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Flexible Hoses	PB	Elastomers	(E) Air-indoor uncontrolled	Hardening and loss of strength/elastomer degradation	External Surfaces Monitoring	A-017	3.3.1-11	E
			(I) Raw water	Hardening and loss of strength/elastomer degradation	Work Control Process	AP-075	3.3.1-75	E
				Loss of material/erosion	Work Control Process	AP-076	3.3.1-75	E
Flow Elements	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Raw water	Loss of material/erosion	Work Control Process			H
				Loss of material/pitting, crevice, and microbiologically influenced corrosion	Work Control Process	AP-055	3.3.1-80	E
Flow Orifices	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Raw water	Loss of material/erosion	Work Control Process			H
				Loss of material/pitting, crevice, and microbiologically influenced corrosion	Work Control Process	AP-055	3.3.1-80	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-22: Auxiliary Systems - Liquid Waste Processing and Discharge - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Flow Transmitters	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Raw water	Loss of material/erosion	Work Control Process			H
				Loss of material/pitting, crevice, and microbiologically influenced corrosion	Work Control Process	AP-055	3.3.1-80	E
Gage Glasses	PB	Glass	(E) Air-indoor uncontrolled	None	None	VII.J-08	3.3.1-93	A
			(I) Air-moist	None	None			H
			(I) Raw water	None	None	VII.J-11	3.3.1-93	A
Laundry and Hot Shower Tanks	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	C
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	C
			(I) Raw water	Loss of material/erosion	Work Control Process			H
				Loss of material/pitting, crevice, and microbiologically influenced corrosion	Work Control Process	AP-055	3.3.1-80	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-22: Auxiliary Systems - Liquid Waste Processing and Discharge - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Laundry Pump	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Raw water	Loss of material/erosion	Work Control Process			H
				Loss of material/pitting, crevice, and microbiologically influenced corrosion	Work Control Process	AP-055	3.3.1-80	E
Level Switches	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Air-moist	Loss of material/pitting and crevice corrosion	Work Control Process	AP-081	3.3.1-54	E
			(I) Raw water	Loss of material/pitting, crevice, and microbiologically influenced corrosion	Work Control Process	AP-055	3.3.1-80	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-22: Auxiliary Systems - Liquid Waste Processing and Discharge - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Pipe	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Air-moist	Loss of material/pitting and crevice corrosion	Work Control Process	AP-081	3.3.1-54	E
			(I) Raw water	Loss of material/erosion	Work Control Process			H
				Loss of material/pitting, crevice, and microbiologically influenced corrosion	Work Control Process	AP-055	3.3.1-80	E
			(I) Treated water-primary	Loss of material/pitting and crevice corrosion	Primary Water Chemistry	AP-079	3.3.1-91	A
					Work Control Process	AP-079	3.3.1-91	E
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(E) Concrete	None	None	VII.J-21	3.3.1-96	A
			(I) Air-moist	Loss of material/general, pitting, and crevice corrosion	Work Control Process	A-023	3.3.1-71	E
			(I) Raw water	Loss of material/erosion	Work Control Process			H
				Loss of material/general, pitting, crevice, and microbiologically influenced corrosion, and fouling	Work Control Process	A-033	3.3.1-68	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-22: Auxiliary Systems - Liquid Waste Processing and Discharge - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Reactor Cavity Filtration Pump	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Treated water-primary	Loss of material/pitting and crevice corrosion	Primary Water Chemistry	AP-079	3.3.1-91	A
					Work Control Process	AP-079	3.3.1-91	E
Reactor Coolant Drain Pumps	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Treated water-primary	Loss of material/pitting and crevice corrosion	Primary Water Chemistry	AP-079	3.3.1-91	A
					Work Control Process	AP-079	3.3.1-91	E
Reactor Coolant Drain Tank	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	C
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	C
			(I) Treated water-primary	Loss of material/pitting and crevice corrosion	Primary Water Chemistry	EP-041	3.2.1-49	A
					Work Control Process	EP-041	3.2.1-49	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-22: Auxiliary Systems - Liquid Waste Processing and Discharge - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Sludge Interceptor Pump	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Raw water	Loss of material/erosion	Work Control Process			H
				Loss of material/pitting, crevice, and microbiologically influenced corrosion	Work Control Process	AP-055	3.3.1-80	E
Sludge Interceptor Tank	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	C
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	C
			(I) Raw water	Loss of material/pitting, crevice, and microbiologically influenced corrosion	Work Control Process	AP-055	3.3.1-80	E
Standpipes	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(I) Air-moist	Loss of material/general, pitting, and crevice corrosion	Work Control Process	A-023	3.3.1-71	E
			(I) Raw water	Loss of material/erosion	Work Control Process			H
				Loss of material/general, pitting, crevice, and microbiologically influenced corrosion, and fouling	Work Control Process	A-033	3.3.1-68	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-22: Auxiliary Systems - Liquid Waste Processing and Discharge - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Strainer Housings	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Raw water	Loss of material/erosion	Work Control Process			H
				Loss of material/pitting, crevice, and microbiologically influenced corrosion	Work Control Process	AP-055	3.3.1-80	E
Sump Tank Pumps	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Raw water	Loss of material/erosion	Work Control Process			H
				Loss of material/pitting, crevice, and microbiologically influenced corrosion	Work Control Process	AP-055	3.3.1-80	E
Sump Tanks	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	C
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	C
			(I) Raw water	Loss of material/erosion	Work Control Process			H
				Loss of material/pitting, crevice, and microbiologically influenced corrosion	Work Control Process	AP-055	3.3.1-80	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-22: Auxiliary Systems - Liquid Waste Processing and Discharge - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Tubing	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Air-moist	Loss of material/pitting and crevice corrosion	Work Control Process	AP-081	3.3.1-54	E
			(I) Raw water	Loss of material/erosion	Work Control Process			H
				Loss of material/pitting, crevice, and microbiologically influenced corrosion	Work Control Process	AP-055	3.3.1-80	E
			(I) Treated water-primary	Loss of material/pitting and crevice corrosion	Primary Water Chemistry	AP-079	3.3.1-91	A
					Work Control Process	AP-079	3.3.1-91	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-22: Auxiliary Systems - Liquid Waste Processing and Discharge - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Valves	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Raw water	Loss of material/erosion	Work Control Process			H
				Loss of material/pitting, crevice, and microbiologically influenced corrosion	Work Control Process	AP-055	3.3.1-80	E
			(I) Treated water-primary	Loss of material/pitting and crevice corrosion	Primary Water Chemistry	AP-079	3.3.1-91	A
					Work Control Process	AP-079	3.3.1-91	E
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(I) Air-moist	Loss of material/general, pitting, and crevice corrosion	Work Control Process	A-023	3.3.1-71	E
			(I) Raw water	Loss of material/erosion	Work Control Process			H
				Loss of material/general, pitting, crevice, and microbiologically influenced corrosion, and fouling	Work Control Process	A-033	3.3.1-68	E
				Loss of material/selective leaching	Selective Leaching of Materials	A-051	3.3.1-85	A, S3

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-22: Auxiliary Systems - Liquid Waste Processing and Discharge - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Waste Condensate Pumps	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Raw water	Loss of material/erosion	Work Control Process			H
				Loss of material/pitting, crevice, and microbiologically influenced corrosion	Work Control Process	AP-055	3.3.1-80	E
Waste Condensate Tanks	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	C
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	C
			(I) Raw water	Loss of material/erosion	Work Control Process			H
				Loss of material/pitting, crevice, and microbiologically influenced corrosion	Work Control Process	AP-055	3.3.1-80	E
Waste Evaporator Concentrates Sample Cooler (Shell Only)	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	C, 1
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	C, 1
			(I) Air-moist	Loss of material/pitting and crevice corrosion	Work Control Process	AP-081	3.3.1-54	E, 1

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-22: Auxiliary Systems - Liquid Waste Processing and Discharge - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Waste Evaporator Feed Pump	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Raw water	Loss of material/erosion	Work Control Process			H
				Loss of material/pitting, crevice, and microbiologically influenced corrosion	Work Control Process	AP-055	3.3.1-80	E
Waste Holdup Tank	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	C
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	C
			(I) Raw water	Loss of material/erosion	Work Control Process			H
				Loss of material/pitting, crevice, and microbiologically influenced corrosion	Work Control Process	AP-055	3.3.1-80	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-22 Notes:

Plant Standard Notes

Note - The following plant standard notes have generic applicability, but may or may not be used for each SSC:

S1. Thermal embrittlement is only applicable to CASS components that are subject to temperatures in excess of 482°F.

S2. Cracking due to SCC is only applicable to stainless steel components exposed to temperatures greater than 140°F.

S3. Selective leaching is applicable to the material group 'Steel,' but only for gray cast iron components.

System Specific Notes

1. The component shell is in-scope only as a seismic anchor. The component is abandoned and drained.

Industry Standard Notes

See last page of Section 3.3 tables.

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-23: Auxiliary Systems - Radiation Monitoring - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Bolting	PB	Steel	(E) Air-indoor uncontrolled	Cracking/cyclic loading, stress corrosion cracking	Bolting Integrity	VII.I-03	3.3.1-41	A
				Loss of material/general, pitting, and crevice corrosion	Bolting Integrity	VII.I-04	3.3.1-43	A
				Loss of preload/thermal effects, gasket creep, and self-loosening	Bolting Integrity	VII.I-05	3.3.1-45	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-02	3.3.1-89	A
Radiation Detectors	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Air-moist	Loss of material/pitting and crevice corrosion	Work Control Process	AP-081	3.3.1-54	E
			(I) Raw water	Loss of material/erosion	Work Control Process			H
				Loss of material/pitting, crevice, and microbiologically influenced corrosion	Work Control Process	AP-055	3.3.1-80	E
			(I) Treated water and/or steam-secondary	Cracking/stress corrosion cracking	Secondary Water Chemistry	SP-017	3.4.1-14	A, S2
					Work Control Process	SP-017	3.4.1-14	E, S2
				Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	SP-016	3.4.1-16	A
					Work Control Process	SP-016	3.4.1-16	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-23: Auxiliary Systems - Radiation Monitoring - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Tubing	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Air-moist	Loss of material/pitting and crevice corrosion	Work Control Process	AP-081	3.3.1-54	E
Valves	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Air-moist	Loss of material/pitting and crevice corrosion	Work Control Process	AP-081	3.3.1-54	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-23 Notes:

Plant Standard Notes

Note - The following plant standard notes have generic applicability, but may or may not be used for each SSC:

S1. Thermal embrittlement is only applicable to CASS components that are subject to temperatures in excess of 482°F.

S2. Cracking due to SCC is only applicable to stainless steel components exposed to temperatures greater than 140°F.

S3. Selective leaching is applicable to the material group 'Steel,' but only for gray cast iron components.

Industry Standard Notes

See last page of Section 3.3 tables.

Table 3.3.2-24: Auxiliary Systems - Makeup and Demineralized Water - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Bolting	PB	Steel	(E) Air-indoor uncontrolled	Cracking/cyclic loading, stress corrosion cracking	Bolting Integrity	VII.I-03	3.3.1-41	A
				Loss of material/general, pitting, and crevice corrosion	Bolting Integrity	VII.I-04	3.3.1-43	A
				Loss of preload/thermal effects, gasket creep, and self-loosening	Bolting Integrity	VII.I-05	3.3.1-45	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-02	3.3.1-89	A
Filter Housing	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(I) Treated water-primary	Loss of material/pitting and crevice corrosion	Primary Water Chemistry	AP-079	3.3.1-91	A
					Work Control Process	AP-079	3.3.1-91	E
Flow Elements	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Treated water-primary	Loss of material/pitting and crevice corrosion	Primary Water Chemistry	AP-079	3.3.1-91	A
					Work Control Process	AP-079	3.3.1-91	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-24: Auxiliary Systems - Makeup and Demineralized Water - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Flow Indicators	PB	Glass	(E) Air-indoor uncontrolled	None	None	VII.J-08	3.3.1-93	A
			(I) Treated water-primary	None	None	VII.J-12	3.3.1-93	A
		Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Treated water-primary	Loss of material/pitting and crevice corrosion	Primary Water Chemistry	AP-079	3.3.1-91	A
					Work Control Process	AP-079	3.3.1-91	E
Hot Water Heater	PB	Glass	(I) Treated water-primary	None	None	VII.J-12	3.3.1-93	C
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
Pipe	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Treated water-primary	Loss of material/pitting and crevice corrosion	Primary Water Chemistry	AP-079	3.3.1-91	A
					Work Control Process	AP-079	3.3.1-91	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-24: Auxiliary Systems - Makeup and Demineralized Water - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Strainer Housing	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Treated water-primary	Loss of material/pitting and crevice corrosion	Primary Water Chemistry	AP-079	3.3.1-91	A
					Work Control Process	AP-079	3.3.1-91	E
Tubing	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Treated water-primary	Loss of material/pitting and crevice corrosion	Primary Water Chemistry	AP-079	3.3.1-91	A
					Work Control Process	AP-079	3.3.1-91	E
Valves	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Treated water-primary	Loss of material/pitting and crevice corrosion	Primary Water Chemistry	AP-079	3.3.1-91	A
					Work Control Process	AP-079	3.3.1-91	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-24 Notes:

Plant Standard Notes

Note - The following plant standard notes have generic applicability, but may or may not be used for each SSC:

S1. Thermal embrittlement is only applicable to CASS components that are subject to temperatures in excess of 482°F.

S2. Cracking due to SCC is only applicable to stainless steel components exposed to temperatures greater than 140°F.

S3. Selective leaching is applicable to the material group 'Steel,' but only for gray cast iron components.

Industry Standard Notes

See last page of Section 3.3 tables.

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-25: Auxiliary Systems - Service Water Pretreatment - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Bolting	PB	Steel	(E) Air-indoor uncontrolled	Cracking/cyclic loading, stress corrosion cracking	Bolting Integrity	VII.I-03	3.3.1-41	A
				Loss of material/general, pitting, and crevice corrosion	Bolting Integrity	VII.I-04	3.3.1-43	A
				Loss of preload/thermal effects, gasket creep, and self-loosening	Bolting Integrity	VII.I-05	3.3.1-45	A
Filter Housings	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(I) Raw water	Loss of material/erosion	Work Control Process			H
				Loss of material/general, pitting, crevice, and microbiologically influenced corrosion, and fouling	Work Control Process	A-033	3.3.1-68	E
Flow Elements	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(I) Raw water	Loss of material/erosion	Work Control Process			H
				Loss of material/pitting, crevice, and microbiologically influenced corrosion	Work Control Process	AP-055	3.3.1-80	E
Mixers (Static)	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(I) Raw water	Loss of material/erosion	Work Control Process			H
				Loss of material/pitting, crevice, and microbiologically influenced corrosion	Work Control Process	AP-055	3.3.1-80	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-25: Auxiliary Systems - Service Water Pretreatment - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Pipe	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(I) Raw water	Loss of material/erosion	Work Control Process			H
				Loss of material/pitting, crevice, and microbiologically influenced corrosion	Work Control Process	AP-055	3.3.1-80	E
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(I) Raw water	Loss of material/erosion	Work Control Process			H
				Loss of material/general, pitting, crevice, and microbiologically influenced corrosion, and fouling	Work Control Process	A-033	3.3.1-68	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-25: Auxiliary Systems - Service Water Pretreatment - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Tubing	PB	Copper Alloys	(E) Air-indoor uncontrolled	Loss of material/pitting and crevice corrosion	External Surfaces Monitoring	A-046	3.3.1-25	E
			(I) Raw water	Loss of material/pitting, crevice, and microbiologically influenced corrosion, and fouling	Work Control Process	A-044	3.3.1-81	E
		Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(I) Raw water	Loss of material/pitting, crevice, and microbiologically influenced corrosion	Work Control Process	AP-055	3.3.1-80	E
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(I) Raw water	Loss of material/general, pitting, crevice, and microbiologically influenced corrosion, and fouling	Work Control Process	A-033	3.3.1-68	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-25: Auxiliary Systems - Service Water Pretreatment - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Valves	PB	Copper Alloys	(E) Air-indoor uncontrolled	Loss of material/pitting and crevice corrosion	External Surfaces Monitoring	A-046	3.3.1-25	E
			(I) Raw water	Loss of material/erosion	Work Control Process			H
				Loss of material/pitting, crevice, and microbiologically influenced corrosion, and fouling	Work Control Process	A-044	3.3.1-81	E
				Loss of material/selective leaching	Selective Leaching of Materials	A-047	3.3.1-84	A
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(I) Raw water	Loss of material/erosion	Work Control Process			H
				Loss of material/general, pitting, crevice, and microbiologically influenced corrosion, and fouling	Work Control Process	A-033	3.3.1-68	E
				Loss of material/selective leaching	Selective Leaching of Materials	A-051	3.3.1-85	A, S3

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-25 Notes:

Plant Standard Notes

Note - The following plant standard notes have generic applicability, but may or may not be used for each SSC:

S1. Thermal embrittlement is only applicable to CASS components that are subject to temperatures in excess of 482°F.

S2. Cracking due to SCC is only applicable to stainless steel components exposed to temperatures greater than 140°F.

S3. Selective leaching is applicable to the material group 'Steel,' but only for gray cast iron components.

Industry Standard Notes

See last page of Section 3.3 tables.

Table 3.3.2-26: Auxiliary Systems - Miscellaneous Drains and Sumps - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Annulus Sump Pumps	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(I) Raw water	Loss of material/erosion	Work Control Process			H
				Loss of material/general, pitting, crevice, and microbiologically influenced corrosion, and fouling	Work Control Process	A-033	3.3.1-68	E
				Loss of material/selective leaching	Selective Leaching of Materials	A-051	3.3.1-85	A, S3
Bolting	PB	Steel	(E) Air-indoor uncontrolled	Cracking/cyclic loading, stress corrosion cracking	Bolting Integrity	VII.I-03	3.3.1-41	A
				Loss of material/general, pitting, and crevice corrosion	Bolting Integrity	VII.I-04	3.3.1-43	A
				Loss of preload/thermal effects, gasket creep, and self-loosening	Bolting Integrity	VII.I-05	3.3.1-45	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-02	3.3.1-89	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-26: Auxiliary Systems - Miscellaneous Drains and Sumps - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Reactor Containment Vessel Sump Pumps (Includes 1A, 1B, and Rx Cavity C)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(E) Raw water	Loss of material/general, pitting, crevice, and microbiologically influenced corrosion, and fouling	External Surfaces Monitoring	A-033	3.3.1-68	E
				Loss of material/selective leaching	Selective Leaching of Materials	A-051	3.3.1-85	A, S3
			(I) Raw water	Loss of material/erosion	Work Control Process			H
				Loss of material/general, pitting, crevice, and microbiologically influenced corrosion, and fouling	Work Control Process	A-033	3.3.1-68	E
				Loss of material/selective leaching	Selective Leaching of Materials	A-051	3.3.1-85	A, S3
Deaerated Drains Tank Emergency Pumps	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Raw water	Loss of material/pitting, crevice, and microbiologically influenced corrosion	Work Control Process	AP-055	3.3.1-80	E
Flow Elements	PB	Elastomers	(I) Raw water	Hardening and loss of strength/elastomer degradation	Work Control Process	AP-075	3.3.1-75	E
				Loss of material/erosion	Work Control Process	AP-076	3.3.1-75	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-26: Auxiliary Systems - Miscellaneous Drains and Sumps - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Orifices	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Raw water	Loss of material/erosion	Work Control Process			H
				Loss of material/pitting, crevice, and microbiologically influenced corrosion	Work Control Process	AP-055	3.3.1-80	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-26: Auxiliary Systems - Miscellaneous Drains and Sumps - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Pipe	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(E) Concrete	None	None	VII.J-17	3.3.1-96	A
			(I) Air-moist	Loss of material/pitting and crevice corrosion	Work Control Process	AP-081	3.3.1-54	E
			(I) Raw water	Loss of material/erosion	Work Control Process			H
				Loss of material/pitting, crevice, and microbiologically influenced corrosion	Work Control Process	AP-055	3.3.1-80	E
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(E) Concrete	None	None	VII.J-21	3.3.1-96	A
			(I) Air-moist	Loss of material/general, pitting, and crevice corrosion	Work Control Process	A-023	3.3.1-71	E
			(I) Raw water	Loss of material/erosion	Work Control Process			H
				Loss of material/general, pitting, crevice, and microbiologically influenced corrosion, and fouling	Work Control Process	A-033	3.3.1-68	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-26: Auxiliary Systems - Miscellaneous Drains and Sumps - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
RHR Pump Pit Sump Pumps	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Raw water	Loss of material/erosion	Work Control Process			H
				Loss of material/pitting, crevice, and microbiologically influenced corrosion	Work Control Process	AP-055	3.3.1-80	E
Safeguards Alley Sump Pumps	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(I) Raw water	Loss of material/erosion	Work Control Process			H
				Loss of material/general, pitting, crevice, and microbiologically influenced corrosion, and fouling	Work Control Process	A-033	3.3.1-68	E
				Loss of material/selective leaching	Selective Leaching of Materials	A-051	3.3.1-85	A, S3
Screen House Sump Pumps	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(I) Raw water	Loss of material/erosion	Work Control Process			H
				Loss of material/general, pitting, crevice, and microbiologically influenced corrosion, and fouling	Work Control Process	A-033	3.3.1-68	E
				Loss of material/selective leaching	Selective Leaching of Materials	A-051	3.3.1-85	A, S3

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-26: Auxiliary Systems - Miscellaneous Drains and Sumps - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Valves	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Air-moist	Loss of material/pitting and crevice corrosion	Work Control Process	AP-081	3.3.1-54	E
			(I) Raw water	Loss of material/erosion	Work Control Process			H
				Loss of material/pitting, crevice, and microbiologically influenced corrosion	Work Control Process	AP-055	3.3.1-80	E
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(I) Air-moist	Loss of material/general, pitting, and crevice corrosion	Work Control Process	A-023	3.3.1-71	E
			(I) Raw water	Loss of material/erosion	Work Control Process			H
				Loss of material/general, pitting, crevice, and microbiologically influenced corrosion, and fouling	Work Control Process	A-033	3.3.1-68	E
				Loss of material/selective leaching	Selective Leaching of Materials	A-051	3.3.1-85	A, S3

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-26 Notes:

Plant Standard Notes

Note - The following plant standard notes have generic applicability, but may or may not be used for each SSC:

S1. Thermal embrittlement is only applicable to CASS components that are subject to temperatures in excess of 482°F.

S2. Cracking due to SCC is only applicable to stainless steel components exposed to temperatures greater than 140°F.

S3. Selective leaching is applicable to the material group 'Steel,' but only for gray cast iron components.

Industry Standard Notes

See last page of Section 3.3 tables.

Table 3.3.2-27: Auxiliary Systems - Miscellaneous Gas - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Bolting	PB	Steel	(E) Air-indoor uncontrolled	Cracking/cyclic loading, stress corrosion cracking	Bolting Integrity	VII.I-03	3.3.1-41	A
				Loss of material/general, pitting, and crevice corrosion	Bolting Integrity	VII.I-04	3.3.1-43	A
				Loss of preload/thermal effects, gasket creep, and self-loosening	Bolting Integrity	VII.I-05	3.3.1-45	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-02	3.3.1-89	A
CO2 Vaporizer (Channel head)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(I) Air-moist	Loss of material/general, pitting, and crevice corrosion	Work Control Process	A-023	3.3.1-71	E
CO2 Vaporizer (Flange)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(I) Air-moist	Loss of material/general, pitting, and crevice corrosion	Work Control Process	A-023	3.3.1-71	E
CO2 Vaporizer (Internal piping)	PB	Steel	(E) Air-moist	Loss of material/general, pitting, and crevice corrosion	Work Control Process	A-023	3.3.1-71	E
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	S-019	3.4.1-03	A
					Work Control Process	S-019	3.4.1-03	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-27: Auxiliary Systems - Miscellaneous Gas - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
CO2 Vaporizer (Shell)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(I) Air-moist	Loss of material/general, pitting, and crevice corrosion	Work Control Process	A-023	3.3.1-71	E
Flexible Connections	PB	Non-Metallic	(E) Air-indoor uncontrolled	None	None			H
			(I) Gas-inert	None	None			H
		Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Gas-inert	None	None	VII.J-19	3.3.1-97	A
Gas Bottles/Cylinders	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(I) Air-moist	Loss of material/general, pitting, and crevice corrosion	Work Control Process	A-023	3.3.1-71	E
			(I) Gas-inert	None	None	VII.J-23	3.3.1-97	C

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-27: Auxiliary Systems - Miscellaneous Gas - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Hoses	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Air-moist	Loss of material/pitting and crevice corrosion	Work Control Process	AP-081	3.3.1-54	E
			(I) Gas-inert	None	None	VII.J-19	3.3.1-97	A
Pipe	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Gas-inert	None	None	VII.J-19	3.3.1-97	A
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(I) Air-moist	Loss of material/general, pitting, and crevice corrosion	Work Control Process	A-023	3.3.1-71	E
			(I) Gas-inert	None	None	VII.J-23	3.3.1-97	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-27: Auxiliary Systems - Miscellaneous Gas - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Regulators	PB	Aluminum	(E) Air-indoor uncontrolled	None	None	EP-003	3.2.1-50	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	AP-001	3.3.1-88	A
			(I) Gas-inert	None	None	VII.J-02	3.3.1-97	A
		Copper Alloys	(E) Air-indoor uncontrolled	None	None	SP-006	3.4.1-41	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-12	3.3.1-88	A
			(I) Gas-inert	None	None	VII.J-04	3.3.1-97	A
		Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Gas-inert	None	None	VII.J-19	3.3.1-97	A
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(I) Gas-inert	None	None	VII.J-23	3.3.1-97	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-27: Auxiliary Systems - Miscellaneous Gas - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
SFP Gate Inflatable Seal N2 Rubber Hoses	PB	Elastomers	(E) Air-indoor uncontrolled	Change in material properties/thermal exposure	Work Control Process			H
				Cracking/thermal exposure	Work Control Process			H
			(I) Gas-inert	None	None			H
Strainer Housings	PB	Copper Alloys	(E) Air-indoor uncontrolled	None	None	SP-006	3.4.1-41	A
			(I) Gas-inert	None	None	VII.J-04	3.3.1-97	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-27: Auxiliary Systems - Miscellaneous Gas - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Tubing	PB	Copper Alloys	(E) Air-indoor uncontrolled	None	None	SP-006	3.4.1-41	A
			(E) Borated water leakage	None	None	VII.J-05	3.3.1-99	A
			(I) Gas-inert	None	None	VII.J-04	3.3.1-97	A
		Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Gas-inert	None	None	VII.J-19	3.3.1-97	A
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(I) Air-moist	Loss of material/general, pitting, and crevice corrosion	Work Control Process	A-023	3.3.1-71	E
			(I) Gas-inert	None	None	VII.J-23	3.3.1-97	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-27: Auxiliary Systems - Miscellaneous Gas - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Valves	PB	Copper Alloys	(E) Air-indoor uncontrolled	None	None	SP-006	3.4.1-41	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-12	3.3.1-88	A
			(I) Gas-inert	None	None	VII.J-04	3.3.1-97	A
		Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Gas-inert	None	None	VII.J-19	3.3.1-97	A
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(I) Air-moist	Loss of material/general, pitting, and crevice corrosion	Work Control Process	A-023	3.3.1-71	E
			(I) Gas-inert	None	None	VII.J-23	3.3.1-97	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-27 Notes:

Plant Standard Notes

Note - The following plant standard notes have generic applicability, but may or may not be used for each SSC:

S1. Thermal embrittlement is only applicable to CASS components that are subject to temperatures in excess of 482°F.

S2. Cracking due to SCC is only applicable to stainless steel components exposed to temperatures greater than 140°F.

S3. Selective leaching is applicable to the material group 'Steel,' but only for gray cast iron components.

Industry Standard Notes

See last page of Section 3.3 tables.

Table 3.3.2-28: Auxiliary Systems - Potable Water - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Bolting	PB	Steel	(E) Air-indoor uncontrolled	Cracking/cyclic loading, stress corrosion cracking	Bolting Integrity	VII.I-03	3.3.1-41	A
				Loss of material/general, pitting, and crevice corrosion	Bolting Integrity	VII.I-04	3.3.1-43	A
				Loss of preload/thermal effects, gasket creep, and self-loosening	Bolting Integrity	VII.I-05	3.3.1-45	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-02	3.3.1-89	A
Nozzles	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(I) Air-indoor uncontrolled	Loss of material/general corrosion	Work Control Process	VII.I-08	3.3.1-58	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-28: Auxiliary Systems - Potable Water - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Pipe	PB	Copper Alloys	(E) Air-indoor uncontrolled	Loss of material/pitting and crevice corrosion	External Surfaces Monitoring	A-046	3.3.1-25	E
			(E) Borated water leakage	None	None	VII.J-05	3.3.1-99	A
			(I) Raw water	Loss of material/pitting, crevice, and microbiologically influenced corrosion, and fouling	Work Control Process	A-044	3.3.1-81	E
				Loss of material/selective leaching	Selective Leaching of Materials	A-047	3.3.1-84	A
		Steel	(E) Air-indoor controlled	None	None	VII.J-20	3.3.1-95	A
			(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(I) Raw water	Loss of material/general, pitting, crevice, and microbiologically influenced corrosion, and fouling	Work Control Process	A-033	3.3.1-68	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-28: Auxiliary Systems - Potable Water - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Valves	PB	Copper Alloys	(E) Air-indoor uncontrolled	Loss of material/pitting and crevice corrosion	External Surfaces Monitoring	A-046	3.3.1-25	E
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-12	3.3.1-88	A
			(I) Raw water	Loss of material/pitting, crevice, and microbiologically influenced corrosion, and fouling	Work Control Process	A-044	3.3.1-81	E
				Loss of material/selective leaching	Selective Leaching of Materials	A-047	3.3.1-84	A
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-08	3.3.1-58	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(I) Raw water	Loss of material/general, pitting, crevice, and microbiologically influenced corrosion, and fouling	Work Control Process	A-033	3.3.1-68	E
				Loss of material/selective leaching	Selective Leaching of Materials	A-051	3.3.1-85	A, S3

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-28 Notes:

Plant Standard Notes

Note - The following plant standard notes have generic applicability, but may or may not be used for each SSC:

S1. Thermal embrittlement is only applicable to CASS components that are subject to temperatures in excess of 482°F.

S2. Cracking due to SCC is only applicable to stainless steel components exposed to temperatures greater than 140°F.

S3. Selective leaching is applicable to the material group 'Steel,' but only for gray cast iron components.

Industry Standard Notes

See last page of Section 3.3 tables.

Table 3.3.2-29: Auxiliary Systems - Primary Sampling - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Bolting	PB	Steel	(E) Air-indoor uncontrolled	Cracking/cyclic loading, stress corrosion cracking	Bolting Integrity	VII.I-03	3.3.1-41	A
				Loss of material/general, pitting, and crevice corrosion	Bolting Integrity	VII.I-04	3.3.1-43	A
				Loss of preload/thermal effects, gasket creep, and self-loosening	Bolting Integrity	VII.I-05	3.3.1-45	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-02	3.3.1-89	A
Expansion Tanks	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	C
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	C
			(I) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	C
Filter Housings	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Treated water-primary	Cracking/stress corrosion cracking	Primary Water Chemistry	AP-082	3.3.1-90	A, S2
					Work Control Process	AP-082	3.3.1-90	E, S2
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	AP-079	3.3.1-91	A
					Work Control Process	AP-079	3.3.1-91	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-29: Auxiliary Systems - Primary Sampling - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Flow Indicators	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Gas-inert	None	None	VII.J-19	3.3.1-97	A
			(I) Treated water-primary	Cracking/stress corrosion cracking	Primary Water Chemistry	AP-082	3.3.1-90	A, S2
					Work Control Process	AP-082	3.3.1-90	E, S2
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	AP-079	3.3.1-91	A
					Work Control Process	AP-079	3.3.1-91	E
Rupture Disks	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
						VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	C
			(I) Treated water-primary	Loss of material/pitting and crevice corrosion	Primary Water Chemistry	AP-079	3.3.1-91	A
					Work Control Process	AP-079	3.3.1-91	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-29: Auxiliary Systems - Primary Sampling - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Sample Heat Exchangers (Shell)	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	C
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	C
			(I) Treated water-closed cycle cooling	Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H
					Work Control Process			H
				Loss of material/pitting and crevice corrosion	Closed-Cycle Cooling Water System	E-019	3.2.1-28	B
					Work Control Process	E-019	3.2.1-28	E
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VII.I-11	3.3.1-58	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VII.I-10	3.3.1-89	A
			(I) Treated water-closed cycle cooling	Loss of material/general, pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	A-063	3.3.1-48	B
					Work Control Process	A-063	3.3.1-48	E
				Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H
					Work Control Process			H

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-29: Auxiliary Systems - Primary Sampling - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Sample Heat Exchangers (Tubes)	PB	Stainless Steel	(E) Treated water-closed cycle cooling	Cracking/stress corrosion cracking	Closed-Cycle Cooling Water System	AP-060	3.3.1-46	D, S2
					Work Control Process	AP-060	3.3.1-46	E, S2
				Loss of material/microbiologically influenced corrosion	Closed-Cycle Cooling Water System			H
					Work Control Process			H
				Loss of material/pitting and crevice corrosion	Closed-Cycle Cooling Water System	E-019	3.2.1-28	B
					Work Control Process	E-019	3.2.1-28	E
			(I) Treated water-primary	Cracking/stress corrosion cracking	Primary Water Chemistry	AP-082	3.3.1-90	C, S2
					Work Control Process	AP-082	3.3.1-90	E, S2
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	S-022	3.4.1-16	A
					Work Control Process	S-022	3.4.1-16	E
Sample Pressure Vessel	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	C
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	C
			(I) Treated water-primary	Loss of material/pitting and crevice corrosion	Primary Water Chemistry	EP-041	3.2.1-49	A
					Work Control Process	EP-041	3.2.1-49	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-29: Auxiliary Systems - Primary Sampling - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Tubing	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(I) Gas-inert	None	None	VII.J-19	3.3.1-97	A
			(I) Treated water-primary	Cracking/stress corrosion cracking	Primary Water Chemistry	AP-082	3.3.1-90	A, S2
					Work Control Process	AP-082	3.3.1-90	E, S2
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	AP-079	3.3.1-91	A
					Work Control Process	AP-079	3.3.1-91	E
Valves	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(E) Borated water leakage	None	None	VII.J-16	3.3.1-99	A
			(I) Air-indoor uncontrolled	None	None	VII.J-15	3.3.1-94	A
			(I) Gas-inert	None	None	VII.J-19	3.3.1-97	A
			(I) Treated water-primary	Cracking/stress corrosion cracking	Primary Water Chemistry	AP-082	3.3.1-90	A, S2
					Work Control Process	AP-082	3.3.1-90	E, S2
				Loss of material/pitting and crevice corrosion	Primary Water Chemistry	AP-079	3.3.1-91	A
					Work Control Process	AP-079	3.3.1-91	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.3.2-29 Notes:

Plant Standard Notes

Note - The following plant standard notes have generic applicability, but may or may not be used for each SSC:

S1. Thermal embrittlement is only applicable to CASS components that are subject to temperatures in excess of 482°F.

S2. Cracking due to SCC is only applicable to stainless steel components exposed to temperatures greater than 140°F.

S3. Selective leaching is applicable to the material group 'Steel,' but only for gray cast iron components.

Industry Standard Notes

See last page of Section 3.3 tables.

Notes for Tables 3.3.2-1 through 3.3.2-29

Industry 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 component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

D. Component is different, but 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 item for component, 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. (Not used. See discussion in Section 3.0)

G. Environment not in NUREG-1801 for this component and material. (Not used. See discussion in Section 3.0)

H. Aging effect not in NUREG-1801 for this component, material and environment combination.

I. Aging effect in NUREG-1801 for this component, material and environment combination is not applicable. (Not used. See discussion in Section 3.0)

J. Neither the component nor the material and environment combination is evaluated in NUREG-1801. (Not used. See discussion in Section 3.0)

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

3.4 AGING MANAGEMENT OF STEAM AND POWER CONVERSION SYSTEM

3.4.1 INTRODUCTION

This section provides the results of the aging management review for those components identified in Section 2.3.4, Steam and Power Conversion System. The systems, or portions of systems, which are addressed in this section, are described in the indicated sections.

- Turbine System (Section 2.3.4.1)
- Main Steam and Steam Dump System (Section 2.3.4.2)
- Bleed Steam System (Section 2.3.4.3)
- Feedwater System (Section 2.3.4.4)
- Condensate System (Section 2.3.4.5)
- Steam Generator Blowdown Treatment System (Section 2.3.4.6)
- Auxiliary Feedwater System (Section 2.3.4.7)
- Air Removal System (Section 2.3.4.8)
- Heater and Moisture Separator Drains System (Section 2.3.4.9)
- Heating Steam System (Section 2.3.4.10)
- Main Generator (Mechanical) and Auxiliaries System (Section 2.3.4.11)
- Secondary Sampling System (Section 2.3.4.12)
- Turbine Oil Purification System (Section 2.3.4.13)
- Turbine Room Traps and Drains System (Section 2.3.4.14)

Table 3.4.1, Summary of Aging Management Programs for Steam and Power Conversion System Evaluated in Chapter VIII of NUREG-1801, provides the summary of the programs evaluated in NUREG-1801 for the Steam and Power Conversion System components that are relied on for license renewal.

This table uses the format described in Section 3.0 above.

3.4.2 RESULTS

The following tables summarize the results of the aging management review for systems in the Steam and Power Conversion Systems group.

Table 3.4.2-1, Turbine - Aging Management Evaluation

Table 3.4.2-2, Main Steam and Steam Dump - Aging Management Evaluation

Table 3.4.2-3, Bleed Steam - Aging Management Evaluation

Table 3.4.2-4, Feedwater - Aging Management Evaluation

Table 3.4.2-5, Condensate - Aging Management Evaluation

Table 3.4.2-6, Steam Generator Blowdown Treatment - Aging Management Evaluation

Table 3.4.2-7, Auxiliary Feedwater - Aging Management Evaluation

Table 3.4.2-8, Air Removal - Aging Management Evaluation

Table 3.4.2-9, Heater and Moisture Separator Drains - Aging Management Evaluation

Table 3.4.2-10, Heating Steam - Aging Management Evaluation

Table 3.4.2-11, Main Generator (Mechanical) and Auxiliaries - Aging Management Evaluation

Table 3.4.2-12, Secondary Sampling - Aging Management Evaluation

Table 3.4.2-13, Turbine Oil Purification - Aging Management Evaluation

Table 3.4.2-14, Turbine Room Traps and Drains - Aging Management Evaluation

The materials from which components are fabricated, the environments to which components 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 of Section 3.4.2.1, Materials, Environment, Aging Effects Requiring Management and Aging Management Programs:

Section 3.4.2.1.1, Turbine System

Section 3.4.2.1.2, Main Steam and Steam Dump System

Section 3.4.2.1.3, Bleed Steam System

Section 3.4.2.1.4, Feedwater System

Section 3.4.2.1.5, Condensate System

Section 3.4.2.1.6, Steam Generator Blowdown Treatment System

Section 3.4.2.1.7, Auxiliary Feedwater System

Section 3.4.2.1.8, Air Removal System

Section 3.4.2.1.9, Heater and Moisture Separator Drains System

Section 3.4.2.1.10, Heating Steam System

Section 3.4.2.1.11, Main Generator (Mechanical) and Auxiliaries System

Section 3.4.2.1.12, Secondary Sampling System

Section 3.4.2.1.13, Turbine Oil Purification System

Section 3.4.2.1.14, Turbine Room Traps and Drains System

3.4.2.1 MATERIALS, ENVIRONMENT, AGING EFFECTS REQUIRING MANAGEMENT AND AGING MANAGEMENT PROGRAMS

3.4.2.1.1 Turbine System

Materials

The materials of construction for the Turbine System component types are:

- Copper Alloys
- Glass
- Stainless Steel
- Steel

Environment

The Turbine System component types are exposed to the following environments:

- Air-indoor uncontrolled
- Gas-inert
- Hydraulic oil
- Lube oil
- Raw water
- Treated water and/or steam-secondary

Aging Effects Requiring Management

The following aging effects, associated with the Turbine System, require management:

- Cracking
- Loss of material
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for the Turbine System component types:

- Bolting Integrity
- External Surfaces Monitoring
- Lubricating Oil Analysis
- Secondary Water Chemistry
- Selective Leaching of Materials
- Work Control Process

3.4.2.1.2 Main Steam and Steam Dump System

Materials

The materials of construction for the Main Steam and Steam Dump System component types are:

- Stainless Steel
- Steel

Environment

The Main Steam and Steam Dump System component types are exposed to the following environments:

- Air-indoor uncontrolled
- Air-moist
- Air-outdoor
- Borated water leakage
- Treated water and/or steam-secondary

Aging Effects Requiring Management

The following aging effects, associated with the Main Steam and Steam Dump System, require management:

- Cracking
- Cumulative fatigue damage
- Loss of material
- Loss of preload
- Wall thinning

Aging Management Programs

The following aging management programs manage the aging effects for the Main Steam and Steam Dump System component types:

- Bolting Integrity
- Boric Acid Corrosion
- External Surfaces Monitoring
- Flow-Accelerated Corrosion
- Secondary Water Chemistry
- Work Control Process

3.4.2.1.3 Bleed Steam System

Materials

The materials of construction for the Bleed Steam System component types are:

- Stainless Steel
- Steel

Environment

The Bleed Steam System component types are exposed to the following environments:

- Air-indoor uncontrolled
- Air-moist
- Treated water and/or steam-secondary

Aging Effects Requiring Management

The following aging effects, associated with the Bleed Steam System, 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 Bleed Steam System component types:

- Bolting Integrity
- External Surfaces Monitoring
- Flow-Accelerated Corrosion
- Secondary Water Chemistry
- Work Control Process

3.4.2.1.4 Feedwater System

Materials

The materials of construction for the Feedwater System component types are:

- Copper Alloys
- Stainless Steel
- Steel

Environment

The Feedwater System component types are exposed to the following environments:

- Air-indoor uncontrolled
- Borated water leakage
- Lube oil
- Raw water

- Treated water and/or steam-secondary

Aging Effects Requiring Management

The following aging effects, associated with the Feedwater System, require management:

- Cracking
- Cumulative fatigue damage
- 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
- Boric Acid Corrosion
- External Surfaces Monitoring
- Flow-Accelerated Corrosion
- Lubricating Oil Analysis
- Secondary Water Chemistry
- Selective Leaching of Materials
- Work Control Process

3.4.2.1.5 Condensate System

Materials

The materials of construction for the Condensate System component types are:

- Copper Alloys
- Stainless Steel
- Steel

Environment

The Condensate System component types are exposed to the following environments:

- Air-indoor uncontrolled
- Borated water leakage
- Treated water and/or steam-secondary

Aging Effects Requiring Management

The following aging effects, associated with the Condensate System, 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 Condensate System component types:

- Bolting Integrity
- Boric Acid Corrosion
- External Surfaces Monitoring
- Flow-Accelerated Corrosion
- Secondary Water Chemistry
- Selective Leaching of Materials
- Work Control Process

3.4.2.1.6 Steam Generator Blowdown Treatment System

Materials

The materials of construction for the Steam Generator Blowdown Treatment System component types are:

- Copper Alloys

- Stainless Steel
- Steel

Environment

The Steam Generator Blowdown Treatment System component types are exposed to the following environments:

- Air-indoor uncontrolled
- Air-moist
- Borated water leakage
- Treated water and/or steam-secondary

Aging Effects Requiring Management

The following aging effects, associated with the Steam Generator Blowdown Treatment System, 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 Treatment System component types:

- Bolting Integrity
- Boric Acid Corrosion
- External Surfaces Monitoring
- Flow-Accelerated Corrosion
- Secondary Water Chemistry
- Selective Leaching of Materials
- Work Control Process

3.4.2.1.7 Auxiliary Feedwater System

Materials

The materials of construction for the Auxiliary Feedwater System component types are:

- Copper Alloys
- Glass
- Stainless Steel
- Steel

Environment

The Auxiliary Feedwater System component types are exposed to the following environments:

- Air-indoor uncontrolled
- Air-moist
- Borated water leakage
- Lube oil
- Treated water and/or steam-secondary

Aging Effects Requiring Management

The following aging effects, associated with the Auxiliary Feedwater System, require management:

- Cracking
- Cumulative fatigue damage
- 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

- Boric Acid Corrosion
- External Surfaces Monitoring
- Lubricating Oil Analysis
- Secondary Water Chemistry
- Selective Leaching of Materials
- Work Control Process

3.4.2.1.8 Air Removal System

Materials

The materials of construction for the Air Removal System component types are:

- Copper Alloys
- Glass
- Stainless Steel
- Steel

Environment

The Air Removal System component types are exposed to the following environments:

- Air-indoor uncontrolled
- Air-moist
- Treated water and/or steam-secondary

Aging Effects Requiring Management

The following aging effects, associated with the Air Removal System, 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 Air Removal System component types:

- Bolting Integrity
- External Surfaces Monitoring
- Flow-Accelerated Corrosion
- Secondary Water Chemistry
- Selective Leaching of Materials
- Work Control Process

3.4.2.1.9 Heater and Moisture Separator Drains System

Materials

The materials of construction for the Heater and Moisture Separator Drains System component types are:

- Copper Alloys
- Glass
- Stainless Steel
- Steel

Environment

The Heater and Moisture Separator Drains System component types are exposed to the following environments:

- Air-indoor uncontrolled
- Raw water
- Treated water and/or steam-secondary

Aging Effects Requiring Management

The following aging effects, associated with the Heater and Moisture Separator Drains System, 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 Heater and Moisture Separator Drains System component types:

- Bolting Integrity
- External Surfaces Monitoring
- Flow-Accelerated Corrosion
- Secondary Water Chemistry
- Selective Leaching of Materials
- Work Control Process

3.4.2.1.10 Heating Steam System

Materials

The materials of construction for the Heating Steam System component types are:

- Copper Alloys
- Glass
- Stainless Steel
- Steel

Environment

The Heating Steam System component types are exposed to the following environments:

- Air-indoor controlled
- Air-indoor uncontrolled
- Borated water leakage
- Raw water
- Treated water and/or steam-secondary

Aging Effects Requiring Management

The following aging effects, associated with the Heating Steam System, 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 Heating Steam System component types:

- Bolting Integrity
- Boric Acid Corrosion
- External Surfaces Monitoring
- Flow-Accelerated Corrosion
- Secondary Water Chemistry
- Selective Leaching of Materials
- Work Control Process

3.4.2.1.11 Main Generator (Mechanical) and Auxiliaries System

Materials

The materials of construction for the Main Generator (Mechanical) and Auxiliaries System component types are:

- Copper Alloys
- Glass
- Stainless Steel
- Steel

Environment

The Main Generator (Mechanical) and Auxiliaries System component types are exposed to the following environments:

- Air-indoor uncontrolled
- Gas-inert
- Lube oil
- Raw water

Aging Effects Requiring Management

The following aging effects, associated with the Main Generator (Mechanical) and Auxiliaries System, require management:

- Cracking
- Loss of material
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for the Main Generator (Mechanical) and Auxiliaries System component types:

- Bolting Integrity
- External Surfaces Monitoring
- Lubricating Oil Analysis
- Selective Leaching of Materials
- Work Control Process

3.4.2.1.12 Secondary Sampling System

Materials

The materials of construction for the Secondary Sampling System component types are:

- Copper Alloys
- Glass
- Non-Metallic
- Stainless Steel
- Steel

Environment

The Secondary Sampling System component types are exposed to the following environments:

- Air-indoor uncontrolled
- Air-moist
- Borated water leakage
- Raw water
- Treated water and/or steam-secondary
- Treated water-closed cycle cooling

Aging Effects Requiring Management

The following aging effects, associated with the Secondary Sampling System, require management:

- Cracking
- Loss of material
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for the Secondary Sampling System component types:

- Bolting Integrity
- Boric Acid Corrosion
- External Surfaces Monitoring
- Secondary Water Chemistry
- Selective Leaching of Materials
- Work Control Process

3.4.2.1.13 Turbine Oil Purification System

Materials

The materials of construction for the Turbine Oil Purification System component types are:

- Copper Alloys
- Steel

Environment

The Turbine Oil Purification System component types are exposed to the following environments:

- Air-indoor uncontrolled
- Lube oil

Aging Effects Requiring Management

The following aging effects, associated with the Turbine Oil Purification System, require management:

- Cracking
- Loss of material
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for the Turbine Oil Purification System component types:

- Bolting Integrity
- External Surfaces Monitoring
- Lubricating Oil Analysis
- Work Control Process

3.4.2.1.14 Turbine Room Traps and Drains System

Materials

The materials of construction for the Turbine Room Traps and Drains System component types are:

- Copper Alloys
- Stainless Steel
- Steel

Environment

The Turbine Room Traps and Drains System component types are exposed to the following environments:

- Air-indoor uncontrolled
- Treated water and/or steam-secondary

Aging Effects Requiring Management

The following aging effects, associated with the Turbine Room Traps and Drains System, 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 Turbine Room Traps and Drains System component types:

- Bolting Integrity
- External Surfaces Monitoring
- Flow-Accelerated Corrosion
- Secondary Water Chemistry
- Selective Leaching of Materials
- Work Control Process

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 in the license renewal application. For the Steam and Power Conversion Systems, those programs are addressed in the following sections.

3.4.2.2.1 Cumulative Fatigue Damage

Fatigue is a TLAA as defined in 10 CFR 54.3. TLAAs are required to be evaluated in accordance with 10 CFR 54.21(c). The evaluation of this TLAA is addressed in Section 4.3, Metal Fatigue.

3.4.2.2.2 Loss of Material due to General, Pitting, and Crevice Corrosion

3.4.2.2.2.1 Loss of Material due to General, Pitting, and Crevice Corrosion

The loss of material due to general, pitting, and crevice corrosion for applicable components exposed to a treated water and/or steam environment is managed by control of water chemistry through the Secondary Water Chemistry program. In lieu of a one-time inspection, the Work Control Process program is used to provide confirmation of the effectiveness of the Secondary Water Chemistry program. The Work Control Process program provides the opportunity to visually inspect the internal surfaces of components constructed of typical system materials and exposed to typical system environments, including stagnant locations, during preventive and corrective maintenance activities on an ongoing basis.

The Work Control Process program provides input to the Corrective Action program if aging effects are identified. The Corrective Action program would evaluate the cause and extent of condition and, if required, recommend enhancements to ensure continued effectiveness of the Secondary Water Chemistry program.

3.4.2.2.2.2 Loss of Material due to General, Pitting, and Crevice Corrosion

The loss of material due to general, pitting, and crevice corrosion for applicable components exposed to a lubricating oil environment is managed by the Lubricating Oil Analysis program. In lieu of a one-time inspection, the Work Control Process program is used to provide confirmation of the effectiveness of the Lubricating Oil Analysis program. The Work Control Process program provides the opportunity to visually inspect the internal surfaces of components constructed of typical system materials and exposed to typical system environments, including stagnant locations, during preventive and corrective maintenance activities on an ongoing basis.

The Work Control Process program provides input to the Corrective Action program if aging effects are identified. The Corrective Action program would evaluate the cause and extent of condition and, if required, recommend enhancements to ensure continued effectiveness of the Lubricating Oil Analysis program.

3.4.2.2.3 Loss of Material due to General, Pitting, Crevice, and Microbiologically-Influenced Corrosion (MIC), and Fouling

The backup water supply for the Auxiliary Feedwater System is the Service Water System. The backup water source is maintained isolated from the Auxiliary Feedwater System by normally closed motor-operated valves. The backup water supply piping and components are evaluated for the effects of aging with the Service Water System in Section 3.3, Aging Management of Auxiliary Systems.

Based on the above, the auxiliary feedwater pump suction piping was not evaluated for aging effects due to the backup water supply environment.

3.4.2.2.4 Reduction of Heat Transfer due to Fouling

3.4.2.2.4.1 Reduction of Heat Transfer due to Fouling

The reduction of heat transfer due to fouling for applicable components exposed to a treated water and/or steam environment is managed by control of water chemistry through the Secondary Water Chemistry program. In lieu of a one-time inspection, the Work Control Process program is used to provide confirmation of the effectiveness of the Secondary Water Chemistry program. The Work Control Process program provides the opportunity to visually inspect the internal surfaces of components constructed of typical system materials and exposed to typical system environments, including stagnant locations, during preventive and corrective maintenance activities on an ongoing basis.

The Work Control Process program provides input to the Corrective Action Program if aging effects are identified. The Corrective Action Program would evaluate the cause and extent of condition and, if required, recommend enhancements to ensure continued effectiveness of the Secondary Water Chemistry program.

3.4.2.2.4.2 Reduction of Heat Transfer due to Fouling

The reduction of heat transfer due to fouling for applicable components exposed to a lubricating oil environment is managed by the Lubricating Oil Analysis program. In lieu of a one-time inspection, the Work Control Process program is used to provide confirmation of the effectiveness of the Lubricating Oil Analysis program. The Work Control Process program provides the opportunity to visually inspect the internal surfaces of components constructed of typical system materials and exposed to typical system environments, including stagnant locations, during preventive and corrective maintenance activities on an ongoing basis.

The Work Control Process program provides input to the Corrective Action Program if aging effects are identified. The Corrective Action Program would evaluate the cause and extent of condition and, if required, recommend enhancements to ensure continued effectiveness of the Lubricating Oil Analysis program.

3.4.2.2.5 Loss of Material due to General, Pitting, Crevice, and Microbiologically-Influenced Corrosion

3.4.2.2.5.1 Loss of Material due to General, Pitting, Crevice, and Microbiologically-Influenced Corrosion

There are no Steam and Power Conversion System components exposed to a soil environment. Therefore, this item is not applicable.

3.4.2.2.5.2 Loss of Material due to General, Pitting, Crevice, and Microbiologically-Influenced Corrosion

The loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion for applicable components exposed to a lubricating oil environment is managed by the Lubricating Oil Analysis program. In lieu of a one-time inspection, the Work Control Process program is used to provide confirmation of the effectiveness of the Lubricating Oil Analysis program. The Work Control Process program provides the opportunity to visually inspect the internal surfaces of components constructed of typical system materials and exposed to typical system environments, including stagnant locations, during preventive and corrective maintenance activities on an ongoing basis.

The Work Control Process program provides input to the Corrective Action Program if aging effects are identified. The Corrective Action Program would evaluate the cause and extent of condition and, if required, recommend enhancements to ensure continued effectiveness of the Lubricating Oil Analysis program.

3.4.2.2.6 Cracking due to Stress Corrosion Cracking (SCC)

Cracking due to stress-corrosion cracking for applicable components exposed to a treated water and/or steam environment is managed by the Secondary Water Chemistry program. In lieu of a one-time inspection, the Work Control Process program is used to provide confirmation of the effectiveness of the Secondary Water Chemistry program. The Work Control Process program provides the opportunity to visually inspect the internal surfaces of components constructed of typical system materials and exposed to typical system environments, including stagnant locations, during preventive and corrective maintenance activities on an ongoing basis.

The Work Control Process program provides input to the Corrective Action Program if aging effects are identified. The Corrective Action Program would evaluate the cause and extent of condition and, if required, recommend enhancements to ensure continued effectiveness of the Secondary Water Chemistry program.

3.4.2.2.7 Loss of Material due to Pitting and Crevice Corrosion

3.4.2.2.7.1 Loss of Material due to Pitting and Crevice Corrosion

The loss of material due to pitting and crevice corrosion for applicable components exposed to a treated water and/or steam environment is managed by control of water chemistry through the Secondary Water Chemistry program and the Primary Water Chemistry program. In lieu of a one-time inspection, the Work Control Process program is used to provide confirmation of the effectiveness of the chemistry control programs. The Work Control Process program provides the opportunity to visually inspect the internal surfaces of components constructed of typical system materials and exposed to typical system environments, including stagnant locations, during preventive and corrective maintenance activities on an ongoing basis.

The Work Control Process program provides input to the Corrective Action Program if aging effects are identified. The Corrective Action Program would evaluate the cause and extent of condition and, if required, recommend enhancements to ensure continued effectiveness of both chemistry control programs.

3.4.2.2.7.2 Loss of Material due to Pitting and Crevice Corrosion

There are no steam and power conversion system components exposed to a soil environment. Therefore, this item is not applicable.

3.4.2.2.7.3 Loss of Material due to Pitting and Crevice Corrosion

The loss of material due to pitting and crevice corrosion for applicable components exposed to a lubricating oil environment is managed by the Lubricating Oil Analysis program. In lieu of a one-time inspection, the Work Control Process program is used to provide confirmation of the effectiveness of the Lubricating Oil Analysis program. The Work Control Process program provides the opportunity to visually inspect the internal surfaces of components constructed of typical system materials and exposed to typical system environments, including stagnant locations, during preventive and corrective maintenance activities on an ongoing basis.

The Work Control Process program provides input to the Corrective Action Program if aging effects are identified. The Corrective Action Program would evaluate the cause and extent of condition and, if required, recommend enhancements to ensure continued effectiveness of the Lubricating Oil Analysis program.

3.4.2.2.8 Loss of Material due to Pitting, Crevice, and Microbiologically-Influenced Corrosion

The loss of material due to pitting, crevice, and microbiologically influenced corrosion for applicable components exposed to a lubricating oil environment is managed by the Lubricating Oil Analysis program. In lieu of a one-time inspection, the Work Control Process program is used to provide confirmation of the effectiveness of the Lubricating Oil Analysis program. The Work Control Process program provides the opportunity to visually inspect the internal surfaces of components constructed of typical system materials and exposed to typical system environments, including stagnant locations, during preventive and corrective maintenance activities on an ongoing basis.

The Work Control Process program provides input to the Corrective Action Program if aging effects are identified. The Corrective Action Program would evaluate the cause and extent of condition and, if required, recommend enhancements to ensure continued effectiveness of the Lubricating Oil Analysis program.

3.4.2.2.9 Loss of Material due to General, Pitting, Crevice, and Galvanic Corrosion

Applicable to BWR Only

3.4.2.3 TIME-LIMITED AGING ANALYSIS

The TLAA identified below is associated with the Steam and Power Conversion Systems. The section of the LRA that contains the TLAA review results is indicated in parenthesis.

- Metal Fatigue (Section 4.3)

3.4.3 CONCLUSION

The Steam and Power Conversion Systems components that are subject to aging management review have been identified in accordance with the requirements of 10 CFR 54.4. The aging management programs selected to manage aging effects for the Steam and Power Conversion Systems components are identified in the summary tables and Section 3.4.2.1.

A description of these aging management programs is provided in Appendix B, along with the demonstration that the identified aging effects will be managed for the period of extended operation.

Therefore, based on the programs provided in Appendix B, the effects of aging associated with the Steam and Power Conversion System components will be adequately managed so that there is reasonable assurance that the intended function(s) will be maintained consistent with the current licensing basis during the period of extended operation.

Results Tables: Steam and Power Conversion Systems

Table 3.4.1 Summary of Aging Management Programs for Steam and Power Conversion System Evaluated in Chapter VIII of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	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	Further evaluation is documented 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 and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. Loss of material due to general, pitting and crevice corrosion is managed by the Work Control Process program, which is a plant-specific program, and the Secondary Water Chemistry program. Further evaluation is documented in Subsection 3.4.2.2.2.1.

Table 3.4.1 Summary of Aging Management Programs for Steam and Power Conversion System Evaluated in Chapter VIII of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	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 and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. Loss of material due to general, pitting and crevice corrosion is managed by the Work Control Process program, which is a plant-specific program, and the Secondary Water Chemistry program. Further evaluation is documented in Subsection 3.4.2.2.2.1.
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 and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. Loss of material due to general, pitting and crevice corrosion is managed by the Work Control Process program, which is a plant-specific program, and the Secondary Water Chemistry program. Further evaluation is documented in Subsection 3.4.2.2.2.1.
3.4.1-05	BWR Only				

Table 3.4.1 Summary of Aging Management Programs for Steam and Power Conversion System Evaluated in Chapter VIII of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	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 and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. Loss of material due to general, pitting and crevice corrosion is managed by the Work Control Process program, which is a plant-specific program, and the Secondary Water Chemistry program. Further evaluation is documented in Subsection 3.4.2.2.7.1, except for steel tanks see Subsection 3.4.2.2.2.1.
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 and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. Loss of material due to general, pitting and crevice corrosion is managed by the Work Control Process program, which is a plant-specific program, and the Lubricating Oil Analysis program. Further evaluation is documented in Subsection 3.4.2.2.2.2.

Table 3.4.1 Summary of Aging Management Programs for Steam and Power Conversion System Evaluated in Chapter VIII of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-08	Steel piping, piping components, and piping elements exposed to raw water	Loss of material due to general, pitting, crevice, and micro-biologically-influenced corrosion, and fouling	Plant specific	Yes, plant specific	NUREG-1801 item is not applicable. Untreated water from the back-up water supply is normally isolated from the Auxiliary Feedwater System. Further evaluation is documented in Subsection 3.4.2.2.3.
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 and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. Reduction of heat transfer due to fouling is managed by the Work Control Process program, which is a plant-specific program, and the Secondary Water Chemistry program. Further evaluation is documented in Subsection 3.4.2.2.4.1.

Table 3.4.1 Summary of Aging Management Programs for Steam and Power Conversion System Evaluated in Chapter VIII of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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 and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. Reduction of heat transfer due to fouling is managed by the Work Control Process program, which is a plant-specific program, and the Lubricating Oil Analysis program. Further evaluation is documented 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 micro-biologically-influenced corrosion	Buried Piping and Tanks Surveillance or Buried Piping and Tanks Inspection	No or Yes, detection of aging effects and operating experience are to be further evaluated	NUREG-1801 item is not applicable. There are no Steam and Power Conversion System components exposed to a soil environment. Further evaluation is documented in Subsection 3.4.2.2.5.1.

Table 3.4.1 Summary of Aging Management Programs for Steam and Power Conversion System Evaluated in Chapter VIII of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	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 micro-biologically-influenced corrosion	Lubricating Oil Analysis and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. Loss of material due to general, pitting, crevice, and microbiologically- influenced corrosion is managed by the Work Control Process program, which is a plant-specific program, and the Lubricating Oil Analysis program. Further evaluation is documented in Subsection 3.4.2.2.5.2.
3.4.1-13	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 and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. Cracking due to stress corrosion cracking is managed by the Work Control Process program, which is a plant-specific program, and the Secondary Water Chemistry program. Further evaluation is documented in Subsection 3.4.2.2.6.

Table 3.4.1 Summary of Aging Management Programs for Steam and Power Conversion System Evaluated in Chapter VIII of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	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 and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. Loss of material due to pitting and crevice corrosion is managed by the Work Control Process program, which is a plant-specific program, and the Secondary Water Chemistry program. Further evaluation is documented in Subsection 3.4.2.2.7.1.
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 and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. Loss of material due to pitting and crevice corrosion is managed by the Work Control Process program, which is a plant-specific program, and the Primary Water Chemistry and Secondary Water Chemistry programs Further evaluation is documented in Subsection 3.4.2.2.7.1.

Table 3.4.1 Summary of Aging Management Programs for Steam and Power Conversion System Evaluated in Chapter VIII of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-17	Stainless steel piping, piping components, and piping elements exposed to soil	Loss of material due to pitting and crevice corrosion	Plant specific	Yes, plant specific	NUREG-1801 item is not applicable. There are no Steam and Power Conversion System components exposed to a soil environment. Further evaluation is documented in Subsection 3.4.2.2.7.2.
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 and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. Loss of material due to pitting and crevice corrosion is managed by the Work Control Process program, which is a plant-specific program, and the Lubricating Oil Analysis program. Further evaluation is documented in Subsection 3.4.2.2.7.3.

Table 3.4.1 Summary of Aging Management Programs for Steam and Power Conversion System Evaluated in Chapter VIII of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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 micro-biologically-influenced corrosion	Lubricating Oil Analysis and One-Time Inspection	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. Loss of material due to pitting, crevice, and microbiologically-influenced corrosion is managed by the Work Control Process program, which is a plant-specific program, and the Lubricating Oil Analysis program. Further evaluation is documented in Subsection 3.4.2.2.8.
3.4.1-20	Steel tanks exposed to air – outdoor (external)	Loss of material/ general, pitting, and crevice corrosion	Aboveground Steel Tanks	No	NUREG-1801 item is not applicable. There are no Steam and Power Conversion System steel tanks exposed to an air – outdoor (external) environment.
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	No	Consistent with NUREG-1801. Cracking due to cyclic loading and stress corrosion cracking of bolting is managed by the Bolting Integrity program.

Table 3.4.1 Summary of Aging Management Programs for Steam and Power Conversion System Evaluated in Chapter VIII of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	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	No	Consistent with NUREG-1801. Loss of material due to general, pitting and crevice corrosion; loss of preload due to thermal effects, gasket creep, and self-loosening of bolting is managed by the Bolting Integrity program.
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	No	NUREG-1801 item is not applicable. There are no Steam and Power Conversion System components exposed to a closed-cycle cooling water environment (>140°F).
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	No	Loss of material due to general, pitting, crevice, and galvanic corrosion for applicable components exposed to a closed-cycle cooling water environment is managed by the Work Control Process program, which is a plant-specific program.

Table 3.4.1 Summary of Aging Management Programs for Steam and Power Conversion System Evaluated in Chapter VIII of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	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	No	Loss of material due to pitting and crevice corrosion for applicable components exposed to a closed-cycle cooling water environment is managed by the Work Control Process program, which is a plant-specific program.
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	No	Loss of material due to pitting, crevice, and galvanic corrosion for applicable components exposed to a closed-cycle cooling water environment is managed by the Work Control Process program, which is a plant-specific program.
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	No	NUREG-1801 item is not applicable. There are no steel, stainless steel, or copper alloy heat exchanger tubes exposed to a closed-cycle cooling water environment, that perform a heat transfer intended function per 10 CFR 54.4(a).

Table 3.4.1 Summary of Aging Management Programs for Steam and Power Conversion System Evaluated in Chapter VIII of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	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	No	Consistent with NUREG-1801. Loss of material due to general corrosion is managed by the External Surfaces Monitoring program.
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	No	Consistent with NUREG-1801. Wall thinning due to flow - accelerated corrosion is managed by the Flow-Accelerated Corrosion program, which takes some exceptions to the NUREG-1801 AMP
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	No	Loss of material due to general, pitting, and crevice corrosion is managed by the Work Control Process program, which is a plant-specific program.

Table 3.4.1 Summary of Aging Management Programs for Steam and Power Conversion System Evaluated in Chapter VIII of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-31	Steel heat exchanger components exposed to raw water	Loss of material due to general, pitting, crevice, galvanic, and micro-biologically-influenced corrosion, and fouling	Open-Cycle Cooling Water System	No	Loss of material due to general, pitting, crevice, galvanic, microbiologically- influenced corrosion, and fouling is managed by the Work Control Process program, which is a plant-specific program.
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 micro-biologically-influenced corrosion	Open-Cycle Cooling Water System	No	Loss of material due to pitting, crevice, and microbiologically-influenced corrosion is managed by the Work Control Process program, which is a plant-specific program.
3.4.1-33	Stainless steel heat exchanger components exposed to raw water	Loss of material due to pitting, crevice, and micro-biologically-influenced corrosion, and fouling	Open-Cycle Cooling Water System	No	NUREG-1801 item is not applicable. There are no stainless steel heat exchanger components exposed to a raw water environment.

Table 3.4.1 Summary of Aging Management Programs for Steam and Power Conversion System Evaluated in Chapter VIII of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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	No	NUREG-1801 item is not applicable. There are no steel, stainless steel or copper alloy heat exchanger components exposed to a raw water environment that have a heat transfer intended function per 10 CFR 54.4(a).
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	No	Consistent with NUREG-1801. Loss of material due to selective leaching is managed by the Selective Leaching of Materials program.
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	No	Consistent with NUREG-1801. Loss of material due to selective leaching is managed by the Selective Leaching of Materials program.

Table 3.4.1 Summary of Aging Management Programs for Steam and Power Conversion System Evaluated in Chapter VIII of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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	No	Consistent with NUREG-1801. Loss of material due to pitting and crevice corrosion is managed by the Work Control Process program, which is a plant-specific program, and the Secondary Water Chemistry program.
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	No	Consistent with NUREG-1801. Loss of material due to boric acid corrosion is managed by the Boric Acid Corrosion program.
3.4.1-39	Stainless steel piping, piping components, and piping elements exposed to steam	Cracking due to stress corrosion cracking	Water Chemistry	No	Consistent with NUREG-1801. Cracking due to stress corrosion cracking is managed by he Work Control Process program, which is a plant-specific program, and the Secondary Water Chemistry program.

Table 3.4.1 Summary of Aging Management Programs for Steam and Power Conversion System Evaluated in Chapter VIII of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-40	Glass piping elements exposed to air, lubricating oil, raw water, and treated water	None	None	NA - No AEM or AMP	Consistent with NUREG-1801. There are no aging effects associated with glass components exposed to air - indoor uncontrolled (external), lubricating oil, raw water, treated water, or treated borated water.
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	NA - No AEM or AMP	Consistent with NUREG-1801. There are no aging effects associated with stainless steel, copper alloy, and nickel alloy components exposed to air-indoor uncontrolled.
3.4.1-42	Steel piping, piping components, and piping elements exposed to air – indoor controlled (external)	None	None	NA - No AEM or AMP	Consistent with NUREG-1801. There are no aging effects associated with steel components exposed to air-indoor controlled (external).

Table 3.4.1 Summary of Aging Management Programs for Steam and Power Conversion System Evaluated in Chapter VIII of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-43	Steel and stainless steel piping, piping components, and piping elements in concrete	None	None	NA - No AEM or AMP	NUREG-1801 item is not applicable. There are no steel or stainless steel piping components or piping elements in concrete.
3.4.1-44	Steel, stainless steel, aluminum, and copper alloy piping, piping components, and piping elements exposed to gas	None	None	NA - No AEM or AMP	Consistent with NUREG-1801. There are no aging effects associated with steel, stainless steel, aluminum, or copper alloy components exposed to gas.

Results Tables: Steam and Power Conversion Systems AMR Results

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-1: Steam and Power Conversion System - Turbine - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Accumulators (EHC)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Gas-inert	None	None	VIII.I-15	3.4.1-44	A
			(I) Hydraulic oil	None	None			H
Accumulators (Zero speed indication)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Lube oil	Loss of material/general, pitting, and crevice corrosion	Lubricating Oil Analysis	VIII.A-14	3.4.1-07	A
					Work Control Process	VIII.A-14	3.4.1-07	E
Bolting	PB	Steel	(E) Air-indoor uncontrolled	Cracking/cyclic loading, stress corrosion cracking	Bolting Integrity	VIII.H-03	3.4.1-21	A
				Loss of material/general, pitting, and crevice corrosion	Bolting Integrity	VIII.H-04	3.4.1-22	A
				Loss of preload/thermal effects, gasket creep, and self-loosening	Bolting Integrity	VIII.H-05	3.4.1-22	A
Electro Hydraulic Control System Oil Coolers (Bonnets)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Raw water	Loss of material/erosion	Work Control Process			H
				Loss of material/general, pitting, crevice, galvanic, and microbiologically influenced corrosion, and fouling	Work Control Process	S-024	3.4.1-31	E
				Loss of material/selective leaching	Selective Leaching of Materials	VIII.A-07	3.4.1-36	C, S3

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-1: Steam and Power Conversion System - Turbine - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Electro Hydraulic Control System Oil Coolers (Shell)	PB	Copper Alloys	(E) Air-indoor uncontrolled	None	None	VIII.I-02	3.4.1-41	A
			(I) Hydraulic oil	None	None			H
Filter Housings	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Hydraulic oil	None	None			H
Pipe	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VIII.I-10	3.4.1-41	A
			(I) Hydraulic oil	None	None			H
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Lube oil	Loss of material/general, pitting, and crevice corrosion	Lubricating Oil Analysis	VIII.A-14	3.4.1-07	A
					Work Control Process	VIII.A-14	3.4.1-07	E
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	VIII.A-16	3.4.1-02	A
					Work Control Process	VIII.A-16	3.4.1-02	E
Pumps (EHC)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Hydraulic oil	None	None			H
Reservoir (EHC)	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VIII.I-10	3.4.1-41	A
			(I) Hydraulic oil	None	None			H

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-1: Steam and Power Conversion System - Turbine - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Sight Glasses	PB	Glass	(E) Air-indoor uncontrolled	None	None	VIII.I-05	3.4.1-40	A
			(I) Lube oil	None	None	VIII.I-06	3.4.1-40	A
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Lube oil	Loss of material/general, pitting, and crevice corrosion	Lubricating Oil Analysis	VIII.A-14	3.4.1-07	A
					Work Control Process	VIII.A-14	3.4.1-07	E
Tubing	PB	Copper Alloys	(E) Air-indoor uncontrolled	None	None	VIII.I-02	3.4.1-41	A
			(I) Hydraulic oil	None	None			H
			(I) Lube oil	Loss of material/pitting and crevice corrosion	Lubricating Oil Analysis	VIII.A-03	3.4.1-18	A
					Work Control Process	VIII.A-03	3.4.1-18	E
		Stainless Steel	(E) Air-indoor uncontrolled	None	None	VIII.I-10	3.4.1-41	A
			(I) Hydraulic oil	None	None			H
			(I) Lube oil	Loss of material/pitting, crevice, and microbiologically influenced corrosion	Lubricating Oil Analysis	VIII.A-09	3.4.1-19	A
					Work Control Process	VIII.A-09	3.4.1-19	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-1: Steam and Power Conversion System - Turbine - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Tubing	PB	Stainless Steel	(I) Treated water and/or steam-secondary	Cracking/stress corrosion cracking	Secondary Water Chemistry	VIII.A-10	3.4.1-39	A
					Work Control Process	VIII.A-10	3.4.1-39	E
				Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	VIII.A-12	3.4.1-37	A
					Work Control Process	VIII.A-12	3.4.1-37	E
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Hydraulic oil	None	None			H
			(I) Lube oil	Loss of material/general, pitting, and crevice corrosion	Lubricating Oil Analysis	VIII.A-14	3.4.1-07	A
					Work Control Process	VIII.A-14	3.4.1-07	E
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	VIII.A-16	3.4.1-02	A
					Work Control Process	VIII.A-16	3.4.1-02	E
Turbine Casings	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	VIII.A-16	3.4.1-02	A
					Work Control Process	VIII.A-16	3.4.1-02	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-1: Steam and Power Conversion System - Turbine - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Turbine Exhaust Hoods	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	VIII.A-16	3.4.1-02	A
					Work Control Process	VIII.A-16	3.4.1-02	E
Turbine Gland Steam Condenser (Shell and Channel Heads)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	S-019	3.4.1-03	A
					Work Control Process	S-019	3.4.1-03	E
Turbine Oil Coolers (Channel heads)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Raw water	Loss of material/erosion	Work Control Process			H
				Loss of material/general, pitting, crevice, galvanic, and microbiologically influenced corrosion, and fouling	Work Control Process	S-024	3.4.1-31	E
				Loss of material/selective leaching	Selective Leaching of Materials	VIII.A-07	3.4.1-36	C, S3
Turbine Oil Coolers (Shell)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Lube oil	Loss of material/general, pitting, crevice, and microbiologically influenced corrosion	Lubricating Oil Analysis	S-017	3.4.1-12	A
					Work Control Process	S-017	3.4.1-12	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-1: Steam and Power Conversion System - Turbine - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Valves	PB	Copper Alloys	(E) Air-indoor uncontrolled	None	None	VIII.I-02	3.4.1-41	A
			(I) Hydraulic oil	None	None			H
			(I) Lube oil	Loss of material/pitting and crevice corrosion	Lubricating Oil Analysis	VIII.A-03	3.4.1-18	A
					Work Control Process	VIII.A-03	3.4.1-18	E
		Stainless Steel	(E) Air-indoor uncontrolled	None	None	VIII.I-10	3.4.1-41	A
			(I) Hydraulic oil	None	None			H
			(I) Lube oil	Loss of material/pitting, crevice, and microbiologically influenced corrosion	Lubricating Oil Analysis	VIII.A-09	3.4.1-19	A
					Work Control Process	VIII.A-09	3.4.1-19	E
			(I) Treated water and/or steam-secondary	Cracking/stress corrosion cracking	Secondary Water Chemistry	VIII.A-10	3.4.1-39	A
					Work Control Process	VIII.A-10	3.4.1-39	E
				Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	VIII.A-12	3.4.1-37	A
					Work Control Process	VIII.A-12	3.4.1-37	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-1: Steam and Power Conversion System - Turbine - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Valves	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Hydraulic oil	None	None			H
			(I) Lube oil	Loss of material/general, pitting, and crevice corrosion	Lubricating Oil Analysis	VIII.A-14	3.4.1-07	A
					Work Control Process	VIII.A-14	3.4.1-07	E
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	VIII.A-16	3.4.1-02	A
					Work Control Process	VIII.A-16	3.4.1-02	E

Table 3.4.2-1 Notes:

Plant Standard Notes

Note - The following plant standard notes have generic applicability, but may or may not be used for each SSC:

S1. Thermal embrittlement is only applicable to CASS components that are subject to temperatures in excess of 482°F.

S2. Cracking due to SCC is only applicable to stainless steel components exposed to temperatures greater than 140°F.

S3. Selective leaching is applicable to the material group 'Steel,' but only for gray cast iron components.

Industry Standard Notes

See last page of Section 3.4 tables.

Table 3.4.2-2: Steam and Power Conversion System - Main Steam and Steam Dump - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Bolting	PB	Steel	(E) Air-indoor uncontrolled	Cracking/cyclic loading, stress corrosion cracking	Bolting Integrity	VIII.H-03	3.4.1-21	A
				Loss of material/general, pitting, and crevice corrosion	Bolting Integrity	VIII.H-04	3.4.1-22	A
				Loss of preload/thermal effects, gasket creep, and self-loosening	Bolting Integrity	VIII.H-05	3.4.1-22	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VIII.H-02	3.4.1-38	A
Condensing Chambers	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VIII.H-09	3.4.1-38	A
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	VIII.B1-11	3.4.1-04	A
					Work Control Process	VIII.B1-11	3.4.1-04	E
Flex Connections	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VIII.I-10	3.4.1-41	A
			(I) Air-moist	Loss of material/pitting and crevice corrosion	Work Control Process			H
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Air-moist	Loss of material/general, pitting, and crevice corrosion	Work Control Process	VIII.B1-07	3.4.1-30	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-2: Steam and Power Conversion System - Main Steam and Steam Dump - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Flow Elements	PB; RF	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VIII.I-10	3.4.1-41	A
			(I) Treated water and/or steam-secondary	Cracking/stress corrosion cracking	Secondary Water Chemistry	VIII.B1-05	3.4.1-14	A, S2
					Work Control Process	VIII.B1-05	3.4.1-14	E, S2
				Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	VIII.B1-04	3.4.1-16	A
					Work Control Process	VIII.B1-04	3.4.1-16	E
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	VIII.B1-11	3.4.1-04	A
					Work Control Process	VIII.B1-11	3.4.1-04	E
Flow Orifices	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VIII.I-10	3.4.1-41	A
			(I) Treated water and/or steam-secondary	Cracking/stress corrosion cracking	Secondary Water Chemistry	VIII.B1-05	3.4.1-14	A, S2
					Work Control Process	VIII.B1-05	3.4.1-14	E, S2
				Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	VIII.B1-04	3.4.1-16	A
					Work Control Process	VIII.B1-04	3.4.1-16	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-2: Steam and Power Conversion System - Main Steam and Steam Dump - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Moisture Separator (Steam to TDAFW Pump)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Air-moist	Loss of material/general, pitting, and crevice corrosion	Work Control Process	VIII.B1-07	3.4.1-30	E
Pipe	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VIII.I-10	3.4.1-41	A
			(I) Air-moist	Loss of material/pitting and crevice corrosion	Work Control Process			H
			(I) Treated water and/or steam-secondary	Cracking/stress corrosion cracking	Secondary Water Chemistry	VIII.B1-05	3.4.1-14	A, S2
					Work Control Process	VIII.B1-05	3.4.1-14	E, S2
				Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	VIII.B1-04	3.4.1-37	A
					Work Control Process	VIII.B1-04	3.4.1-37	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-2: Steam and Power Conversion System - Main Steam and Steam Dump - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Pipe	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(E) Air-outdoor	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-08	3.4.1-28	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VIII.H-09	3.4.1-38	A
			(I) Air-moist	Loss of material/general, pitting, and crevice corrosion	Work Control Process	VIII.B1-07	3.4.1-30	E
			(I) Treated water and/or steam-secondary	Cumulative fatigue damage/fatigue	TLAA	VIII.B1-10	3.4.1-01	A
				Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	VIII.B1-11	3.4.1-04	A
					Work Control Process	VIII.B1-11	3.4.1-04	E
				Wall thinning/flow-accelerated corrosion	Flow-Accelerated Corrosion	VIII.B1-09	3.4.1-29	B
Piping Sleeves	EQB; JIS; PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A, 1
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VIII.H-09	3.4.1-38	A, 1

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-2: Steam and Power Conversion System - Main Steam and Steam Dump - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Rupture Discs	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VIII.I-10	3.4.1-41	A
			(I) Air-moist	Loss of material/pitting and crevice corrosion	Work Control Process			H
			(I) Treated water and/or steam-secondary	Cracking/stress corrosion cracking	Secondary Water Chemistry	VIII.B1-05	3.4.1-14	A, S2
					Work Control Process	VIII.B1-05	3.4.1-14	E, S2
				Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	VIII.B1-04	3.4.1-37	A
					Work Control Process	VIII.B1-04	3.4.1-37	E
Strainer Housings	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	VIII.B1-11	3.4.1-04	A
					Work Control Process	VIII.B1-11	3.4.1-04	E
Traps	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	VIII.B1-11	3.4.1-04	A
					Work Control Process	VIII.B1-11	3.4.1-04	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-2: Steam and Power Conversion System - Main Steam and Steam Dump - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Tubing	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VIII.I-10	3.4.1-41	A
			(I) Treated water and/or steam-secondary	Cracking/stress corrosion cracking	Secondary Water Chemistry	VIII.B1-05	3.4.1-14	A, S2
					Work Control Process	VIII.B1-05	3.4.1-14	E, S2
				Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	VIII.B1-04	3.4.1-37	A
					Work Control Process	VIII.B1-04	3.4.1-37	E
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VIII.H-09	3.4.1-38	A
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	VIII.B1-11	3.4.1-04	A
					Work Control Process	VIII.B1-11	3.4.1-04	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-2: Steam and Power Conversion System - Main Steam and Steam Dump - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Valves	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VIII.I-10	3.4.1-41	A
			(I) Treated water and/or steam-secondary	Cracking/stress corrosion cracking	Secondary Water Chemistry	VIII.B1-05	3.4.1-14	A, S2
					Work Control Process	VIII.B1-05	3.4.1-14	E, S2
				Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	VIII.B1-04	3.4.1-37	A
					Work Control Process	VIII.B1-04	3.4.1-37	E
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VIII.H-09	3.4.1-38	A
			(I) Air-moist	Loss of material/general, pitting, and crevice corrosion	Work Control Process	VIII.B1-07	3.4.1-30	E
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	VIII.B1-11	3.4.1-04	A
					Work Control Process	VIII.B1-11	3.4.1-04	E
				Wall thinning/flow-accelerated corrosion	Flow-Accelerated Corrosion	VIII.B1-09	3.4.1-29	B

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-2 Notes:

Plant Standard Notes

Note - The following plant standard notes have generic applicability, but may or may not be used for each SSC:

S1. Thermal embrittlement is only applicable to CASS components that are subject to temperatures in excess of 482°F.

S2. Cracking due to SCC is only applicable to stainless steel components exposed to temperatures greater than 140°F.

S3. Selective leaching is applicable to the material group 'Steel,' but only for gray cast iron components.

System Specific Notes

1. As shown on USAR Figure 10A.3-1, encapsulation sleeves, jet impingement barrier sleeves, and restraint sleeves are used to mitigate a HELB.

Industry Standard Notes

See last page of Section 3.4 tables.

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-3: Steam and Power Conversion System - Bleed Steam - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Bolting	PB	Steel	(E) Air-indoor uncontrolled	Cracking/cyclic loading, stress corrosion cracking	Bolting Integrity	VIII.H-03	3.4.1-21	A
				Loss of material/general, pitting, and crevice corrosion	Bolting Integrity	VIII.H-04	3.4.1-22	A
				Loss of preload/thermal effects, gasket creep, and self-loosening	Bolting Integrity	VIII.H-05	3.4.1-22	A
Expansion Joints	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VIII.I-10	3.4.1-41	A
			(I) Air-moist	Loss of material/pitting and crevice corrosion	Work Control Process			H
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Air-moist	Loss of material/general, pitting, and crevice corrosion	Work Control Process	SP-060	3.4.1-30	E
Flow Elements	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VIII.I-10	3.4.1-41	A
			(I) Treated water and/or steam-secondary	Cracking/stress corrosion cracking	Secondary Water Chemistry	VIII.C-02	3.4.1-14	A, S2
					Work Control Process	VIII.C-02	3.4.1-14	E, S2
				Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	VIII.C-01	3.4.1-16	A
					Work Control Process	VIII.C-01	3.4.1-16	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-3: Steam and Power Conversion System - Bleed Steam - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Moisture Separators/Reheaters (Shell and Channel Head)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	S-019	3.4.1-03	A
					Work Control Process	S-019	3.4.1-03	E
				Wall thinning/flow-accelerated corrosion	Flow-Accelerated Corrosion	VIII.C-05	3.4.1-29	D
Pipe	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VIII.I-10	3.4.1-41	A
			(I) Air-moist	Loss of material/pitting and crevice corrosion	Work Control Process			H
			(I) Treated water and/or steam-secondary	Cracking/stress corrosion cracking	Secondary Water Chemistry	VIII.C-02	3.4.1-14	A, S2
					Work Control Process	VIII.C-02	3.4.1-14	E, S2
				Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	VIII.C-01	3.4.1-16	A
					Work Control Process	VIII.C-01	3.4.1-16	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-3: Steam and Power Conversion System - Bleed Steam - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Pipe	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Air-moist	Loss of material/general, pitting, and crevice corrosion	Work Control Process	SP-060	3.4.1-30	E
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	VIII.C-07	3.4.1-04	A
					Work Control Process	VIII.C-07	3.4.1-04	E
				Wall thinning/flow-accelerated corrosion	Flow-Accelerated Corrosion	VIII.C-05	3.4.1-29	B
Restricting Orifices	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VIII.I-10	3.4.1-41	A
			(I) Treated water and/or steam-secondary	Cracking/stress corrosion cracking	Secondary Water Chemistry	VIII.C-02	3.4.1-14	A, S2
					Work Control Process	VIII.C-02	3.4.1-14	E, S2
				Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	VIII.C-01	3.4.1-16	A
					Work Control Process	VIII.C-01	3.4.1-16	E
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	VIII.C-07	3.4.1-04	A
					Work Control Process	VIII.C-07	3.4.1-04	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-3: Steam and Power Conversion System - Bleed Steam - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Tubing	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VIII.I-10	3.4.1-41	A
			(I) Treated water and/or steam-secondary	Cracking/stress corrosion cracking	Secondary Water Chemistry	VIII.C-02	3.4.1-14	A, S2
					Work Control Process	VIII.C-02	3.4.1-14	E, S2
				Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	VIII.C-01	3.4.1-16	A
					Work Control Process	VIII.C-01	3.4.1-16	E
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	VIII.C-07	3.4.1-04	A
					Work Control Process	VIII.C-07	3.4.1-04	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-3: Steam and Power Conversion System - Bleed Steam - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Valves	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VIII.I-10	3.4.1-41	A
			(I) Treated water and/or steam-secondary	Cracking/stress corrosion cracking	Secondary Water Chemistry	VIII.C-02	3.4.1-14	A, S2
					Work Control Process	VIII.C-02	3.4.1-14	E, S2
				Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	VIII.C-01	3.4.1-16	A
					Work Control Process	VIII.C-01	3.4.1-16	E
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Air-moist	Loss of material/general, pitting, and crevice corrosion	Work Control Process	SP-060	3.4.1-30	E
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	VIII.C-07	3.4.1-04	A
					Work Control Process	VIII.C-07	3.4.1-04	E
				Wall thinning/flow-accelerated corrosion	Flow-Accelerated Corrosion	VIII.C-05	3.4.1-29	B

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-3 Notes:

Plant Standard Notes

Note - The following plant standard notes have generic applicability, but may or may not be used for each SSC:

S1. Thermal embrittlement is only applicable to CASS components that are subject to temperatures in excess of 482°F.

S2. Cracking due to SCC is only applicable to stainless steel components exposed to temperatures greater than 140°F.

S3. Selective leaching is applicable to the material group 'Steel,' but only for gray cast iron components.

Industry Standard Notes

See last page of Section 3.4 tables.

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-4: Steam and Power Conversion System - Feedwater - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Bolting	PB	Steel	(E) Air-indoor uncontrolled	Cracking/cyclic loading, stress corrosion cracking	Bolting Integrity	VIII.H-03	3.4.1-21	A
				Loss of material/general, pitting, and crevice corrosion	Bolting Integrity	VIII.H-04	3.4.1-22	A
				Loss of preload/thermal effects, gasket creep, and self-loosening	Bolting Integrity	VIII.H-05	3.4.1-22	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VIII.H-02	3.4.1-38	A
Breakdown Orifices	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VIII.I-10	3.4.1-41	A
			(I) Treated water and/or steam-secondary	Cracking/stress corrosion cracking	Secondary Water Chemistry	VIII.D1-05	3.4.1-14	A, S2
					Work Control Process	VIII.D1-05	3.4.1-14	E, S2
				Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	VIII.D1-04	3.4.1-16	A
					Work Control Process	VIII.D1-04	3.4.1-16	E
Feedwater Heaters (Shell and Channel Heads)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	S-019	3.4.1-03	A
					Work Control Process	S-019	3.4.1-03	E
				Wall thinning/flow-accelerated corrosion	Flow-Accelerated Corrosion	VIII.D1-09	3.4.1-29	D

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-4: Steam and Power Conversion System - Feedwater - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Feedwater Pumps	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VIII.I-10	3.4.1-41	A
			(I) Treated water and/or steam-secondary	Cracking/stress corrosion cracking	Secondary Water Chemistry	VIII.D1-05	3.4.1-14	A, S2
					Work Control Process	VIII.D1-05	3.4.1-14	E, S2
				Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	VIII.D1-04	3.4.1-16	A
					Work Control Process	VIII.D1-04	3.4.1-16	E
Feedwater Pumps Oil Coolers (Channel Heads)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Raw water	Loss of material/erosion	Work Control Process			H
				Loss of material/general, pitting, crevice, galvanic, and microbiologically influenced corrosion, and fouling	Work Control Process	S-024	3.4.1-31	E
				Loss of material/selective leaching	Selective Leaching of Materials	SP-028	3.4.1-36	C, S3
Feedwater Pumps Oil Coolers (Shell)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Lube oil	Loss of material/general, pitting, crevice, and microbiologically influenced corrosion	Lubricating Oil Analysis	S-017	3.4.1-12	A
					Work Control Process	S-017	3.4.1-12	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-4: Steam and Power Conversion System - Feedwater - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Filter Housings (Oil)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Lube oil	Loss of material/general, pitting, and crevice corrosion	Lubricating Oil Analysis	VIII.D1-06	3.4.1-07	A
					Work Control Process	VIII.D1-06	3.4.1-07	E
Flow Elements/Nozzles	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VIII.I-10	3.4.1-41	A
			(I) Treated water and/or steam-secondary	Cracking/stress corrosion cracking	Secondary Water Chemistry	VIII.D1-05	3.4.1-14	A, S2
					Work Control Process	VIII.D1-05	3.4.1-14	E, S2
				Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	VIII.D1-04	3.4.1-16	A
					Work Control Process	VIII.D1-04	3.4.1-16	E
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VIII.H-09	3.4.1-38	A
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	VIII.D1-08	3.4.1-04	A
					Work Control Process	VIII.D1-08	3.4.1-04	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-4: Steam and Power Conversion System - Feedwater - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Oil Pumps (Main and Auxiliary)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Lube oil	Loss of material/general, pitting, and crevice corrosion	Lubricating Oil Analysis	VIII.D1-06	3.4.1-07	A
					Work Control Process	VIII.D1-06	3.4.1-07	E
Oil Reservoirs	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Lube oil	Loss of material/general, pitting, and crevice corrosion	Lubricating Oil Analysis	VIII.D1-06	3.4.1-07	A
					Work Control Process	VIII.D1-06	3.4.1-07	E
Pipe	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VIII.I-10	3.4.1-41	A
			(I) Treated water and/or steam-secondary	Cracking/stress corrosion cracking	Secondary Water Chemistry	VIII.D1-05	3.4.1-14	A, S2
					Work Control Process	VIII.D1-05	3.4.1-14	E, S2
				Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	VIII.D1-04	3.4.1-16	A
					Work Control Process	VIII.D1-04	3.4.1-16	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-4: Steam and Power Conversion System - Feedwater - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Pipe	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VIII.H-09	3.4.1-38	A
			(I) Lube oil	Loss of material/general, pitting, and crevice corrosion	Lubricating Oil Analysis	VIII.D1-06	3.4.1-07	A
					Work Control Process	VIII.D1-06	3.4.1-07	E
			(I) Treated water and/or steam-secondary	Cumulative fatigue damage/fatigue	TLAA	VIII.D1-07	3.4.1-01	A
				Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	VIII.D1-08	3.4.1-04	A
					Work Control Process	VIII.D1-08	3.4.1-04	E
				Wall thinning/flow-accelerated corrosion	Flow-Accelerated Corrosion	VIII.D1-09	3.4.1-29	B
Piping Sleeves	EQB; JIS; PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A, 1
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VIII.H-09	3.4.1-38	A, 1

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-4: Steam and Power Conversion System - Feedwater - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Straightening Vanes	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VIII.I-10	3.4.1-41	A
			(I) Treated water and/or steam-secondary	Cracking/stress corrosion cracking	Secondary Water Chemistry	VIII.D1-05	3.4.1-14	A, S2
					Work Control Process	VIII.D1-05	3.4.1-14	E, S2
				Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	VIII.D1-04	3.4.1-16	A
					Work Control Process	VIII.D1-04	3.4.1-16	E
Tubing	PB	Copper Alloys	(E) Air-indoor uncontrolled	None	None	VIII.I-02	3.4.1-41	A
			(I) Lube oil	Loss of material/pitting and crevice corrosion	Lubricating Oil Analysis	VIII.D1-02	3.4.1-18	A
					Work Control Process	VIII.D1-02	3.4.1-18	E
		Stainless Steel	(E) Air-indoor uncontrolled	None	None	VIII.I-10	3.4.1-41	A
			(I) Treated water and/or steam-secondary	Cracking/stress corrosion cracking	Secondary Water Chemistry	VIII.D1-05	3.4.1-14	A, S2
					Work Control Process	VIII.D1-05	3.4.1-14	E, S2
				Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	VIII.D1-04	3.4.1-16	A
					Work Control Process	VIII.D1-04	3.4.1-16	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-4: Steam and Power Conversion System - Feedwater - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Tubing	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VIII.H-09	3.4.1-38	A
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	VIII.D1-08	3.4.1-04	A
					Work Control Process	VIII.D1-08	3.4.1-04	E
Valves	PB	Copper Alloys	(E) Air-indoor uncontrolled	None	None	VIII.I-02	3.4.1-41	A
			(I) Lube oil	Loss of material/pitting and crevice corrosion	Lubricating Oil Analysis	VIII.D1-02	3.4.1-18	A
					Work Control Process	VIII.D1-02	3.4.1-18	E
		Stainless Steel	(E) Air-indoor uncontrolled	None	None	VIII.I-10	3.4.1-41	A
			(I) Treated water and/or steam-secondary	Cracking/stress corrosion cracking	Secondary Water Chemistry	VIII.D1-05	3.4.1-14	A, S2
					Work Control Process	VIII.D1-05	3.4.1-14	E, S2
				Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	VIII.D1-04	3.4.1-16	A
					Work Control Process	VIII.D1-04	3.4.1-16	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-4: Steam and Power Conversion System - Feedwater - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Valves	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VIII.H-09	3.4.1-38	A
			(I) Lube oil	Loss of material/general, pitting, and crevice corrosion	Lubricating Oil Analysis	VIII.D1-06	3.4.1-07	A
					Work Control Process	VIII.D1-06	3.4.1-07	E
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	VIII.D1-08	3.4.1-04	A
					Work Control Process	VIII.D1-08	3.4.1-04	E
				Wall thinning/flow-accelerated corrosion	Flow-Accelerated Corrosion	VIII.D1-09	3.4.1-29	B

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-4 Notes:

Plant Standard Notes

Note - The following plant standard notes have generic applicability, but may or may not be used for each SSC:

S1. Thermal embrittlement is only applicable to CASS components that are subject to temperatures in excess of 482°F.

S2. Cracking due to SCC is only applicable to stainless steel components exposed to temperatures greater than 140°F.

S3. Selective leaching is applicable to the material group 'Steel,' but only for gray cast iron components.

System Specific Notes

1. As shown on USAR Figure 10A.4-1, jet impingement barrier sleeves and restraint sleeves are used to mitigate a HELB.

Industry Standard Notes

See last page of Section 3.4 tables.

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-5: Steam and Power Conversion System - Condensate - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Bolting	PB	Steel	(E) Air-indoor uncontrolled	Cracking/cyclic loading, stress corrosion cracking	Bolting Integrity	VIII.H-03	3.4.1-21	A
				Loss of material/general, pitting, and crevice corrosion	Bolting Integrity	VIII.H-04	3.4.1-22	A
				Loss of preload/thermal effects, gasket creep, and self-loosening	Bolting Integrity	VIII.H-05	3.4.1-22	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VIII.H-02	3.4.1-38	A
Condensate Storage Tanks	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VIII.I-10	3.4.1-41	C
			(I) Treated water and/or steam-secondary	Loss of material/general (steel only), pitting and crevice corrosion	Secondary Water Chemistry	VIII.E-40	3.4.1-06	A
					Work Control Process	VIII.E-40	3.4.1-06	E
Feedwater Heaters (Shell and Channel Heads)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	VIII.E-37	3.4.1-03	A
					Work Control Process	VIII.E-37	3.4.1-03	E
				Wall thinning/flow-accelerated corrosion	Flow-Accelerated Corrosion	VIII.E-35	3.4.1-29	D

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-5: Steam and Power Conversion System - Condensate - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Feedwater Seal Water Startup Filter Housings	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	VIII.E-34	3.4.1-04	A
					Work Control Process	VIII.E-34	3.4.1-04	E
Flow Elements	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	VIII.E-34	3.4.1-04	A
					Work Control Process	VIII.E-34	3.4.1-04	E
Flow Switches	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VIII.I-10	3.4.1-41	A
			(I) Treated water and/or steam-secondary	Cracking/stress corrosion cracking	Secondary Water Chemistry	VIII.E-30	3.4.1-14	A, S2
					Work Control Process	VIII.E-30	3.4.1-14	E, S2
				Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	VIII.E-29	3.4.1-16	A
					Work Control Process	VIII.E-29	3.4.1-16	E
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	VIII.E-34	3.4.1-04	A
					Work Control Process	VIII.E-34	3.4.1-04	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-5: Steam and Power Conversion System - Condensate - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Pipe	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VIII.I-10	3.4.1-41	A
			(I) Treated water and/or steam-secondary	Cracking/stress corrosion cracking	Secondary Water Chemistry	VIII.E-30	3.4.1-14	A, S2
					Work Control Process	VIII.E-30	3.4.1-14	E, S2
				Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	VIII.E-29	3.4.1-16	A
					Work Control Process	VIII.E-29	3.4.1-16	E
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VIII.H-09	3.4.1-38	A
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	VIII.E-34	3.4.1-04	A
					Work Control Process	VIII.E-34	3.4.1-04	E
				Wall thinning/flow-accelerated corrosion	Flow-Accelerated Corrosion	VIII.E-35	3.4.1-29	B

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-5: Steam and Power Conversion System - Condensate - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Strainer Housings	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VIII.I-10	3.4.1-41	A
			(I) Treated water and/or steam-secondary	Cracking/stress corrosion cracking	Secondary Water Chemistry	VIII.E-30	3.4.1-14	A, S2
					Work Control Process	VIII.E-30	3.4.1-14	E, S2
				Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	VIII.E-29	3.4.1-16	A
					Work Control Process	VIII.E-29	3.4.1-16	E
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	VIII.E-34	3.4.1-04	A
					Work Control Process	VIII.E-34	3.4.1-04	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-5: Steam and Power Conversion System - Condensate - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Tubing	PB	Copper Alloys	(E) Air-indoor uncontrolled	None	None	VIII.I-02	3.4.1-41	A
			(I) Treated water and/or steam-secondary	Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	SP-061	3.4.1-15	A
					Work Control Process	SP-061	3.4.1-15	E
		Stainless Steel	(E) Air-indoor uncontrolled	None	None	VIII.I-10	3.4.1-41	A
			(I) Treated water and/or steam-secondary	Cracking/stress corrosion cracking	Secondary Water Chemistry	VIII.E-30	3.4.1-14	A, S2
					Work Control Process	VIII.E-30	3.4.1-14	E, S2
				Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	VIII.E-29	3.4.1-16	A
					Work Control Process	VIII.E-29	3.4.1-16	E
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VIII.H-09	3.4.1-38	A
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	VIII.E-34	3.4.1-04	A
					Work Control Process	VIII.E-34	3.4.1-04	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-5: Steam and Power Conversion System - Condensate - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Valves	PB	Copper Alloys	(E) Air-indoor uncontrolled	None	None	VIII.I-02	3.4.1-41	A
			(I) Treated water and/or steam-secondary	Cracking/stress corrosion cracking	Secondary Water Chemistry			H
					Work Control Process			H
				Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	SP-061	3.4.1-15	A
					Work Control Process	SP-061	3.4.1-15	E
				Loss of material/selective leaching	Selective Leaching of Materials	VIII.E-21	3.4.1-35	A
		Stainless Steel	(E) Air-indoor uncontrolled	None	None	VIII.I-10	3.4.1-41	A
			(I) Treated water and/or steam-secondary	Cracking/stress corrosion cracking	Secondary Water Chemistry	VIII.E-30	3.4.1-14	A, S2
					Work Control Process	VIII.E-30	3.4.1-14	E, S2
				Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	VIII.E-29	3.4.1-16	A
					Work Control Process	VIII.E-29	3.4.1-16	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-5: Steam and Power Conversion System - Condensate - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Valves	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VIII.H-09	3.4.1-38	A
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	VIII.E-34	3.4.1-04	A
					Work Control Process	VIII.E-34	3.4.1-04	E
				Loss of material/selective leaching	Selective Leaching of Materials	VIII.E-23	3.4.1-36	A, S3
				Wall thinning/flow-accelerated corrosion	Flow-Accelerated Corrosion	VIII.E-35	3.4.1-29	B

Table 3.4.2-5 Notes:

Plant Standard Notes

Note - The following plant standard notes have generic applicability, but may or may not be used for each SSC:

S1. Thermal embrittlement is only applicable to CASS components that are subject to temperatures in excess of 482°F.

S2. Cracking due to SCC is only applicable to stainless steel components exposed to temperatures greater than 140°F.

S3. Selective leaching is applicable to the material group 'Steel,' but only for gray cast iron components.

Industry Standard Notes

See last page of Section 3.4 tables.

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-6: Steam and Power Conversion System - Steam Generator Blowdown Treatment - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Bolting	PB	Steel	(E) Air-indoor uncontrolled	Cracking/cyclic loading, stress corrosion cracking	Bolting Integrity	VIII.H-03	3.4.1-21	A
				Loss of material/general, pitting, and crevice corrosion	Bolting Integrity	VIII.H-04	3.4.1-22	A
				Loss of preload/thermal effects, gasket creep, and self-loosening	Bolting Integrity	VIII.H-05	3.4.1-22	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VIII.H-02	3.4.1-38	A
Filter Housings	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VIII.I-10	3.4.1-41	A
			(I) Treated water and/or steam-secondary	Cracking/stress corrosion cracking	Secondary Water Chemistry	VIII.F-24	3.4.1-14	A, S2
					Work Control Process	VIII.F-24	3.4.1-14	E, S2
				Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	VIII.F-23	3.4.1-16	A
					Work Control Process	VIII.F-23	3.4.1-16	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-6: Steam and Power Conversion System - Steam Generator Blowdown Treatment - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Flow Indicators	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VIII.I-10	3.4.1-41	A
			(I) Treated water and/or steam-secondary	Cracking/stress corrosion cracking	Secondary Water Chemistry	VIII.F-24	3.4.1-14	A, S2
					Work Control Process	VIII.F-24	3.4.1-14	E, S2
				Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	VIII.F-23	3.4.1-16	A
					Work Control Process	VIII.F-23	3.4.1-16	E
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VIII.H-09	3.4.1-38	A
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	VIII.F-25	3.4.1-04	A
					Work Control Process	VIII.F-25	3.4.1-04	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-6: Steam and Power Conversion System - Steam Generator Blowdown Treatment - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Pipe	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VIII.I-10	3.4.1-41	A
			(I) Treated water and/or steam-secondary	Cracking/stress corrosion cracking	Secondary Water Chemistry	VIII.F-24	3.4.1-14	A, S2
					Work Control Process	VIII.F-24	3.4.1-14	E, S2
				Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	VIII.F-23	3.4.1-16	A
					Work Control Process	VIII.F-23	3.4.1-16	E
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VIII.H-09	3.4.1-38	A
			(I) Air-moist	Loss of material/general, pitting, and crevice corrosion	Work Control Process	SP-060	3.4.1-30	E
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	VIII.F-25	3.4.1-04	A
					Work Control Process	VIII.F-25	3.4.1-04	E
				Wall thinning/flow-accelerated corrosion	Flow-Accelerated Corrosion	VIII.F-26	3.4.1-29	B

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-6: Steam and Power Conversion System - Steam Generator Blowdown Treatment - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Resin Trap	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VIII.I-10	3.4.1-41	A
			(I) Treated water and/or steam-secondary	Cracking/stress corrosion cracking	Secondary Water Chemistry	VIII.F-24	3.4.1-14	A, S2
					Work Control Process	VIII.F-24	3.4.1-14	E, S2
				Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	VIII.F-23	3.4.1-16	A
					Work Control Process	VIII.F-23	3.4.1-16	E
Rupture Disk	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VIII.I-10	3.4.1-41	A
			(I) Air-moist	Loss of material/pitting and crevice corrosion	Work Control Process			H
			(I) Treated water and/or steam-secondary	Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	VIII.F-23	3.4.1-04	A
					Work Control Process	VIII.F-23	3.4.1-04	E
SGBT Recovery Ion Exchangers	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VIII.I-10	3.4.1-41	A
			(I) Treated water and/or steam-secondary	Cracking/stress corrosion cracking	Secondary Water Chemistry	VIII.F-24	3.4.1-14	A, S2
					Work Control Process	VIII.F-24	3.4.1-14	E, S2
				Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	VIII.F-23	3.4.1-16	A
					Work Control Process	VIII.F-23	3.4.1-16	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-6: Steam and Power Conversion System - Steam Generator Blowdown Treatment - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
SGBT Standpipe	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VIII.H-09	3.4.1-38	A
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	VIII.F-25	3.4.1-04	A
					Work Control Process	VIII.F-25	3.4.1-04	E
Steam Generator Blowdown Heat Exchangers (Shell)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VIII.H-09	3.4.1-38	A
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	VIII.F-28	3.4.1-03	A
					Work Control Process	VIII.F-28	3.4.1-03	E
Steam Generator Blowdown Tank	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VIII.H-09	3.4.1-38	A
			(I) Treated water and/or steam-secondary	Loss of material/general (steel only), pitting and crevice corrosion	Secondary Water Chemistry	S-013	3.4.1-06	A
					Work Control Process	S-013	3.4.1-06	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-6: Steam and Power Conversion System - Steam Generator Blowdown Treatment - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Tubing	PB	Copper Alloys	(E) Air-indoor uncontrolled	None	None	VIII.I-02	3.4.1-41	A
			(I) Treated water and/or steam-secondary	Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	VIII.F-15	3.4.1-15	A
					Work Control Process	VIII.F-15	3.4.1-15	E
		Stainless Steel	(E) Air-indoor uncontrolled	None	None	VIII.I-10	3.4.1-41	A
			(I) Treated water and/or steam-secondary	Cracking/stress corrosion cracking	Secondary Water Chemistry	VIII.F-24	3.4.1-14	A, S2
					Work Control Process	VIII.F-24	3.4.1-14	E, S2
				Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	VIII.F-23	3.4.1-16	A
					Work Control Process	VIII.F-23	3.4.1-16	E
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VIII.H-09	3.4.1-38	A
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	VIII.F-25	3.4.1-04	A
					Work Control Process	VIII.F-25	3.4.1-04	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-6: Steam and Power Conversion System - Steam Generator Blowdown Treatment - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Valves	PB	Copper Alloys	(E) Air-indoor uncontrolled	None	None	VIII.I-02	3.4.1-41	A
			(I) Treated water and/or steam-secondary	Cracking/stress corrosion cracking	Secondary Water Chemistry			H
					Work Control Process			H
				Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	VIII.F-15	3.4.1-15	A
					Work Control Process	VIII.F-15	3.4.1-15	E
				Loss of material/selective leaching	Selective Leaching of Materials	VIII.F-18	3.4.1-35	A
		Stainless Steel	(E) Air-indoor uncontrolled	None	None	VIII.I-10	3.4.1-41	A
			(I) Treated water and/or steam-secondary	Cracking/stress corrosion cracking	Secondary Water Chemistry	VIII.F-24	3.4.1-14	A, S2
					Work Control Process	VIII.F-24	3.4.1-14	E, S2
				Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	VIII.F-23	3.4.1-16	A
					Work Control Process	VIII.F-23	3.4.1-16	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-6: Steam and Power Conversion System - Steam Generator Blowdown Treatment - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Valves	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VIII.H-09	3.4.1-38	A
			(I) Air-moist	Loss of material/general, pitting, and crevice corrosion	Work Control Process	SP-060	3.4.1-30	E
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	VIII.F-25	3.4.1-04	A
					Work Control Process	VIII.F-25	3.4.1-04	E
				Wall thinning/flow-accelerated corrosion	Flow-Accelerated Corrosion	VIII.F-26	3.4.1-29	B

Table 3.4.2-6 Notes:

Plant Standard Notes

Note - The following plant standard notes have generic applicability, but may or may not be used for each SSC:

S1. Thermal embrittlement is only applicable to CASS components that are subject to temperatures in excess of 482°F.

S2. Cracking due to SCC is only applicable to stainless steel components exposed to temperatures greater than 140°F.

S3. Selective leaching is applicable to the material group 'Steel,' but only for gray cast iron components.

Industry Standard Notes

See last page of Section 3.4 tables.

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-7: Steam and Power Conversion System - Auxiliary Feedwater - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
AFW Pump Oil Coolers (Bonnet)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	S-019	3.4.1-03	A
					Work Control Process	S-019	3.4.1-03	E
				Loss of material/selective leaching	Selective Leaching of Materials	VIII.G-26	3.4.1-36	C, S3
AFW Pump Oil Coolers (Shell)	PB	Copper Alloys	(E) Air-indoor uncontrolled	None	None	VIII.I-02	3.4.1-41	A
			(I) Lube oil	Loss of material/pitting and crevice corrosion	Lubricating Oil Analysis	VIII.G-19	3.4.1-18	C
					Work Control Process	VIII.G-19	3.4.1-18	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-7: Steam and Power Conversion System - Auxiliary Feedwater - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
AFW Pump Oil Coolers (Tubes)	HT; PB	Copper Alloys	(E) Lube oil	Loss of material/pitting and crevice corrosion	Lubricating Oil Analysis	VIII.G-19	3.4.1-18	C
					Work Control Process	VIII.G-19	3.4.1-18	E
				Reduction of heat transfer/fouling	Lubricating Oil Analysis	VIII.G-08	3.4.1-10	A
					Work Control Process	VIII.G-08	3.4.1-10	E
			(I) Treated water and/or steam-secondary	Cracking/stress corrosion cracking	Secondary Water Chemistry			H
					Work Control Process			H
				Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	SP-061	3.4.1-15	C
					Work Control Process	SP-061	3.4.1-15	E
				Loss of material/selective leaching	Selective Leaching of Materials	VIII.G-23	3.4.1-35	C
				Reduction of heat transfer/fouling	Secondary Water Chemistry	VIII.G-10	3.4.1-09	A
					Work Control Process	VIII.G-10	3.4.1-09	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-7: Steam and Power Conversion System - Auxiliary Feedwater - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
AFW Pump Oil Coolers (Tubesheet)	PB	Copper Alloys	(E) Lube oil	Loss of material/pitting and crevice corrosion	Lubricating Oil Analysis	VIII.G-19	3.4.1-18	C
					Work Control Process	VIII.G-19	3.4.1-18	E
			(I) Treated water and/or steam-secondary	Cracking/stress corrosion cracking	Secondary Water Chemistry			H
					Work Control Process			H
				Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	SP-061	3.4.1-15	C
					Work Control Process	SP-061	3.4.1-15	E
				Loss of material/selective leaching	Selective Leaching of Materials	VIII.G-23	3.4.1-35	C
AFW Pump Oil Pumps	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Lube oil	Loss of material/general, pitting, and crevice corrosion	Lubricating Oil Analysis	VIII.G-35	3.4.1-07	A
					Work Control Process	VIII.G-35	3.4.1-07	E
AFW Pump Oil Reservoir	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Lube oil	Loss of material/general, pitting, and crevice corrosion	Lubricating Oil Analysis	VIII.G-35	3.4.1-07	A
					Work Control Process	VIII.G-35	3.4.1-07	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-7: Steam and Power Conversion System - Auxiliary Feedwater - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Bolting	PB	Steel	(E) Air-indoor uncontrolled	Cracking/cyclic loading, stress corrosion cracking	Bolting Integrity	VIII.H-03	3.4.1-21	A
				Loss of material/general, pitting, and crevice corrosion	Bolting Integrity	VIII.H-04	3.4.1-22	A
				Loss of preload/thermal effects, gasket creep, and self-loosening	Bolting Integrity	VIII.H-05	3.4.1-22	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VIII.H-02	3.4.1-38	A
Breakdown Orifices	PB; RF	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VIII.I-10	3.4.1-41	A
			(I) Treated water and/or steam-secondary	Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	VIII.G-32	3.4.1-16	A
					Work Control Process	VIII.G-32	3.4.1-16	E
Filter Housings (Oil)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Lube oil	Loss of material/general, pitting, and crevice corrosion	Lubricating Oil Analysis	VIII.G-35	3.4.1-07	A
					Work Control Process	VIII.G-35	3.4.1-07	E
Flow Elements	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VIII.I-10	3.4.1-41	A
			(I) Treated water and/or steam-secondary	Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	VIII.G-32	3.4.1-16	A
					Work Control Process	VIII.G-32	3.4.1-16	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-7: Steam and Power Conversion System - Auxiliary Feedwater - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Level Glass	PB	Glass	(E) Air-indoor uncontrolled	None	None	VIII.I-05	3.4.1-40	A
			(I) Lube oil	None	None	VIII.I-06	3.4.1-40	A
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Lube oil	Loss of material/general, pitting, and crevice corrosion	Lubricating Oil Analysis	VIII.G-35	3.4.1-07	A
					Work Control Process	VIII.G-35	3.4.1-07	E
Motor Driven Auxiliary Feedwater Pumps	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	VIII.G-38	3.4.1-04	A
					Work Control Process	VIII.G-38	3.4.1-04	E
Motor Driven Auxiliary Feedwater Pumps (Pump bearing housing)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Lube oil	Loss of material/general, pitting, and crevice corrosion	Lubricating Oil Analysis	VIII.G-35	3.4.1-07	A
					Work Control Process	VIII.G-35	3.4.1-07	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-7: Steam and Power Conversion System - Auxiliary Feedwater - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Pipe	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VIII.H-09	3.4.1-38	A
			(I) Lube oil	Loss of material/general, pitting, and crevice corrosion	Lubricating Oil Analysis	VIII.G-35	3.4.1-07	A
					Work Control Process	VIII.G-35	3.4.1-07	E
			(I) Treated water and/or steam-secondary	Cumulative fatigue damage/fatigue	TLAA	VIII.G-37	3.4.1-01	A
				Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	VIII.G-38	3.4.1-04	A
					Work Control Process	VIII.G-38	3.4.1-04	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-7: Steam and Power Conversion System - Auxiliary Feedwater - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Tubing	PB	Copper Alloys	(E) Air-indoor uncontrolled	None	None	VIII.I-02	3.4.1-41	A
			(I) Treated water and/or steam-secondary	Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	SP-061	3.4.1-15	A
					Work Control Process	SP-061	3.4.1-15	E
		Stainless Steel	(E) Air-indoor uncontrolled	None	None	VIII.I-10	3.4.1-41	A
			(I) Treated water and/or steam-secondary	Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	VIII.G-32	3.4.1-16	A
					Work Control Process	VIII.G-32	3.4.1-16	E
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VIII.H-09	3.4.1-38	A
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	VIII.G-38	3.4.1-04	A
					Work Control Process	VIII.G-38	3.4.1-04	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-7: Steam and Power Conversion System - Auxiliary Feedwater - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Turbine Driven AFW Pump Turbine Bearing Coolers (Coil)	HT; PB	Copper Alloys	(E) Lube oil	Loss of material/pitting and crevice corrosion	Lubricating Oil Analysis	VIII.G-19	3.4.1-18	C, 1
					Work Control Process	VIII.G-19	3.4.1-18	E, 1
				Reduction of heat transfer/fouling	Lubricating Oil Analysis	VIII.G-08	3.4.1-10	A, 1
					Work Control Process	VIII.G-08	3.4.1-10	E, 1
			(I) Treated water and/or steam-secondary	Cracking/stress corrosion cracking	Secondary Water Chemistry			H, 1
					Work Control Process			H, 1
				Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	SP-061	3.4.1-15	C, 1
					Work Control Process	SP-061	3.4.1-15	E, 1
				Loss of material/selective leaching	Selective Leaching of Materials	VIII.G-23	3.4.1-35	C, 1
				Reduction of heat transfer/fouling	Secondary Water Chemistry	VIII.G-10	3.4.1-09	A, 1
					Work Control Process	VIII.G-10	3.4.1-09	E, 1
Turbine Driven Auxiliary Feedwater Pump	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	VIII.G-38	3.4.1-04	A
					Work Control Process	VIII.G-38	3.4.1-04	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-7: Steam and Power Conversion System - Auxiliary Feedwater - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Turbine Driven Auxiliary Feedwater Pump (Pump bearing housing)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Lube oil	Loss of material/general, pitting, and crevice corrosion	Lubricating Oil Analysis	VIII.G-35	3.4.1-07	A
					Work Control Process	VIII.G-35	3.4.1-07	E
Turbine Driven Auxiliary Feedwater Pump (Turbine bearing housing)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A, 1
			(I) Lube oil	Loss of material/general, pitting, crevice, and microbiologically influenced corrosion	Lubricating Oil Analysis	VIII.G-06	3.4.1-12	A, 1
					Work Control Process	VIII.G-06	3.4.1-12	E, 1
Turbine Driven Auxiliary Feedwater Pump (Turbine casing)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Air-moist	Loss of material/general, pitting, and crevice corrosion	Work Control Process	VIII.G-34	3.4.1-30	E
Valves	PB	Copper Alloys	(E) Air-indoor uncontrolled	None	None	VIII.I-02	3.4.1-41	A
			(I) Lube oil	Loss of material/pitting and crevice corrosion	Lubricating Oil Analysis	VIII.G-19	3.4.1-18	A
					Work Control Process	VIII.G-19	3.4.1-18	E
			(I) Treated water and/or steam-secondary	Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	SP-061	3.4.1-15	A
					Work Control Process	SP-061	3.4.1-15	E
				Loss of material/selective leaching	Selective Leaching of Materials	VIII.G-23	3.4.1-35	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-7: Steam and Power Conversion System - Auxiliary Feedwater - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Valves	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VIII.I-10	3.4.1-41	A
			(I) Treated water and/or steam-secondary	Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	VIII.G-32	3.4.1-16	A
					Work Control Process	VIII.G-32	3.4.1-16	E
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VIII.H-09	3.4.1-38	A
			(I) Lube oil	Loss of material/general, pitting, and crevice corrosion	Lubricating Oil Analysis	VIII.G-35	3.4.1-07	A
					Work Control Process	VIII.G-35	3.4.1-07	E
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	VIII.G-38	3.4.1-04	A
					Work Control Process	VIII.G-38	3.4.1-04	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-7 Notes:

Plant Standard Notes

Note - The following plant standard notes have generic applicability, but may or may not be used for each SSC:

S1. Thermal embrittlement is only applicable to CASS components that are subject to temperatures in excess of 482°F.

S2. Cracking due to SCC is only applicable to stainless steel components exposed to temperatures greater than 140°F.

S3. Selective leaching is applicable to the material group 'Steel,' but only for gray cast iron components.

System Specific Notes

1. The turbine driven auxiliary feedwater pump turbine bearing coolers consist of a copper coil located inside the turbine bearing housing.

Industry Standard Notes

See last page of Section 3.4 tables.

Table 3.4.2-8: Steam and Power Conversion System - Air Removal - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Air Ejector After Condensers (Shell and Head)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	S-019	3.4.1-03	A
					Work Control Process	S-019	3.4.1-03	E
Air Ejector Inter Condensers (Shell and Head)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	S-019	3.4.1-03	A
					Work Control Process	S-019	3.4.1-03	E
Air Ejectors	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	S-006	3.4.1-02	A
					Work Control Process	S-006	3.4.1-02	E
Bolting	PB	Steel	(E) Air-indoor uncontrolled	Cracking/cyclic loading, stress corrosion cracking	Bolting Integrity	VIII.H-03	3.4.1-21	A
				Loss of material/general, pitting, and crevice corrosion	Bolting Integrity	VIII.H-04	3.4.1-22	A
				Loss of preload/thermal effects, gasket creep, and self-loosening	Bolting Integrity	VIII.H-05	3.4.1-22	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-8: Steam and Power Conversion System - Air Removal - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Damper Housings	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Air-moist	Loss of material/general, pitting, and crevice corrosion	Work Control Process	SP-060	3.4.1-30	E
Gland Steam Condenser Air Exhauster	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Air-moist	Loss of material/general, pitting, and crevice corrosion	Work Control Process	SP-060	3.4.1-30	E
Hogging Jet	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Air-moist	Loss of material/general, pitting, and crevice corrosion	Work Control Process	SP-060	3.4.1-30	E
Pipe	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Air-moist	Loss of material/general, pitting, and crevice corrosion	Work Control Process	SP-060	3.4.1-30	E
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	S-006	3.4.1-02	A
					Work Control Process	S-006	3.4.1-02	E
				Wall thinning/flow-accelerated corrosion	Flow-Accelerated Corrosion	S-015	3.4.1-29	B

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-8: Steam and Power Conversion System - Air Removal - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Sight Glass	PB	Glass	(E) Air-indoor uncontrolled	None	None	VIII.I-05	3.4.1-40	A
			(I) Treated water and/or steam-secondary	None	None	VIII.I-08	3.4.1-40	A
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	S-006	3.4.1-02	A
					Work Control Process	S-006	3.4.1-02	E
Strainer Housing	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	S-006	3.4.1-02	A
					Work Control Process	S-006	3.4.1-02	E
Traps	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	S-006	3.4.1-02	A
					Work Control Process	S-006	3.4.1-02	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-8: Steam and Power Conversion System - Air Removal - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Tubing	PB	Copper Alloys	(E) Air-indoor uncontrolled	None	None	VIII.I-02	3.4.1-41	A
			(I) Treated water and/or steam-secondary	Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	SP-061	3.4.1-15	A
					Work Control Process	SP-061	3.4.1-15	E
		Stainless Steel	(E) Air-indoor uncontrolled	None	None	VIII.I-10	3.4.1-41	A
			(I) Treated water and/or steam-secondary	Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	SP-043	3.4.1-37	A
					Work Control Process	SP-043	3.4.1-37	E
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	S-006	3.4.1-02	A
					Work Control Process	S-006	3.4.1-02	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-8:   Steam and Power Conversion System - Air Removal - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Valves	PB	Copper Alloys	(E) Air-indoor uncontrolled	None	None	VIII.I-02	3.4.1-41	A
			(I) Treated water and/or steam-secondary	Cracking/stress corrosion cracking	Secondary Water Chemistry			H
					Work Control Process			H
				Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	SP-061	3.4.1-15	A
					Work Control Process	SP-061	3.4.1-15	E
				Loss of material/selective leaching	Selective Leaching of Materials	SP-055	3.4.1-35	A
		Stainless Steel	(E) Air-indoor uncontrolled	None	None	VIII.I-10	3.4.1-41	A
			(I) Treated water and/or steam-secondary	Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	SP-043	3.4.1-37	A
					Work Control Process	SP-043	3.4.1-37	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-8: Steam and Power Conversion System - Air Removal - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Valves	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Air-moist	Loss of material/general, pitting, and crevice corrosion	Work Control Process	SP-060	3.4.1-30	E
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	S-006	3.4.1-02	A
					Work Control Process	S-006	3.4.1-02	E
				Loss of material/selective leaching	Selective Leaching of Materials	SP-027	3.4.1-36	A, S3
				Wall thinning/flow-accelerated corrosion	Flow-Accelerated Corrosion	S-015	3.4.1-29	B

Table 3.4.2-8 Notes:

Plant Standard Notes

Note - The following plant standard notes have generic applicability, but may or may not be used for each SSC:

S1. Thermal embrittlement is only applicable to CASS components that are subject to temperatures in excess of 482°F.

S2. Cracking due to SCC is only applicable to stainless steel components exposed to temperatures greater than 140°F.

S3. Selective leaching is applicable to the material group 'Steel,' but only for gray cast iron components.

Industry Standard Notes

See last page of Section 3.4 tables.

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-9: Steam and Power Conversion System - Heater and Moisture Separator Drains - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Bolting	PB	Steel	(E) Air-indoor uncontrolled	Cracking/cyclic loading, stress corrosion cracking	Bolting Integrity	VIII.H-03	3.4.1-21	A
				Loss of material/general, pitting, and crevice corrosion	Bolting Integrity	VIII.H-04	3.4.1-22	A
				Loss of preload/thermal effects, gasket creep, and self-loosening	Bolting Integrity	VIII.H-05	3.4.1-22	A
Constant Head Chamber	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	VIII.A-16	3.4.1-02	A
					Work Control Process	VIII.A-16	3.4.1-02	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-9: Steam and Power Conversion System - Heater and Moisture Separator Drains - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Expansion Joints	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VIII.I-10	3.4.1-41	A
			(I) Treated water and/or steam-secondary	Cracking/stress corrosion cracking	Secondary Water Chemistry	VIII.A-10	3.4.1-39	A, S2
					Work Control Process	VIII.A-10	3.4.1-39	E, S2
				Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	VIII.A-12	3.4.1-37	A
					Work Control Process	VIII.A-12	3.4.1-37	E
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	VIII.A-16	3.4.1-02	A
					Work Control Process	VIII.A-16	3.4.1-02	E
Flow Elements	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VIII.I-10	3.4.1-41	A
			(I) Treated water and/or steam-secondary	Cracking/stress corrosion cracking	Secondary Water Chemistry	VIII.A-10	3.4.1-39	A, S2
					Work Control Process	VIII.A-10	3.4.1-39	E, S2
				Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	VIII.A-12	3.4.1-37	A
					Work Control Process	VIII.A-12	3.4.1-37	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-9: Steam and Power Conversion System - Heater and Moisture Separator Drains - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Heater Drain Pumps	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VIII.I-10	3.4.1-41	A
			(I) Treated water and/or steam-secondary	Cracking/stress corrosion cracking	Secondary Water Chemistry	VIII.A-10	3.4.1-39	A, S2
					Work Control Process	VIII.A-10	3.4.1-39	E, S2
				Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	VIII.A-12	3.4.1-37	A
					Work Control Process	VIII.A-12	3.4.1-37	E
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Raw water	Loss of material/erosion	Work Control Process			H
				Loss of material/general, pitting, crevice, galvanic, and microbiologically influenced corrosion, and fouling	Work Control Process	S-024	3.4.1-31	E
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	VIII.A-16	3.4.1-02	A
					Work Control Process	VIII.A-16	3.4.1-02	E
Heater Drain Tank	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Treated water and/or steam-secondary	Loss of material/general (steel only), pitting and crevice corrosion	Secondary Water Chemistry	S-013	3.4.1-06	A
					Work Control Process	S-013	3.4.1-06	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-9: Steam and Power Conversion System - Heater and Moisture Separator Drains - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Level Glass	PB	Glass	(E) Air-indoor uncontrolled	None	None	VIII.I-05	3.4.1-40	A
			(I) Treated water and/or steam-secondary	None	None	VIII.I-08	3.4.1-40	A
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	VIII.A-16	3.4.1-02	A
					Work Control Process	VIII.A-16	3.4.1-02	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-9: Steam and Power Conversion System - Heater and Moisture Separator Drains - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Pipe	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VIII.I-10	3.4.1-41	A
			(I) Treated water and/or steam-secondary	Cracking/stress corrosion cracking	Secondary Water Chemistry	VIII.A-10	3.4.1-39	A, S2
					Work Control Process	VIII.A-10	3.4.1-39	E, S2
				Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	VIII.A-12	3.4.1-37	A
					Work Control Process	VIII.A-12	3.4.1-37	E
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	VIII.A-16	3.4.1-02	A
					Work Control Process	VIII.A-16	3.4.1-02	E
				Wall thinning/flow-accelerated corrosion	Flow-Accelerated Corrosion	VIII.A-17	3.4.1-29	B
Reheater Drain Tanks	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Treated water and/or steam-secondary	Loss of material/general (steel only), pitting and crevice corrosion	Secondary Water Chemistry	S-013	3.4.1-06	A
					Work Control Process	S-013	3.4.1-06	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-9: Steam and Power Conversion System - Heater and Moisture Separator Drains - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Standpipes	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	VIII.A-16	3.4.1-02	A
					Work Control Process	VIII.A-16	3.4.1-02	E
Strainer Housings	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VIII.I-10	3.4.1-41	A
			(I) Treated water and/or steam-secondary	Cracking/stress corrosion cracking	Secondary Water Chemistry	VIII.A-10	3.4.1-39	A, S2
					Work Control Process	VIII.A-10	3.4.1-39	E, S2
				Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	VIII.A-12	3.4.1-37	A
					Work Control Process	VIII.A-12	3.4.1-37	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-9: Steam and Power Conversion System - Heater and Moisture Separator Drains - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Tubing	PB	Copper Alloys	(E) Air-indoor uncontrolled	None	None	VIII.I-02	3.4.1-41	A
			(I) Treated water and/or steam-secondary	Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	VIII.A-05	3.4.1-15	A
					Work Control Process	VIII.A-05	3.4.1-15	E
		Stainless Steel	(E) Air-indoor uncontrolled	None	None	VIII.I-10	3.4.1-41	A
			(I) Treated water and/or steam-secondary	Cracking/stress corrosion cracking	Secondary Water Chemistry	VIII.A-10	3.4.1-39	A, S2
					Work Control Process	VIII.A-10	3.4.1-39	E, S2
				Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	VIII.A-12	3.4.1-37	A
					Work Control Process	VIII.A-12	3.4.1-37	E
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	VIII.A-16	3.4.1-02	A
					Work Control Process	VIII.A-16	3.4.1-02	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-9: Steam and Power Conversion System - Heater and Moisture Separator Drains - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Valves	PB	Copper Alloys	(E) Air-indoor uncontrolled	None	None	VIII.I-02	3.4.1-41	A
			(I) Treated water and/or steam-secondary	Cracking/stress corrosion cracking	Secondary Water Chemistry			H
					Work Control Process			H
				Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	VIII.A-05	3.4.1-15	A
					Work Control Process	VIII.A-05	3.4.1-15	E
				Loss of material/selective leaching	Selective Leaching of Materials	SP-055	3.4.1-35	A
		Stainless Steel	(E) Air-indoor uncontrolled	None	None	VIII.I-10	3.4.1-41	A
			(I) Treated water and/or steam-secondary	Cracking/stress corrosion cracking	Secondary Water Chemistry	VIII.A-10	3.4.1-39	A, S2
					Work Control Process	VIII.A-10	3.4.1-39	E, S2
				Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	VIII.A-12	3.4.1-37	A
					Work Control Process	VIII.A-12	3.4.1-37	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-9: Steam and Power Conversion System - Heater and Moisture Separator Drains - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Valves	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	VIII.A-16	3.4.1-02	A
					Work Control Process	VIII.A-16	3.4.1-02	E
				Wall thinning/flow-accelerated corrosion	Flow-Accelerated Corrosion	VIII.A-17	3.4.1-29	B

Table 3.4.2-9 Notes:

Plant Standard Notes

Note - The following plant standard notes have generic applicability, but may or may not be used for each SSC:

S1. Thermal embrittlement is only applicable to CASS components that are subject to temperatures in excess of 482°F.

S2. Cracking due to SCC is only applicable to stainless steel components exposed to temperatures greater than 140°F.

S3. Selective leaching is applicable to the material group 'Steel,' but only for gray cast iron components.

Industry Standard Notes

See last page of Section 3.4 tables.

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-10: Steam and Power Conversion System - Heating Steam - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Bolting	PB	Steel	(E) Air-indoor uncontrolled	Cracking/cyclic loading, stress corrosion cracking	Bolting Integrity	VIII.H-03	3.4.1-21	A
				Loss of material/general, pitting, and crevice corrosion	Bolting Integrity	VIII.H-04	3.4.1-22	A
				Loss of preload/thermal effects, gasket creep, and self-loosening	Bolting Integrity	VIII.H-05	3.4.1-22	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VIII.H-02	3.4.1-38	A
Boric Acid Evaporator Cond Return Tank	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VIII.H-09	3.4.1-38	A
			(I) Treated water and/or steam-secondary	Loss of material/general (steel only), pitting and crevice corrosion	Secondary Water Chemistry	S-013	3.4.1-06	A
					Work Control Process	S-013	3.4.1-06	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-10: Steam and Power Conversion System - Heating Steam - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Boric Acid Evaporator Cond Return Unit Heat Exchanger (Bonnet)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VIII.H-09	3.4.1-38	A
			(I) Raw water	Loss of material/erosion	Work Control Process			H
				Loss of material/general, pitting, crevice, galvanic, and microbiologically influenced corrosion, and fouling	Work Control Process	S-024	3.4.1-31	E
				Loss of material/selective leaching	Selective Leaching of Materials	SP-028	3.4.1-36	C, S3
Boric Acid Evaporator Cond Return Unit Heat Exchanger (Shell)	PB	Copper Alloys	(E) Air-indoor uncontrolled	None	None	VIII.I-02	3.4.1-41	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	EP-038	3.2.1-45	C
			(I) Treated water and/or steam-secondary	Cracking/stress corrosion cracking	Secondary Water Chemistry			H
					Work Control Process			H
				Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	SP-061	3.4.1-15	C
					Work Control Process	SP-061	3.4.1-15	E
				Loss of material/selective leaching	Selective Leaching of Materials	SP-055	3.4.1-35	C

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-10: Steam and Power Conversion System - Heating Steam - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Condensate Return Pumps	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VIII.H-09	3.4.1-38	A
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	S-006	3.4.1-02	A
					Work Control Process	S-006	3.4.1-02	E
				Loss of material/selective leaching	Selective Leaching of Materials	SP-027	3.4.1-36	A, S3
Condenser Water Box Priming Ejector	PB	Stainless Steel	(I) Treated water and/or steam-secondary	Cracking/stress corrosion cracking	Secondary Water Chemistry	SP-017	3.4.1-14	A, S2
					Work Control Process	SP-017	3.4.1-14	E, S2
				Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	SP-016	3.4.1-16	A
					Work Control Process	SP-016	3.4.1-16	E
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	S-006	3.4.1-02	A
					Work Control Process	S-006	3.4.1-02	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-10: Steam and Power Conversion System - Heating Steam - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Control Room A/C HW Pump	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Raw water	Loss of material/general, pitting, crevice, and microbiologically influenced corrosion, and fouling	Work Control Process	A-033	3.3.1-68	E
				Loss of material/selective leaching	Selective Leaching of Materials	SP-028	3.4.1-36	A, S3
Control Room A/C Steam Humidifier	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Treated water and/or steam-secondary	Loss of material/general (steel only), pitting and crevice corrosion	Secondary Water Chemistry	S-013	3.4.1-06	A
					Work Control Process	S-013	3.4.1-06	E
Control Room Humidification Steam Boiler	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VIII.H-09	3.4.1-38	A
			(I) Treated water and/or steam-secondary	Loss of material/general (steel only), pitting and crevice corrosion	Secondary Water Chemistry	S-013	3.4.1-06	A
					Work Control Process	S-013	3.4.1-06	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-10: Steam and Power Conversion System - Heating Steam - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Heating Coils	PB	Copper Alloys	(E) Air-indoor uncontrolled	None	None	VIII.I-02	3.4.1-41	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	EP-038	3.2.1-45	C
			(I) Raw water	Loss of material/pitting, crevice, and microbiologically influenced corrosion	Work Control Process	SP-031	3.4.1-32	E
			(I) Treated water and/or steam-secondary	Cracking/stress corrosion cracking	Secondary Water Chemistry			H
					Work Control Process			H
				Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	SP-061	3.4.1-15	C
					Work Control Process	SP-061	3.4.1-15	E
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VIII.H-09	3.4.1-38	A
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	S-019	3.4.1-03	A
					Work Control Process	S-019	3.4.1-03	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-10: Steam and Power Conversion System - Heating Steam - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Heating System Condensate Drain Tank	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Treated water and/or steam-secondary	Loss of material/general (steel only), pitting and crevice corrosion	Secondary Water Chemistry	S-013	3.4.1-06	A
					Work Control Process	S-013	3.4.1-06	E
Pipe	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VIII.I-10	3.4.1-41	A
			(I) Treated water and/or steam-secondary	Cracking/stress corrosion cracking	Secondary Water Chemistry	SP-017	3.4.1-14	A, S2
					Work Control Process	SP-017	3.4.1-14	E, S2
				Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	SP-016	3.4.1-16	A
					Work Control Process	SP-016	3.4.1-16	E
		Steel	(E) Air-indoor controlled	None	None	VIII.I-13	3.4.1-42	A
			(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VIII.H-09	3.4.1-38	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-10: Steam and Power Conversion System - Heating Steam - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Pipe	PB	Steel	(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	S-006	3.4.1-02	A
					Work Control Process	S-006	3.4.1-02	E
				Wall thinning/flow-accelerated corrosion	Flow-Accelerated Corrosion	S-015	3.4.1-29	B
Sight Glasses	PB	Glass	(E) Air-indoor uncontrolled	None	None	VIII.I-05	3.4.1-40	A
			(I) Treated water and/or steam-secondary	None	None	VIII.I-08	3.4.1-40	A
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	S-006	3.4.1-02	A
					Work Control Process	S-006	3.4.1-02	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-10: Steam and Power Conversion System - Heating Steam - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Strainer Housings	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VIII.I-10	3.4.1-41	A
			(I) Treated water and/or steam-secondary	Cracking/stress corrosion cracking	Secondary Water Chemistry	SP-017	3.4.1-14	A, S2
					Work Control Process	SP-017	3.4.1-14	E, S2
				Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	SP-016	3.4.1-16	A
					Work Control Process	SP-016	3.4.1-16	E
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VIII.H-09	3.4.1-38	A
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	S-006	3.4.1-02	A
					Work Control Process	S-006	3.4.1-02	E
Traps	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VIII.H-09	3.4.1-38	A
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	S-006	3.4.1-02	A
					Work Control Process	S-006	3.4.1-02	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-10: Steam and Power Conversion System - Heating Steam - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Tubing	PB	Copper Alloys	(E) Air-indoor uncontrolled	None	None	VIII.I-02	3.4.1-41	A
			(I) Treated water and/or steam-secondary	Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	SP-061	3.4.1-15	A
					Work Control Process	SP-061	3.4.1-15	E
		Stainless Steel	(E) Air-indoor uncontrolled	None	None	VIII.I-10	3.4.1-41	A
			(I) Treated water and/or steam-secondary	Cracking/stress corrosion cracking	Secondary Water Chemistry	SP-017	3.4.1-14	A, S2
					Work Control Process	SP-017	3.4.1-14	E, S2
				Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	SP-016	3.4.1-16	A
					Work Control Process	SP-016	3.4.1-16	E
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VIII.H-09	3.4.1-38	A
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	S-006	3.4.1-02	A
					Work Control Process	S-006	3.4.1-02	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-10: Steam and Power Conversion System - Heating Steam - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Valves	PB	Copper Alloys	(E) Air-indoor uncontrolled	None	None	VIII.I-02	3.4.1-41	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	EP-038	3.2.1-45	A
			(I) Treated water and/or steam-secondary	Cracking/stress corrosion cracking	Secondary Water Chemistry			H
					Work Control Process			H
				Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	SP-061	3.4.1-15	A
					Work Control Process	SP-061	3.4.1-15	E
				Loss of material/selective leaching	Selective Leaching of Materials	SP-055	3.4.1-35	A
		Stainless Steel	(E) Air-indoor uncontrolled	None	None	VIII.I-10	3.4.1-41	A
			(I) Treated water and/or steam-secondary	Cracking/stress corrosion cracking	Secondary Water Chemistry	SP-017	3.4.1-14	A, S2
					Work Control Process	SP-017	3.4.1-14	E, S2
				Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	SP-016	3.4.1-16	A
					Work Control Process	SP-016	3.4.1-16	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-10: Steam and Power Conversion System - Heating Steam - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Valves	PB	Steel	(E) Air-indoor controlled	None	None	VIII.I-13	3.4.1-42	A
			(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VIII.H-09	3.4.1-38	A
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	S-006	3.4.1-02	A
					Work Control Process	S-006	3.4.1-02	E
				Loss of material/selective leaching	Selective Leaching of Materials	SP-027	3.4.1-36	A, S3
				Wall thinning/flow-accelerated corrosion	Flow-Accelerated Corrosion	S-015	3.4.1-29	B

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-10 Notes:

Plant Standard Notes

Note - The following plant standard notes have generic applicability, but may or may not be used for each SSC:

S1. Thermal embrittlement is only applicable to CASS components that are subject to temperatures in excess of 482°F.

S2. Cracking due to SCC is only applicable to stainless steel components exposed to temperatures greater than 140°F.

S3. Selective leaching is applicable to the material group 'Steel,' but only for gray cast iron components.

Industry Standard Notes

See last page of Section 3.4 tables.

Table 3.4.2-11: Steam and Power Conversion System - Main Generator (Mechanical) and Auxiliaries - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Air Side Seal Oil Backup Pump	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Lube oil	Loss of material/general, pitting, and crevice corrosion	Lubricating Oil Analysis	SP-025	3.4.1-07	A
					Work Control Process	SP-025	3.4.1-07	E
Air Side Seal Oil Cooler (Channel Heads)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Raw water	Loss of material/erosion	Work Control Process			H
				Loss of material/general, pitting, crevice, galvanic, and microbiologically influenced corrosion, and fouling	Work Control Process	S-024	3.4.1-31	E
				Loss of material/selective leaching	Selective Leaching of Materials	SP-028	3.4.1-36	C, S3
Air Side Seal Oil Cooler (Shell)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Lube oil	Loss of material/general, pitting, crevice, and microbiologically influenced corrosion	Lubricating Oil Analysis	S-017	3.4.1-12	A
					Work Control Process	S-017	3.4.1-12	E
Air Side Seal Oil Pump	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Lube oil	Loss of material/general, pitting, and crevice corrosion	Lubricating Oil Analysis	SP-025	3.4.1-07	A
					Work Control Process	SP-025	3.4.1-07	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-11: Steam and Power Conversion System - Main Generator (Mechanical) and Auxiliaries - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Bolting	PB	Steel	(E) Air-indoor uncontrolled	Cracking/cyclic loading, stress corrosion cracking	Bolting Integrity	VIII.H-03	3.4.1-21	A
				Loss of material/general, pitting, and crevice corrosion	Bolting Integrity	VIII.H-04	3.4.1-22	A
				Loss of preload/thermal effects, gasket creep, and self-loosening	Bolting Integrity	VIII.H-05	3.4.1-22	A
Defoaming Tanks	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Lube oil	Loss of material/general, pitting, and crevice corrosion	Lubricating Oil Analysis	SP-025	3.4.1-07	A
					Work Control Process	SP-025	3.4.1-07	E
Filter Housings	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Lube oil	Loss of material/general, pitting, and crevice corrosion	Lubricating Oil Analysis	SP-025	3.4.1-07	A
					Work Control Process	SP-025	3.4.1-07	E
Generator Bearing Oil Drain Line Loop Seal	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Lube oil	Loss of material/general, pitting, and crevice corrosion	Lubricating Oil Analysis	SP-025	3.4.1-07	A
					Work Control Process	SP-025	3.4.1-07	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-11: Steam and Power Conversion System - Main Generator (Mechanical) and Auxiliaries - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Generator Hydrogen Coolers (Coils)	PB	Copper Alloys	(E) Gas-inert	None	None	VIII.I-03	3.4.1-44	A
			(I) Raw water	Loss of material/erosion	Work Control Process			H
				Loss of material/pitting, crevice, and microbiologically influenced corrosion	Work Control Process	SP-031	3.4.1-32	E
Hydrogen Side Drain Regulator	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Lube oil	Loss of material/general, pitting, and crevice corrosion	Lubricating Oil Analysis	SP-025	3.4.1-07	A
					Work Control Process	SP-025	3.4.1-07	E
Hydrogen Side Seal Oil Cooler (Channel Heads)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Raw water	Loss of material/erosion	Work Control Process			H
				Loss of material/general, pitting, crevice, galvanic, and microbiologically influenced corrosion, and fouling	Work Control Process	S-024	3.4.1-31	E
				Loss of material/selective leaching	Selective Leaching of Materials	SP-028	3.4.1-36	C, S3
Hydrogen Side Seal Oil Cooler (Shell)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Lube oil	Loss of material/general, pitting, crevice, and microbiologically influenced corrosion	Lubricating Oil Analysis	S-017	3.4.1-12	A
					Work Control Process	S-017	3.4.1-12	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-11: Steam and Power Conversion System - Main Generator (Mechanical) and Auxiliaries - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Hydrogen Side Seal Oil Pump	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Lube oil	Loss of material/general, pitting, and crevice corrosion	Lubricating Oil Analysis	SP-025	3.4.1-07	A
					Work Control Process	SP-025	3.4.1-07	E
Oil Level Gauge	PB	Glass	(E) Air-indoor uncontrolled	None	None	VIII.I-05	3.4.1-40	A
			(I) Lube oil	None	None	VIII.I-06	3.4.1-40	A
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Lube oil	Loss of material/general, pitting, and crevice corrosion	Lubricating Oil Analysis	SP-025	3.4.1-07	A
					Work Control Process	SP-025	3.4.1-07	E
Pipe	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Lube oil	Loss of material/general, pitting, and crevice corrosion	Lubricating Oil Analysis	SP-025	3.4.1-07	A
					Work Control Process	SP-025	3.4.1-07	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-11: Steam and Power Conversion System - Main Generator (Mechanical) and Auxiliaries - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Tubing	PB	Copper Alloys	(E) Air-indoor uncontrolled	None	None	VIII.I-02	3.4.1-41	A
			(I) Lube oil	Loss of material/pitting and crevice corrosion	Lubricating Oil Analysis	SP-032	3.4.1-18	A
					Work Control Process	SP-032	3.4.1-18	E
		Stainless Steel	(E) Air-indoor uncontrolled	None	None	VIII.I-10	3.4.1-41	A
			(I) Lube oil	Loss of material/pitting, crevice, and microbiologically influenced corrosion	Lubricating Oil Analysis	SP-038	3.4.1-19	A
					Work Control Process	SP-038	3.4.1-19	E
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Lube oil	Loss of material/general, pitting, and crevice corrosion	Lubricating Oil Analysis	SP-025	3.4.1-07	A
					Work Control Process	SP-025	3.4.1-07	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-11: Steam and Power Conversion System - Main Generator (Mechanical) and Auxiliaries - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Valves	PB	Copper Alloys	(E) Air-indoor uncontrolled	None	None	VIII.I-02	3.4.1-41	A
			(I) Lube oil	Loss of material/pitting and crevice corrosion	Lubricating Oil Analysis	SP-032	3.4.1-18	A
					Work Control Process	SP-032	3.4.1-18	E
		Stainless Steel	(E) Air-indoor uncontrolled	None	None	VIII.I-10	3.4.1-41	A
			(I) Lube oil	Loss of material/pitting, crevice, and microbiologically influenced corrosion	Lubricating Oil Analysis	SP-038	3.4.1-19	A
					Work Control Process	SP-038	3.4.1-19	E
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Lube oil	Loss of material/general, pitting, and crevice corrosion	Lubricating Oil Analysis	SP-025	3.4.1-07	A
					Work Control Process	SP-025	3.4.1-07	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-11 Notes:

Plant Standard Notes

Note - The following plant standard notes have generic applicability, but may or may not be used for each SSC:

S1. Thermal embrittlement is only applicable to CASS components that are subject to temperatures in excess of 482°F.

S2. Cracking due to SCC is only applicable to stainless steel components exposed to temperatures greater than 140°F.

S3. Selective leaching is applicable to the material group 'Steel,' but only for gray cast iron components.

Industry Standard Notes

See last page of Section 3.4 tables.

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-12: Steam and Power Conversion System - Secondary Sampling - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Bolting	PB	Steel	(E) Air-indoor uncontrolled	Cracking/cyclic loading, stress corrosion cracking	Bolting Integrity	VIII.H-03	3.4.1-21	A
				Loss of material/general, pitting, and crevice corrosion	Bolting Integrity	VIII.H-04	3.4.1-22	A
				Loss of preload/thermal effects, gasket creep, and self-loosening	Bolting Integrity	VIII.H-05	3.4.1-22	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VIII.H-02	3.4.1-38	A
Cation Conductivity Electrodes	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VIII.I-10	3.4.1-41	A
			(I) Treated water and/or steam-secondary	Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	SP-016	3.4.1-16	A
					Work Control Process	SP-016	3.4.1-16	E
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	S-010	3.4.1-04	A
					Work Control Process	S-010	3.4.1-04	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-12: Steam and Power Conversion System - Secondary Sampling - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Cooler Units (Channel head of first stage cooler units)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Raw water	Loss of material/erosion	Work Control Process			H
				Loss of material/general, pitting, crevice, galvanic, and microbiologically influenced corrosion, and fouling	Work Control Process	S-024	3.4.1-31	E
Cooler Units (Shell of first stage cooler units)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Treated water-closed cycle cooling	Loss of material/general, pitting, crevice, and galvanic corrosion	Work Control Process	S-023	3.4.1-24	E
				Loss of material/microbiologically influenced corrosion	Work Control Process			H

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-12: Steam and Power Conversion System - Secondary Sampling - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Coolers (Shell of sample coolers)	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VIII.I-10	3.4.1-41	A
			(I) Treated water-closed cycle cooling	Loss of material/microbiologically influenced corrosion	Work Control Process			H
				Loss of material/pitting and crevice corrosion	Work Control Process	S-025	3.4.1-25	E
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Treated water-closed cycle cooling	Loss of material/general, pitting, crevice, and galvanic corrosion	Work Control Process	S-023	3.4.1-24	E
				Loss of material/microbiologically influenced corrosion	Work Control Process			H
Filter Housings	PB	Non-Metallic	(E) Air-indoor uncontrolled	None	None			H
			(I) Treated water and/or steam-secondary	None	None			H

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-12: Steam and Power Conversion System - Secondary Sampling - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Flow Indicators	PB	Glass	(E) Air-indoor uncontrolled	None	None	VIII.I-05	3.4.1-40	A
			(I) Treated water and/or steam-secondary	None	None	VIII.I-08	3.4.1-40	A
		Stainless Steel	(E) Air-indoor uncontrolled	None	None	VIII.I-10	3.4.1-41	A
			(I) Treated water and/or steam-secondary	Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	SP-016	3.4.1-16	A
					Work Control Process	SP-016	3.4.1-16	E
FW Sample Line Chiller (Evaporator tank)	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VIII.I-10	3.4.1-41	A
			(I) Treated water-closed cycle cooling	Loss of material/microbiologically influenced corrosion	Work Control Process			H
				Loss of material/pitting and crevice corrosion	Work Control Process	SP-039	3.4.1-25	E
FW Sample Line Chiller (Recirculating pump)	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VIII.I-10	3.4.1-41	A
			(I) Treated water-closed cycle cooling	Loss of material/microbiologically influenced corrosion	Work Control Process			H
				Loss of material/pitting and crevice corrosion	Work Control Process	SP-039	3.4.1-25	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-12: Steam and Power Conversion System - Secondary Sampling - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
PH Electrodes (Housing)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	S-010	3.4.1-04	A
					Work Control Process	S-010	3.4.1-04	E
Pipe	PB	Non-Metallic	(E) Air-indoor uncontrolled	None	None			H
			(I) Treated water and/or steam-secondary	None	None			H
		Stainless Steel	(E) Air-indoor uncontrolled	None	None	VIII.I-10	3.4.1-41	A
			(I) Treated water and/or steam-secondary	Cracking/stress corrosion cracking	Secondary Water Chemistry	SP-017	3.4.1-14	A, S2
					Work Control Process	SP-017	3.4.1-14	E, S2
				Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	SP-016	3.4.1-16	A
					Work Control Process	SP-016	3.4.1-16	E
			(I) Treated water-closed cycle cooling	Loss of material/microbiologically influenced corrosion	Work Control Process			H
				Loss of material/pitting and crevice corrosion	Work Control Process	SP-039	3.4.1-25	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-12: Steam and Power Conversion System - Secondary Sampling - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Pipe	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	VIII.H-09	3.4.1-38	A
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	S-010	3.4.1-04	A
					Work Control Process	S-010	3.4.1-04	E
			(I) Treated water-closed cycle cooling	Loss of material/general, pitting, crevice, and galvanic corrosion	Work Control Process	S-023	3.4.1-24	E
				Loss of material/microbiologically influenced corrosion	Work Control Process			H
Recirculation Pumps	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Treated water-closed cycle cooling	Loss of material/general, pitting, crevice, and galvanic corrosion	Work Control Process	S-023	3.4.1-24	E
				Loss of material/microbiologically influenced corrosion	Work Control Process			H

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-12: Steam and Power Conversion System - Secondary Sampling - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Refrigeration Unit Chiller Condenser (Channel head)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Raw water	Loss of material/erosion	Work Control Process			H
				Loss of material/general, pitting, crevice, galvanic, and microbiologically influenced corrosion, and fouling	Work Control Process	S-024	3.4.1-31	E
				Loss of material/selective leaching	Selective Leaching of Materials	SP-028	3.4.1-36	C, S3
Refrigeration Unit Chiller Condenser (Shell)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Air-moist	Loss of material/general, pitting, and crevice corrosion	Work Control Process	SP-060	3.4.1-30	E
			(I) Treated water-closed cycle cooling	Loss of material/general, pitting, crevice, and galvanic corrosion	Work Control Process	S-023	3.4.1-24	E
				Loss of material/microbiologically influenced corrosion	Work Control Process			H
Refrigeration Unit Chiller Evaporator (Shell)	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Treated water-closed cycle cooling	Loss of material/general, pitting, crevice, and galvanic corrosion	Work Control Process	S-023	3.4.1-24	E
				Loss of material/microbiologically influenced corrosion	Work Control Process			H

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-12: Steam and Power Conversion System - Secondary Sampling - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Sodium Analyzer Elements	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VIII.I-10	3.4.1-41	A
			(I) Treated water and/or steam-secondary	Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	SP-016	3.4.1-16	A
					Work Control Process	SP-016	3.4.1-16	E
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	S-010	3.4.1-04	A
					Work Control Process	S-010	3.4.1-04	E
Specific Conductivity Electrodes	PB	Non-Metallic	(E) Air-indoor uncontrolled	None	None			H
			(I) Treated water and/or steam-secondary	None	None			H
Storage Tank	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Treated water-closed cycle cooling	Loss of material/general, pitting, crevice, and galvanic corrosion	Work Control Process	S-023	3.4.1-24	E
				Loss of material/microbiologically influenced corrosion	Work Control Process			H

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-12: Steam and Power Conversion System - Secondary Sampling - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Tubing	PB	Copper Alloys	(E) Air-indoor uncontrolled	None	None	VIII.I-02	3.4.1-41	A
			(I) Treated water and/or steam-secondary	Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	SP-061	3.4.1-15	A
					Work Control Process	SP-061	3.4.1-15	E
			(I) Treated water-closed cycle cooling	Loss of material/microbiologically influenced corrosion	Work Control Process			H
				Loss of material/pitting, crevice, and galvanic corrosion	Work Control Process	SP-008	3.4.1-26	E
		Stainless Steel	(E) Air-indoor uncontrolled	None	None	VIII.I-10	3.4.1-41	A
			(I) Treated water and/or steam-secondary	Cracking/stress corrosion cracking	Secondary Water Chemistry	SP-017	3.4.1-14	A, S2
					Work Control Process	SP-017	3.4.1-14	E, S2
				Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	SP-016	3.4.1-16	A
					Work Control Process	SP-016	3.4.1-16	E
			(I) Treated water-closed cycle cooling	Loss of material/microbiologically influenced corrosion	Work Control Process			H
				Loss of material/pitting and crevice corrosion	Work Control Process	SP-039	3.4.1-25	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-12: Steam and Power Conversion System - Secondary Sampling - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Tubing	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	S-010	3.4.1-04	A
					Work Control Process	S-010	3.4.1-04	E
			(I) Treated water-closed cycle cooling	Loss of material/general, pitting, crevice, and galvanic corrosion	Work Control Process	S-023	3.4.1-24	E
				Loss of material/microbiologically influenced corrosion	Work Control Process			H
Valves	PB	Copper Alloys	(E) Air-indoor uncontrolled	None	None	VIII.I-02	3.4.1-41	A
			(I) Treated water and/or steam-secondary	Cracking/stress corrosion cracking	Secondary Water Chemistry			H
					Work Control Process			H
				Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	SP-061	3.4.1-15	A
					Work Control Process	SP-061	3.4.1-15	E
				Loss of material/selective leaching	Selective Leaching of Materials	SP-055	3.4.1-35	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-12: Steam and Power Conversion System - Secondary Sampling - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Valves	PB	Copper Alloys	(I) Treated water-closed cycle cooling	Loss of material/microbiologically influenced corrosion	Work Control Process			H
				Loss of material/pitting, crevice, and galvanic corrosion	Work Control Process	SP-008	3.4.1-26	E
				Loss of material/selective leaching	Selective Leaching of Materials	SP-029	3.4.1-35	A
		Stainless Steel	(E) Air-indoor uncontrolled	None	None	VIII.I-10	3.4.1-41	A
			(I) Treated water and/or steam-secondary	Cracking/stress corrosion cracking	Secondary Water Chemistry	SP-017	3.4.1-14	A, S2
					Work Control Process	SP-017	3.4.1-14	E, S2
				Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	SP-016	3.4.1-16	A
					Work Control Process	SP-016	3.4.1-16	E
			(I) Treated water-closed cycle cooling	Loss of material/microbiologically influenced corrosion	Work Control Process			H
				Loss of material/pitting and crevice corrosion	Work Control Process	SP-039	3.4.1-25	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-12: Steam and Power Conversion System - Secondary Sampling - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Valves	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	S-010	3.4.1-04	A
					Work Control Process	S-010	3.4.1-04	E
			(I) Treated water-closed cycle cooling	Loss of material/general, pitting, crevice, and galvanic corrosion	Work Control Process	S-023	3.4.1-24	E
				Loss of material/microbiologically influenced corrosion	Work Control Process			H

Table 3.4.2-12 Notes:

Plant Standard Notes

Note - The following plant standard notes have generic applicability, but may or may not be used for each SSC:

S1. Thermal embrittlement is only applicable to CASS components that are subject to temperatures in excess of 482°F.

S2. Cracking due to SCC is only applicable to stainless steel components exposed to temperatures greater than 140°F.

S3. Selective leaching is applicable to the material group 'Steel,' but only for gray cast iron components.

Industry Standard Notes

See last page of Section 3.4 tables.

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-13: Steam and Power Conversion System - Turbine Oil Purification - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Bolting	PB	Steel	(E) Air-indoor uncontrolled	Cracking/cyclic loading, stress corrosion cracking	Bolting Integrity	VIII.H-03	3.4.1-21	A
				Loss of material/general, pitting, and crevice corrosion	Bolting Integrity	VIII.H-04	3.4.1-22	A
				Loss of preload/thermal effects, gasket creep, and self-loosening	Bolting Integrity	VIII.H-05	3.4.1-22	A
Pipe	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Lube oil	Loss of material/general, pitting, and crevice corrosion	Lubricating Oil Analysis	VIII.A-14	3.4.1-07	A
					Work Control Process	VIII.A-14	3.4.1-07	E
Tubing	PB	Copper Alloys	(E) Air-indoor uncontrolled	None	None	VIII.I-02	3.4.1-41	A
			(I) Lube oil	Loss of material/pitting and crevice corrosion	Lubricating Oil Analysis	VIII.A-03	3.4.1-18	A
					Work Control Process	VIII.A-03	3.4.1-18	E
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Lube oil	Loss of material/general, pitting, and crevice corrosion	Lubricating Oil Analysis	VIII.A-14	3.4.1-07	A
					Work Control Process	VIII.A-14	3.4.1-07	E
Turbine Oil Circulating and Transfer Pump	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Lube oil	Loss of material/general, pitting, and crevice corrosion	Lubricating Oil Analysis	VIII.A-14	3.4.1-07	A
					Work Control Process	VIII.A-14	3.4.1-07	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-13: Steam and Power Conversion System - Turbine Oil Purification - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Valves	PB	Copper Alloys	(E) Air-indoor uncontrolled	None	None	VIII.I-02	3.4.1-41	A
			(I) Lube oil	Loss of material/pitting and crevice corrosion	Lubricating Oil Analysis	VIII.A-03	3.4.1-18	A
					Work Control Process	VIII.A-03	3.4.1-18	E
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Lube oil	Loss of material/general, pitting, and crevice corrosion	Lubricating Oil Analysis	VIII.A-14	3.4.1-07	A
					Work Control Process	VIII.A-14	3.4.1-07	E

Table 3.4.2-13 Notes:

Plant Standard Notes

Note - The following plant standard notes have generic applicability, but may or may not be used for each SSC:

S1. Thermal embrittlement is only applicable to CASS components that are subject to temperatures in excess of 482°F.

S2. Cracking due to SCC is only applicable to stainless steel components exposed to temperatures greater than 140°F.

S3. Selective leaching is applicable to the material group 'Steel,' but only for gray cast iron components.

Industry Standard Notes

See last page of Section 3.4 tables.

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-14: Steam and Power Conversion System - Turbine Room Traps and Drains - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Bolting	PB	Steel	(E) Air-indoor uncontrolled	Cracking/cyclic loading, stress corrosion cracking	Bolting Integrity	VIII.H-03	3.4.1-21	A
				Loss of material/general, pitting, and crevice corrosion	Bolting Integrity	VIII.H-04	3.4.1-22	A
				Loss of preload/thermal effects, gasket creep, and self-loosening	Bolting Integrity	VIII.H-05	3.4.1-22	A
Pipe	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	VIII.I-10	3.4.1-41	A
			(I) Treated water and/or steam-secondary	Cracking/stress corrosion cracking	Secondary Water Chemistry	VIII.A-10	3.4.1-39	A, S2
					Work Control Process	VIII.A-10	3.4.1-39	E, S2
				Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	VIII.A-12	3.4.1-37	A
					Work Control Process	VIII.A-12	3.4.1-37	E
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	VIII.A-16	3.4.1-02	A
					Work Control Process	VIII.A-16	3.4.1-02	E
				Wall thinning/flow-accelerated corrosion	Flow-Accelerated Corrosion	VIII.A-17	3.4.1-29	B

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-14: Steam and Power Conversion System - Turbine Room Traps and Drains - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Steam Traps	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	VIII.A-16	3.4.1-02	A
					Work Control Process	VIII.A-16	3.4.1-02	E
Tubing	PB	Copper Alloys	(E) Air-indoor uncontrolled	None	None	VIII.I-02	3.4.1-41	A
			(I) Treated water and/or steam-secondary	Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	VIII.A-05	3.4.1-15	A
					Work Control Process	VIII.A-05	3.4.1-15	E
		Stainless Steel	(E) Air-indoor uncontrolled	None	None	VIII.I-10	3.4.1-41	A
			(I) Treated water and/or steam-secondary	Cracking/stress corrosion cracking	Secondary Water Chemistry	VIII.A-10	3.4.1-39	A, S2
					Work Control Process	VIII.A-10	3.4.1-39	E, S2
				Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	VIII.A-12	3.4.1-37	A
					Work Control Process	VIII.A-12	3.4.1-37	E
		Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	VIII.A-16	3.4.1-02	A
					Work Control Process	VIII.A-16	3.4.1-02	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-14: Steam and Power Conversion System - Turbine Room Traps and Drains - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Valves	PB	Copper Alloys	(E) Air-indoor uncontrolled	None	None	VIII.I-02	3.4.1-41	A
			(I) Treated water and/or steam-secondary	Cracking/stress corrosion cracking	Secondary Water Chemistry			H
					Work Control Process			H
				Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	VIII.A-05	3.4.1-15	A
					Work Control Process	VIII.A-05	3.4.1-15	E
				Loss of material/selective leaching	Selective Leaching of Materials	SP-055	3.4.1-35	A
		Stainless Steel	(E) Air-indoor uncontrolled	None	None	VIII.I-10	3.4.1-41	A
			(I) Treated water and/or steam-secondary	Cracking/stress corrosion cracking	Secondary Water Chemistry	VIII.A-10	3.4.1-39	A, S2
					Work Control Process	VIII.A-10	3.4.1-39	E, S2
				Loss of material/pitting and crevice corrosion	Secondary Water Chemistry	VIII.A-12	3.4.1-37	A
					Work Control Process	VIII.A-12	3.4.1-37	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.4.2-14: Steam and Power Conversion System - Turbine Room Traps and Drains - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Valves	PB	Steel	(E) Air-indoor uncontrolled	Loss of material/general corrosion	External Surfaces Monitoring	VIII.H-07	3.4.1-28	A
			(I) Treated water and/or steam-secondary	Loss of material/general, pitting, and crevice corrosion	Secondary Water Chemistry	VIII.A-16	3.4.1-02	A
					Work Control Process	VIII.A-16	3.4.1-02	E
				Loss of material/selective leaching	Selective Leaching of Materials	VIII.A-08	3.4.1-36	A, S3
				Wall thinning/flow-accelerated corrosion	Flow-Accelerated Corrosion	VIII.A-17	3.4.1-29	B

Table 3.4.2-14 Notes:

Plant Standard Notes

Note - The following plant standard notes have generic applicability, but may or may not be used for each SSC:

S1. Thermal embrittlement is only applicable to CASS components that are subject to temperatures in excess of 482°F.

S2. Cracking due to SCC is only applicable to stainless steel components exposed to temperatures greater than 140°F.

S3. Selective leaching is applicable to the material group 'Steel,' but only for gray cast iron components.

Industry Standard Notes

See last page of Section 3.4 tables.

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Notes for Tables 3.4.2-1 through 3.4.2-14

Industry 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 component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

D. Component is different, but 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 item for component, 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. (Not used. See discussion in Section 3.0)

G. Environment not in NUREG-1801 for this component and material. (Not used. See discussion in Section 3.0)

H. Aging effect not in NUREG-1801 for this component, material and environment combination.

I. Aging effect in NUREG-1801 for this component, material and environment combination is not applicable. (Not used. See discussion in Section 3.0)

Neither the component nor the material and environment combination is evaluated in NUREG-1801. (Not used. See discussion in Section 3.0)

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

3.5 AGING MANAGEMENT OF CONTAINMENT, STRUCTURES AND COMPONENT SUPPORTS

3.5.1 INTRODUCTION

This section provides the results of the aging management review for those structures and component supports identified in Section 2.4, Structures. The structures, which are addressed in this section, are described in the indicated sections.

- Reactor Containment Vessel (Section 2.4.1)
- Structures and Structural Components (Section 2.4.2), which include,
  - Shield Building (Section 2.4.2.1)
  - Administration Building (Section 2.4.2.2)
  - Auxiliary Building (Section 2.4.2.3)
  - Screenhouse Access Tunnel (Section 2.4.2.4)
  - Technical Support Center (Section 2.4.2.5)
  - Turbine Building (Section 2.4.2.6)
  - Yard Structures (Section 2.4.2.7)
  - Discharge Structure (Section 2.4.2.8)
  - Discharge Tunnel and Pipe (Section 2.4.2.9)
  - Intake Structure (Section 2.4.2.10)
  - Screenhouse (Section 2.4.2.11)
- Component Supports (Section 2.4.3)
- Miscellaneous Structural Commodities (Section 2.4.4)
- NSSS Supports (Section 2.4.5)

Table 3.5.1, Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801, provides the summary of the programs evaluated in NUREG-1801 for the Structures and Component Supports structural members that are relied on for license renewal.

This table uses the format described in Section 3.0 above.

3.5.2 RESULTS

The following tables summarize the results of the aging management review for the components in the structures and component supports group:

Table 3.5.2-1, Reactor Containment Vessel - Aging Management Evaluation

Table 3.5.2-2, Shield Building - Aging Management Evaluation

Table 3.5.2-3, Administration Building - Aging Management Evaluation

Table 3.5.2-4, Auxiliary Building - Aging Management Evaluation

Table 3.5.2-5, Screenhouse Access Tunnel - Aging Management Evaluation

Table 3.5.2-6, Technical Support Center - Aging Management Evaluation

Table 3.5.2-7, Turbine Building - Aging Management Evaluation

Table 3.5.2-8, Yard Structures - Aging Management Evaluation

Table 3.5.2-9, Discharge Structure - Aging Management Evaluation

Table 3.5.2-10, Discharge Tunnel & Pipe - Aging Management Evaluation

Table 3.5.2-11, Intake Structure - Aging Management Evaluation

Table 3.5.2-12, Screenhouse - Aging Management Evaluation

Table 3.5.2-13, Component Supports - Aging Management Evaluation

Table 3.5.2-14, Miscellaneous Structural Commodities - Aging Management Evaluation

Table 3.5.2-15, NSSS Supports - Aging Management Evaluation

The materials from which components are fabricated, the environments to which components 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 in the following subsections of Section 3.5.2.1, Materials, Environment, Aging Effects Requiring Management and Aging Management Programs:

Section 3.5.2.1.1, Reactor Containment Vessel

Section 3.5.2.1.2, Shield Building

Section 3.5.2.1.3, Administration Building

Section 3.5.2.1.4, Auxiliary Building

Section 3.5.2.1.5, Screenhouse Access Tunnel

Section 3.5.2.1.6, Technical Support Center

Section 3.5.2.1.7, Turbine Building

Section 3.5.2.1.8, Yard Structures

Section 3.5.2.1.9, Discharge Structure

Section 3.5.2.1.10, Discharge Tunnel and Pipe

Section 3.5.2.1.11, Intake Structure

Section 3.5.2.1.12, Screenhouse

Section 3.5.2.1.13, Component Supports

Section 3.5.2.1.14, Miscellaneous Structural Commodities

Section 3.5.2.1.15, NSSS Supports

3.5.2.1 MATERIALS, ENVIRONMENT, AGING EFFECTS REQUIRING MANAGEMENT AND AGING MANAGEMENT PROGRAMS

3.5.2.1.1 Reactor Containment Vessel

Materials

The materials of construction for the Reactor Containment Vessel structural members are:

- Concrete
- Elastomers
- Stainless Steel
- Steel

Environment

The Reactor Containment Vessel structural members are exposed to the following environments:

- Air-indoor uncontrolled
- Borated water leakage
- Raw water
- Soil
- Treated water-primary

Aging Effects Requiring Management

The following aging effects, associated with the Reactor Containment Vessel structural members, require management:

- Cracking
- Cracking, loss of bond, and loss of material (spalling, scaling)
- Cracking, Loss of material
- Cracks and distortion
- Increase in porosity and permeability, cracking, loss of material (spalling, scaling)
- Increase in porosity and permeability, loss of strength
- Loss of leak tightness

- Loss of material
- Loss of sealing; Leakage through containment
- Reduction in concrete anchor capacity due to local concrete degradation

Aging Management Programs

The following aging management programs manage the aging effects for the Reactor Containment Vessel structural members:

- ASME Section XI, Subsection IWE
- Boric Acid Corrosion
- Work Control Process
- Primary Water Chemistry
- Reactor Containment Leakage Testing 10 CFR 50, Appendix J
- Structures Monitoring Program

3.5.2.1.2 Shield Building

Materials

The materials of construction for the Shield Building structural members are:

- Concrete
- Elastomers
- Stainless Steel
- Steel

Environment

The Shield Building structural members are exposed to the following environments:

- Air-indoor uncontrolled
- Air-outdoor
- Borated water leakage
- Raw water
- Soil

Aging Effects Requiring Management

The following aging effects, associated with the Shield Building structural members, require management:

- Change in material properties
- Concrete cracking and spalling
- Cracking
- Cracking, Delamination
- 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
- Reduction in concrete anchor capacity due to local concrete degradation

Aging Management Programs

The following aging management programs manage the aging effects for the Shield Building structural members:

- Boric Acid Corrosion
- External Surfaces Monitoring
- Fire Protection
- Structures Monitoring Program

3.5.2.1.3 Administration Building

Materials

The materials of construction for the Administration Building structural members are:

- Concrete
- Steel

Environment

The Administration Building structural members are exposed to the following environments:

- Air-indoor uncontrolled
- Air-outdoor
- Soil

Aging Effects Requiring Management

The following aging effects, associated with the Administration Building structural members, require management:

- Concrete cracking and spalling
- Cracking
- 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
- Reduction in concrete anchor capacity due to local concrete degradation

Aging Management Programs

The following aging management programs manage the aging effects for the Administration Building structural members:

- Fire Protection
- Structures Monitoring Program

3.5.2.1.4 Auxiliary Building

Materials

The materials of construction for the Auxiliary Building structural members are:

- Aluminum
- Concrete

- Elastomers
- Non-Metallic
- Stainless Steel
- Steel

Environment

The Auxiliary Building structural members are exposed to the following environments:

- Air-indoor controlled
- Air-indoor uncontrolled
- Air-outdoor
- Borated water leakage
- Raw water
- Soil
- Treated water-primary

Aging Effects Requiring Management

The following aging effects, associated with the Auxiliary Building structural members, require management:

- Concrete cracking and spalling
- Cracking
- Cracking, loss of bond, and loss of material (spalling, scaling)
- Cracking, Loss of material
- 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
- Reduction in concrete anchor capacity due to local concrete degradation

Aging Management Programs

The following aging management programs manage the aging effects for the Auxiliary Building structural members:

- Boric Acid Corrosion
- Fire Protection
- Work Control Process
- Primary Water Chemistry
- Structures Monitoring Program

3.5.2.1.5 Screenhouse Access Tunnel

Materials

The materials of construction for the Screenhouse Access Tunnel structural members are:

- Concrete
- Steel

Environment

The Screenhouse Access Tunnel structural members are exposed to the following environments:

- Air-indoor uncontrolled
- Soil

Aging Effects Requiring Management

The following aging effects, associated with the Screenhouse Access Tunnel structural members, require management:

- Concrete cracking and spalling
- Cracking
- Cracking, loss of bond, and loss of material (spalling, scaling)
- Cracks and distortion
- Increase in porosity and permeability, cracking, loss of material (spalling, scaling)
- Loss of material

Aging Management Programs

The following aging management programs manage the aging effects for the Screenhouse Access Tunnel structural members:

- Fire Protection
- Structures Monitoring Program

3.5.2.1.6 Technical Support Center

Materials

The materials of construction for the Technical Support Center structural members are:

- Concrete
- Steel

Environment

The Technical Support Center structural members are exposed to the following environments:

- Air-indoor uncontrolled
- Air-outdoor
- Soil

Aging Effects Requiring Management

The following aging effects, associated with the Technical Support Center structural members, require management:

- Concrete cracking and spalling
- Cracking
- 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

- Reduction in concrete anchor capacity due to local concrete degradation

Aging Management Programs

The following aging management programs manage the aging effects for the Technical Support Center structural members:

- Fire Protection
- Structures Monitoring Program

3.5.2.1.7 Turbine Building

Materials

The materials of construction for the Turbine Building structural members are:

- Concrete
- Steel

Environment

The Turbine Building structural members are exposed to the following environments:

- Air-indoor uncontrolled
- Air-outdoor
- Raw water
- Soil

Aging Effects Requiring Management

The following aging effects, associated with the Turbine Building structural members, require management:

- Concrete cracking and spalling
- Cracking
- 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
- Reduction in concrete anchor capacity due to local concrete degradation

Aging Management Programs

The following aging management programs manage the aging effects for the Turbine Building structural members:

- Fire Protection
- Structures Monitoring Program

3.5.2.1.8 Yard Structures

Materials

The materials of construction for the Yard Structures structural members are:

- Aluminum
- Concrete
- Steel

Environment

The Yard Structures structural members are exposed to the following environments:

- Air-outdoor
- Soil

Aging Effects Requiring Management

The following aging effects, associated with the Yard Structures structural members, require management:

- Concrete cracking and spalling
- Cracking
- 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 programs manage the aging effects for the Yard Structures structural members:

- Buried Piping and Tanks Inspection
- Fire Protection
- Structures Monitoring Program

3.5.2.1.9 Discharge Structure

Materials

The materials of construction for the Discharge Structure structural members are:

- Concrete
- Steel

Environment

The Discharge Structure structural members are exposed to the following environments:

- Air-outdoor
- Raw water
- Soil

Aging Effects Requiring Management

The following aging effects, associated with the Discharge Structure structural members, require management:

- Cracking
- 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 programs manage the aging effects for the Discharge Structure structural members:

- Structures Monitoring Program

3.5.2.1.10 Discharge Tunnel and Pipe

Materials

The materials of construction for the Discharge Tunnel & Pipe structural members are:

- Concrete
- Steel

Environment

The Discharge Tunnel & Pipe structural members are exposed to the following environments:

- Concrete
- Raw water
- Soil

Aging Effects Requiring Management

The following aging effects, associated with the Discharge Tunnel & Pipe structural members, require management:

- Cracking
- 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

Aging Management Programs

The following aging management programs manage the aging effects for the Discharge Tunnel & Pipe structural members:

- Structures Monitoring Program

3.5.2.1.11 Intake Structure

Materials

The materials of construction for the Intake Structure structural members are:

- Concrete
- Stainless Steel
- Steel

Environment

The Intake Structure structural members are exposed to the following environments:

- Raw water
- Soil

Aging Effects Requiring Management

The following aging effects, associated with the Intake Structure structural members, require management:

- Cracking
- 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

Aging Management Programs

The following aging management programs manage the aging effects for the Intake Structure structural members:

- Structures Monitoring Program

3.5.2.1.12 Screenhouse

Materials

The materials of construction for the Screenhouse structural members are:

- Concrete
- Elastomers
- Non-Metallic
- Steel

Environment

The Screenhouse structural members are exposed to the following environments:

- Air-indoor uncontrolled
- Air-outdoor
- Raw water
- Soil

Aging Effects Requiring Management

The following aging effects, associated with the Screenhouse structural members, require management:

- Concrete cracking and spalling
- Cracking
- 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
- Reduction in concrete anchor capacity due to local concrete degradation

Aging Management Programs

The following aging management programs manage the aging effects for the Screenhouse structural members:

- Fire Protection
- Structures Monitoring Program

3.5.2.1.13 Component Supports

Materials

The materials of construction for the Component Supports component types/structural members are:

- Aluminum
- Elastomers
- Stainless Steel
- Steel

Environment

The Component Supports component types/structural members are exposed to the following environments:

- Air-indoor uncontrolled
- Air-outdoor
- Borated water leakage
- Raw water
- Treated water-primary

Aging Effects Requiring Management

The following aging effects, associated with the Component Supports component types/structural members, require management:

- Cracking, Loss of material
- Loss of material
- Loss of mechanical function
- Reduction or loss of isolation function

Aging Management Programs

The following aging management programs manage the aging effects for the Component Supports component types/structural members:

- ASME Section XI, Subsection IWF
- Boric Acid Corrosion
- Fire Protection
- Primary Water Chemistry
- Structures Monitoring Program

3.5.2.1.14 Miscellaneous Structural Commodities

Materials

The materials of construction for the Miscellaneous Structural Commodities commodity groups are:

- Aluminum
- Elastomers
- Non-Metallic
- Stainless Steel
- Steel

Environment

The Miscellaneous Structural Commodities commodity groups are exposed to the following environments:

- Air-indoor controlled
- Air-indoor uncontrolled
- Air-outdoor
- Borated water leakage

Aging Effects Requiring Management

The following aging effects, associated with the Miscellaneous Structural Commodities commodity groups, require management:

- Change in material properties

- Cracking
- Cracking; Delamination
- Hardening and loss of strength
- Increased hardness, shrinkage and loss of strength
- Loss of material
- Loss of sealing

Aging Management Programs

The following aging management programs manage the aging effects for the Miscellaneous Structural Commodities commodity groups:

- Boric Acid Corrosion
- External Surfaces Monitoring
- Fire Protection
- Work Control Process
- Structures Monitoring Program

3.5.2.1.15 NSSS Supports

Materials

The materials of construction for the NSSS Supports structural members are:

- Steel
- Stainless Steel

Environment

The NSSS Supports structural members are exposed to the following environments:

- Air-indoor uncontrolled
- Borated water leakage
- Concrete

Aging Effects Requiring Management

The following aging effects, associated with the NSSS Supports structural members, require management:

- Cracking
- Loss of material
- Loss of mechanical function

Aging Management Programs

The following aging management programs manage the aging effects for the NSSS Supports subcomponents:

- ASME Section XI, Subsection IWF
- Bolting Integrity
- Boric Acid Corrosion

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 in the license renewal application. For the Structures and Component Supports, those programs are addressed in the following sections.

3.5.2.2.1 PWR and BWR Containments

3.5.2.2.1.1 Aging of Inaccessible Concrete Areas

There is no accessible concrete in scope for the Reactor Containment Vessel except for the Reactor Containment Vessel internal structures that are addressed in Subsection 3.5.2.2.2. The Reactor Containment Vessel is a steel structure supported on a foundation basemat. The foundation basemat, including concrete fill, is a below-grade inaccessible concrete area that is supported on soil.

When excavation occurs for any reason, the Structures Monitoring Program requires that an examination of the exposed portions of below grade concrete is conducted.

Ground water samples taken during plant construction in July 1968 and June 1971 indicate a ground water pH range of 7.40 to 7.90, chloride range of 14.8 to 39.0 ppm and a single reading of 359.40 ppm for sulfates. Ground water samples taken from February 2006 to December 2006 from the ISFSI construction monitoring wells, just north of the power block, indicate a pH range of 7.40 to 8.48, chloride range of 2.21 to 18.30 ppm and sulfate range of 40.74 to 118.60 ppm. These ground water samples have confirmed that the measured parameters are well within the limits established for a non-aggressive ground water environment. These readings also indicate that the values for chlorides, sulfates, and pH have not varied significantly from the readings taken in 1968 and 1971 time period when compared with the 2006 readings.

Ground water samples taken in June 2007 and March 2008 from the recently installed tritium assessment wells indicate a pH range of 7.07 to 8.17, chloride range of 3.18 to 1240 ppm and sulfate range of 22.7 to 372 ppm. The values for sulfates and pH have not varied significantly from the previous values. However, some of the ground water wells have slightly higher chlorides that are above the established limit. The chloride readings that exceeded the 500 ppm limit were from ground water wells installed in the proximity of paved plant areas that are heavily salted for deicing purposes during the winter months. The plant began using salt instead of sand for deicing of the paved plant areas somewhere between 1992 and 2000 and the salt is the most likely contributor to the high chloride concentrations found in the ground water samples from these wells. As described in Section B2.1.31, the Structures Monitoring Program will be enhanced to include periodic monitoring of below-grade water chemistry.

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 Structures Monitoring Program

As described in USAR Appendix E, the building structures are founded on stiff to hard silty clays. Settlement calculations performed during foundation evaluation indicated that most of the settlement would take place during construction, with very little settlement taking place after construction. Building settlement readings have been measured and recorded periodically since plant construction. No significant variations in building settlement have been observed. Also, no dewatering system is installed for control of settlement and there are no porous concrete subfoundations used below any foundation.

The Structures Monitoring Program is used to inspect for visual cracks and distortion due to increased stress levels from settlement in accessible areas. Also, the Structures Monitoring Program requires that settlement readings be taken every five years.

3.5.2.2.1.3 Reduction of Strength and Modulus of Concrete Structures due to Elevated Temperature

The Reactor Containment Vessel basemat and concrete fills are the only concrete elements addressed for this item. Neither of these concrete elements are exposed to an environment that exceeds the elevated temperature limits (150°F for general areas or 200°F for local areas) that would result in reduction of strength and modulus of concrete structures.

The Reactor Containment Vessel internal concrete structures are addressed in Section 3.5.2.2.2.

3.5.2.2.1.4 Loss of Material due to General, Pitting and Crevice Corrosion

The Reactor Containment Vessel is a steel shell structure with a hemispherical dome and ellipsoidal bottom. The lower portion of the Reactor Containment Vessel is embedded by the internal and external concrete to a point 2 feet-3 inches above the tangent line at the joint between vertical and ellipsoidal bottom. The Reactor Containment Vessel is housed within the Shield Building.

The loss of material due to general, pitting and crevice corrosion of the accessible areas of the Reactor Containment Vessel is managed by ASME Section XI, Subsection IWE and Reactor Containment Leakage Testing 10 CFR 50, Appendix J programs.

Corrosion for inaccessible areas (embedded portion of the Reactor Containment Vessel) is not expected because the concrete in contact with the embedded shell meets the requirements of ACI 318-63 and ACI 201.2R-77, which provide a good quality, dense, well cured, and low permeability concrete. The top of the concrete floors has been provided with sumps and curbs to collect any moisture. The air-gap between the concrete and the Reactor Containment Vessel shell is caulked with a sealant (moisture barrier) to assure that moisture will not penetrate the air gap. The aging effects for the moisture barrier for penetrating cracks are managed by ASME Section XI, Subsection IWE. Operating experience has not identified any significant corrosion (only surface rust) in the Reactor Containment Vessel shell.

Therefore, loss of material due to corrosion is not expected for inaccessible areas of the Reactor Containment Vessel shell.

3.5.2.2.1.5 Loss of Prestress due to Relaxation, Shrinkage, Creep, and Elevated Temperature

The Reactor Containment Vessel is not a prestressed structure. Therefore, this item is not applicable.

3.5.2.2.1.6 Cumulative Fatigue Damage

There are no fatigue analyses in the CLB applicable to penetrations (including penetration sleeves, dissimilar metal welds, and penetration bellows). Therefore, cumulative fatigue damage of penetrations is not a TLAA as defined in 10 CFR 54.3.

3.5.2.2.1.7 Cracking due to Stress Corrosion Cracking (SCC)

SCC is applicable to carbon and low-alloy steel in air only if the fabrication material is high yield strength steel. SCC of stainless steel in air is only applicable to sensitized stainless steel that is exposed to intermittent wetting.

The Reactor Containment Vessel penetrations, including nozzles, bellows, and dissimilar metal welds, are not fabricated from high yield strength steel and the stainless steel materials are not subject to intermittent wetting. Therefore, cracking due to SCC does not require aging management since the conditions necessary for SCC do not exist.

3.5.2.2.1.8 Cracking due to Cyclic Loading

The aging effect of cracking for penetrations (including penetration sleeves, dissimilar metal welds, and penetration bellows) due to cyclic loading is managed by the ASME Section XI, Subsection IWE and Reactor Containment Leakage Testing 10 CFR 50, Appendix J programs. Type A (ILRT) and B (LLRT) leakage testing per 10CFR Appendix J will be adequate to detect leakage.

3.5.2.2.1.9 Loss of Material (Scaling, Cracking, and Spalling) due to Freeze-Thaw

The Reactor Containment Vessel is totally enclosed within the Shield Building and the foundation basemat. Loss of material due to freeze-thaw is not applicable.

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

The foundation basemat including concrete fill is a below-grade inaccessible concrete area that is supported on soil.

The installation of the concrete and the material used for the concrete is in accordance with ACI and ASTM specifications and materials at the time of construction, which are in accordance with the recommendations as contained in ACI 201.2R-77 for durable concrete. Aggregates complied with ASTM C-33, “Specifications for Concrete Aggregates.” The aggregates were evaluated for potential alkali reactivity and tested to the requirements of ASTM C-227 and ASTM C-289 (for potential reactivity) and ASTM C-295, “Petrographic Examination of Aggregates”. Therefore, aging management 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

NUREG-1801 recommends further evaluation of certain structure/aging effects combinations if they are not covered by the structures monitoring program as follows:

1. Cracking, loss of bond, and loss of material (spalling, scaling) due to corrosion of embedded steel for Groups 1-5, 7, 9 structures.
2. Increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack for Groups 1-5, 7, 9 structures.
3. Loss of material due to corrosion for Groups 1-5, 7, 8 structures.
4. Loss of material (spalling, scaling) and cracking due to freeze-thaw for Groups 1-3, 5, 7-9 structures.
5. Cracking due to expansion and reaction with aggregates for Groups 1-5, 7-9 structures.
6. Cracks and distortion due to increased stress levels from settlement for Groups 1-3, 5-9 structures.
7. Reduction in foundation strength, cracking, differential settlement due to erosion of porous concrete subfoundation for Groups 1-3, 5-9 structures.
8. Lock up due to wear for Lubrite® radial beam seats in RPV support shoes for PWR with nozzle supports, steam generator supports, and other sliding support bearings and sliding support surfaces.

The Structures Monitoring Program is used to inspect the accessible areas for the above aging effects/mechanism in Items 1-6. The External Surfaces Monitoring and Fire Protection programs are used to inspect the accessible areas for Item 3. For Item 7, no porous concrete subfoundation is used below any foundation and no dewatering system is installed for control of settlement. Therefore, reduction in foundation strength, cracking, differential settlement due to erosion of porous concrete subfoundation are not aging effects requiring aging management for Groups 1-3, 5-9 structures.

For Item 8, lock-up due to wear is not an aging effect requiring management for this material because of the wear resistance inherent in the design of the material and the low number of times that movement occurs. However, Lubrite® plates are included within the Structures Monitoring Program and ASME Section XI, Subsection IWF program to confirm the absence of aging effects requiring management for this component.

3.5.2.2.2.2 Aging Management of Inaccessible Areas

3.5.2.2.2.2.1 Aging Management of Inaccessible Areas

The weathering index as defined in ASTM C33-90, Table 3, Footnote E., Figure 1 indicates that the station is located in severe weathering conditions. However, the reinforced concrete structures are designed, constructed, and inspected with ACI and ASTM standards that provides a good quality dense concrete with a low permeability. The reinforced concrete structures, other than the Technical Support Center structure, are designed in accordance with ACI 318-63. The Technical Support Center structure (constructed in 1980 for the first two floors and 2003-2004 time frame for the third level) is designed in accordance with ACI 318-77 and ACI 318-2002. Water-cement ratios are based on established reliable test data from concrete design mixes for the required strengths and an air entraining agent is used to provide the recommended air. Plant documents indicate the concrete mixes were designed with water-cement ratios that ranged between 0.41 to 0.52 and entrained air content between 3% to 7%. A review of operating experience has indicated that subsequent inspections for structures in scope for license renewal have not indicated any degradation related to freeze-thaw. Nevertheless, when excavation occurs for any reason, the Structures Monitoring Program requires that an examination of the exposed portions of below grade concrete be conducted.

3.5.2.2.2.2.2 Aging Management of Inaccessible Areas

The installation of the concrete and the material used for the concrete is in accordance with ACI and ASTM specifications and materials at the time of construction, which are in accordance with the recommendations as contained in ACI 201.2R-77 for durable concrete. Aggregates complied with ASTM C-33, “Specifications for Concrete Aggregates”. The aggregates were evaluated for potential alkali reactivity and tested to the requirements of ASTM C-227 and ASTM C-289 (for potential reactivity) and ASTM C-295, “Petrographic Examination of Aggregates”. Therefore, aging management is not required.

3.5.2.2.2.2.3 Aging Management of Inaccessible Areas

The building structures are founded on stiff to hard silty clays. Settlement calculations performed during foundation evaluation indicated that most of the settlement would take place, during construction, with very little settlement taking place after construction. Building settlement readings have been measured and recorded periodically since plant construction. No significant variations in building settlement have been observed. Also, no porous concrete subfoundation is used below any foundation and no dewatering system is installed for control of settlement.

The Structures Monitoring Program is used to inspect for visual cracks and distortion due to increased stress levels from settlement in accessible areas. Also, the Structures Monitoring Program requires that settlement readings be taken every five years.

3.5.2.2.2.2.4 Aging Management of Inaccessible Areas

When excavation occurs for any reason, the Structures Monitoring Program requires that an examination of the exposed portions of below grade concrete be conducted.

Ground water samples taken during plant construction in July 1968 and June 1971 indicate a ground water pH range of 7.40 to 7.90, chloride range of 14.8 to 39.0 ppm and a single reading of 359.40 ppm for sulfates. Ground water samples taken from February 2006 to December 2006 from the ISFSI construction monitoring wells, just north of the power block, indicate a pH range of 7.40 to 8.48, chloride range of 2.21 to 18.30 ppm and sulfate range of 40.74 to 118.60 ppm. These ground water samples have confirmed that the measured parameters are well within the limits established for a non-aggressive ground water environment. These readings also indicate that the values for chlorides, sulfates, and pH have not varied significantly from the readings taken in 1968 and 1971 time period when compared with the 2006 readings.

Ground water samples taken in June 2007 and March 2008 from the recently installed tritium assessment wells indicate a pH range of 7.07 to 8.17, chloride range of 3.18 to 1240 ppm and sulfate range of 22.7 to 372 ppm. The values for sulfates and pH have not varied significantly from the previous values. However, some of the ground water wells have slightly higher chlorides that are above the established limit. The chloride readings that exceeded the 500 ppm limit were from ground water wells installed in the proximity of paved plant areas that are heavily salted for deicing purposes during the winter months. The plant began using salt instead of sand for deicing of the paved plant areas somewhere between 1992 and 2000 and the salt is the most likely contributor to the high chloride concentrations found in the ground water samples from these wells. As described in Section B2.1.31, the Structures Monitoring Program will be enhanced to include periodic monitoring of below-grade water chemistry.

3.5.2.2.2.2.5 Aging Management of Inaccessible Areas

The installation of the concrete and the material used for the concrete is in accordance with ACI and ASTM specifications and materials at the time of construction, which are in accordance with the recommendations as contained in ACI 201.2R-77 for durable concrete.

3.5.2.2.2.3 Reduction of Strength and Modulus of Concrete Structures due to Elevated Temperature

Group 1-5 concrete elements do not exceed temperature limits of 150°F for general areas or 200°F for local areas.

3.5.2.2.2.4 Aging Management of Inaccessible Areas for Group 6 Structures

3.5.2.2.2.4.1 Aging Management of Inaccessible Areas for Group 6 Structures

As indicated in NUREG-1801, XI.S7, “RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants”, for plants not committed to Regulatory Guide 1.127, Revision 1, aging management of water-control structures may be included in the Structures Monitoring Program provided the attributes pertaining to water-control structures are incorporated. The Structures Monitoring Program is used to manage aging effects for inaccessible areas of the in-scope Group 6 structures. When excavation occurs for any reason, the Structures Monitoring Program requires that an examination of the exposed portions of below grade concrete be conducted.

Ground water samples taken during plant construction in July 1968 and June 1971 indicate a ground water pH range of 7.40 to 7.90, chloride range of 14.8 to 39.0 ppm and a single reading of 359.40 ppm for sulfates. Ground water samples taken from February 2006 to December 2006 from the ISFSI construction monitoring wells, just north of the power block, indicate a pH range of 7.40 to 8.48, chloride range of 2.21 to 18.30 ppm and sulfate range of 40.74 to 118.60 ppm. These ground water samples have confirmed that the measured parameters are well within the limits established for a non-aggressive ground water environment. These readings also indicate that the values for chlorides, sulfates, and pH have not varied significantly from the readings taken in 1968 and 1971 time period when compared with the 2006 readings.

Ground water samples taken in June 2007 and March 2008 from the recently installed tritium assessment wells indicate a pH range of 7.07 to 8.17, chloride range of 3.18 to 1240 ppm and sulfate range of 22.7 to 372 ppm. The values for sulfates and pH have not varied significantly from the previous values. However, some of the ground water wells have slightly higher chlorides that are above the established limit. The chloride readings that exceeded the 500 ppm limit were from ground water wells installed in the proximity of paved plant areas that are heavily salted for deicing purposes during the winter months. The plant began using salt instead of sand for deicing of the paved plant areas somewhere between 1992 and 2000 and the salt is the most likely contributor to the high chloride concentrations found in the ground water samples from these wells. As described in Section B2.1.31, the Structures Monitoring Program will be enhanced to include periodic monitoring of below-grade water chemistry.

3.5.2.2.2.4.2 Aging Management of Inaccessible Areas for Group 6 Structures

The weathering index as defined in ASTM C33-90, Table 3, Footnote E., Figure 1 indicates that the station is located in severe weathering conditions. However, the reinforced concrete structures are designed, constructed, and inspected with ACI and ASTM standards that provides a good quality dense concrete with a low permeability. The reinforced concrete structures, other than the Technical Support Center structure, are designed in accordance with ACI 318-63. The Technical Support Center structure (constructed in 1980 for the first two floors and 2003-2004 time frame for the third level) is designed in accordance with ACI 318-77 and ACI 318-2002. Water-cement ratios are based on established reliable test data from concrete design mixes for the required strengths and an air entraining agent is used to provide the recommended air. Plant documents indicate the concrete mixes were designed with water-cement ratios that ranged between 0.41 to 0.52 and entrained air content between 3% to 7%. A review of operating experience has indicated that subsequent inspections for structures in scope for license renewal have not indicated any degradation related to freeze-thaw. Nevertheless, when excavation occurs for any reason, the Structures Monitoring Program requires that an examination of the exposed portions of below grade concrete be conducted.

3.5.2.2.2.4.3 Aging Management of Inaccessible Areas for Group 6 Structures

The installation of the concrete and the material used for the concrete is in accordance with ACI and ASTM specifications and materials at the time of construction, which are in accordance with the recommendations as contained in ACI 201.2R-77 for durable concrete. Aggregates complied with ASTM C-33, “Specifications for Concrete Aggregates”. The aggregates were evaluated for potential alkali reactivity and tested to the requirements of ASTM C-227 and ASTM C-289 (for potential reactivity) and ASTM C-295, “Petrographic Examination of Aggregates”.

3.5.2.2.2.5 Cracking due to Stress Corrosion Cracking and Loss of Material due to Pitting and Crevice Corrosion

Tanks are evaluated for aging management in their respective mechanical systems

3.5.2.2.2.6 Aging of Supports Not Covered by Structures Monitoring Program

The Structures Monitoring Program is used to manage the aging effects for Groups B1-B5 supports and Miscellaneous Structural Commodities such as cabinets and panels. Additionally, the Fire Protection program is used to manage the aging effects for the fire hose stations supports. The External Surfaces Monitoring program and the Fire Protection program are used to manage the aging effects for Miscellaneous Structural Commodities such as junction, terminal, pull boxes, and doors.

3.5.2.2.2.7 Cumulative Fatigue Damage due to Cyclic Loading

There are no fatigue analyses in the CLB applicable to component supports. Therefore, cumulative fatigue damage of component supports is not a TLAA as defined in 10 CFR 54.3.

3.5.2.3 TIME-LIMITED AGING ANALYSIS

The TLAAs identified below are associated with the Structures and Component Supports structural members. The section of the LRA that contains the TLAA review results is indicated in parenthesis.

- Reactor Containment Vessel (Section 4.6, Containment Liner Plate, Metal Containments, and Penetrations Fatigue Analysis)

3.5.3 CONCLUSION

The Structures and Component Supports structural members that are subject to aging management review have been identified in accordance with the requirements of 10 CFR 54.4. The aging management programs selected to manage aging effects for the Structures and Component Supports structural members are identified in the summary tables and Section 3.5.2.1.

A description of these aging management programs is provided in Appendix B, along with the demonstration that the identified aging effects will be managed for the period of extended operation.

Therefore, based on the programs provided in Appendix B, the effects of aging associated with the Structures and Component Supports structural members will be adequately managed so that there is reasonable assurance that the intended function(s) will be maintained consistent with the current licensing basis during the period of extended operation.

Results Tables: Containment, Structures and Component Supports

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
PWR Concrete (Reinforced and Prestressed) and Steel Containments BWR Concrete and Steel (Mark I, II, and III) Containments					
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) 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, plant-specific, if the environment is aggressive	There is no accessible concrete in scope for the Reactor Containment Vessel except for the Reactor Containment Vessel internal structures that are addressed separately. The Reactor Containment Vessel is a steel structure supported on a foundation basemat, which is inaccessible. Aging of inaccessible concrete areas due to aggressive chemical attack, and corrosion of embedded steel for the Reactor Containment Vessel basemat is managed by the Structures Monitoring Program. Further evaluation is documented in Subsection 3.5.2.2.1.1.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-02	Concrete elements; All	Cracks and distortion due to increased stress levels from settlement	Structures Monitoring Program. 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. Cracks and distortion due to increased stress levels from settlement for the Reactor Containment Vessel basemat are managed by the Structures Monitoring Program. No dewatering system is installed for control of settlement. Further evaluation is documented in Subsection 3.5.2.2.1.2.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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. 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	NUREG-1801 item is not applicable. There is no porous concrete subfoundation utilized for the Reactor Containment Vessel basemat. Further evaluation is documented in Subsection 3.5.2.2.1.2.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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, plant-specific if temperature limits are exceeded	NUREG-1801 item is not applicable. The Reactor Containment Vessel basemat, including concrete fill, is a below-grade inaccessible concrete area, which is not exposed to elevated temperature. Further evaluation is documented in Subsection 3.5.2.2.1.3.
3.5.1-05	BWR Only				

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-06	Steel elements: steel liner, liner anchors, integral attachments	Loss of material due to general, pitting and crevice corrosion	ISI (IWE), and 10 CFR Part 50, Appendix J.	Yes, if corrosion is significant for inaccessible areas	Consistent with NUREG-1801. Loss of material due to general, pitting, and crevice corrosion for the Reactor Containment Vessel shell is managed by the ASME Section XI, Subsection IWE and the Reactor Containment Leakage Testing 10 CFR 50, Appendix J programs. Loss of material due to corrosion for inaccessible areas is not expected to occur. Further evaluation is documented 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	Further evaluation is documented in Subsection 3.5.2.2.1.5.
3.5.1-08	BWR Only				

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	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	Further evaluation is documented 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) and 10 CFR Part 50, Appendix J, and additional appropriate examinations/evaluations for bellows assemblies and dissimilar metal welds.	Yes, detection of aging effects is to be evaluated	NUREG-1801 item is not applicable. Cracking due to stress corrosion cracking is not an aging effect requiring management for the Reactor Containment Vessel penetrations, including nozzles, bellows, and dissimilar metal welds. Further evaluation is documented in Subsection 3.5.2.2.1.7.
3.5.1-11	BWR Only				

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	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) and 10 CFR Part 50, Appendix J, and supplemented to detect fine cracks	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. Cracking due to cyclic loading for piping penetrations (including expansion joint bellows) is managed by the ASME Section XI, Subsection IWE and Reactor Containment Leakage Testing 10 CFR 50, Appendix J programs. Further evaluation is documented in Subsection 3.5.2.2.1.8.
3.5.1-13	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). Evaluation is needed for plants that are located in moderate to severe weathering conditions (weathering index >100 day-inch/yr) (NUREG-1557).	Yes, for inaccessible areas of plants located in moderate to severe weathering conditions	NUREG-1801 is not applicable. The Reactor Containment Vessel is not exposed to weather. Further evaluation is documented in Subsection 3.5.2.2.1.9.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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) 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 The Reactor Containment Vessel basemat, including concrete fill, is a below-grade inaccessible concrete area that is supported on soil. The basemat concrete was constructed in accordance with the recommendations in ACI 201.2R-77 for durable concrete. Further evaluation is documented in Subsection 3.5.2.2.1.10.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	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) and 10 CFR Part 50, Appendix J	No	Consistent with NUREG-1801. Loss of sealing and leakage through containment for the emergency, equipment, and personnel air lock and fuel transfer tube blind flange gaskets due to deterioration is managed by the Reactor Containment Leakage Testing 10 CFR 50, Appendix J program. Loss of sealing and leakage through containment for the moisture barrier due to deterioration is managed by the ASME Section XI, Subsection IWE program.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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 and Plant Technical Specifications	No	Consistent with NUREG-1801. Loss of leak tightness due to wear of locks, hinges and closure mechanisms is managed by the Reactor Containment Leakage Testing 10 CFR 50, Appendix J program. Leak tightness testing for these components is governed by the plant Technical Specifications which are part of the current licensing basis and will remain in effect during the period of extended operation.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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) and 10 CFR Part 50, Appendix J.	No	Consistent with NUREG-1801. Loss of material due to general, pitting, and crevice corrosion for the steel penetration sleeves and dissimilar metal welds; expansion joint bellows, personnel and emergency airlocks, and equipment hatch is managed by the ASME Section XI, Subsection IWE and Reactor Containment Leakage Testing 10 CFR 50, Appendix J programs.
3.5.1-19	BWR Only				
3.5.1-20	BWR Only				
3.5.1-21	BWR Only				
3.5.1-22	Prestressed containment: tendons and anchorage components	Loss of material due to corrosion	ISI (IWL)	No	NUREG -1801 is not applicable. The Reactor Containment Vessel is not a prestressed structure.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
Safety Related and Other Structures; and Component Supports					
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	Yes, if not within the scope of the applicant's structures monitoring program	Consistent with NUREG-1801. Cracking, loss of bond, and loss of material (spalling, scaling) due to corrosion of embedded steel for interior and above grade exterior concrete is managed by the Structures Monitoring Program. Further evaluation is documented 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	Yes, if not within the scope of the applicant's structures monitoring program	Consistent with NUREG-1801. Increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack for interior and above grade exterior concrete is managed by the Structures Monitoring Program. Further evaluation is documented in Subsection 3.5.2.2.2.1.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-25	All Groups except Group 6: steel components: all structural steel	Loss of material due to corrosion	Structures Monitoring Program. 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	Loss of material due to corrosion for structural steel components is managed by the Structures Monitoring Program. Loss of material due to corrosion for the steel penetration seals, which are located in the Shield Building, is managed by the Fire Protection program, which takes exception to the NUREG-1801 AMP, and the External Surfaces Monitoring program. Further evaluation is documented in Subsection 3.5.2.2.2.1.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	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. 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. Loss of material (spalling, scaling) and cracking due to freeze-thaw for accessible concrete is managed by the Structures Monitoring Program. Further evaluation is documented in Subsection 3.5.2.2.2.1 or Subsection 3.5.2.2.2.2.1.
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. None for inaccessible areas if concrete was constructed in accordance with the recommendations in ACI 201.2R-77.	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. Cracking due to expansion due to reaction with aggregates for accessible concrete is managed by the Structures Monitoring Program. Concrete in inaccessible areas was constructed in accordance with the recommendations in ACI 201.2R-77 for durable concrete. Further evaluation is documented in Subsection 3.5.2.2.2.1 or Subsection 3.5.2.2.2.2.2.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	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. 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	Consistent with NUREG-1801. Cracks and distortion due to increased stress levels from settlement in concrete is managed by the Structures Monitoring Program. No dewatering system is installed for control of settlement for any license renewal in-scope structure. Further evaluation is documented in Subsection 3.5.2.2.2.1 or Subsection 3.5.2.2.2.2.3.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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. 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	NUREG-1801 item is not applicable. There is no porous concrete subfoundation used for any license renewal in-scope structure. Further evaluation is documented in Subsection 3.5.2.2.2.1 or Subsection 3.5.2.2.2.2.3.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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	ISI (IWF) or Structures monitoring Program	Yes, if not within the scope of ISI or structures monitoring program	NUREG-1801 item is not applicable. Lock-up due to wear is not an aging effect requiring management for this material because of the wear resistance inherent in the design of the material and the low number of times that movement occurs. However, Lubrite® plates are included within the Structures Monitoring Program and the ASME Section XI, Subsection IWF program to confirm the absence of aging effects requiring management for this component. The ASME Section XI, Subsection IWF program takes exception to the NUREG-1801 AMP. Further evaluation is documented in Subsection 3.5.2.2.2.1.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	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; Cracking, loss of bond, and loss of material (spalling, scaling)/ corrosion of embedded steel	Structures Monitoring Program; 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, plant-specific, if environment is aggressive	Consistent with NUREG-1801. Aging effects for inaccessible concrete is managed by the Structures Monitoring Program. Groundwater chemistry is non-aggressive. Exposed portions of below-grade concrete will be examined when excavated and periodic monitoring of groundwater chemistry will be performed. Further evaluation is documented in Subsection 3.5.2.2.2.2.4.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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 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. Increase in porosity and permeability, and loss of strength due to leaching of calcium hydroxide for accessible concrete is managed by the Structures Monitoring Program. Concrete in inaccessible areas was constructed in accordance with the recommendations in ACI 201.2R-77 for durable concrete. Further evaluation is documented 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, plant-specific if temperature limits are exceeded	NUREG-1801 item is not applicable. The specified temperature limits for concrete are not exceeded. Further evaluation is documented in Subsection 3.5.2.2.2.3.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	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 or FERC/US Army Corps of Engineers dam inspections and maintenance programs 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, plant-specific if environment is aggressive	Consistent with NUREG-1801. The Structures Monitoring Program incorporates the recommendations of NUREG-1801, Section XI.S7, RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants. 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 for accessible concrete is managed by the Structures Monitoring Program. Groundwater chemistry is non-aggressive and exposed portions of below-grade concrete will be examined when excavated and periodic monitoring of groundwater chemistry will be performed. Further evaluation is documented in Subsection 3.5.2.2.2.4.1.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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 or FERC/US Army Corps of Engineers dam inspections and maintenance programs. Evaluation is needed for plants that are located in moderate to severe weathering conditions (weathering index >100 day-inch/yr) (NUREG-1557).	Yes, for inaccessible areas of plants located in moderate to severe weathering conditions	Consistent with NUREG-1801. Loss of material (spalling, scaling) and cracking due to freeze-thaw for accessible concrete is managed by the Structures Monitoring Program. The Structures Monitoring Program incorporates the recommendations of NUREG-1801, Section XI.S7, RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants. For inaccessible areas, the reinforced concrete structures are designed, constructed, and inspected with ACI and ASTM standards that provides a good quality dense concrete with a low permeability. Further evaluation is documented in Subsection 3.5.2.2.2.4.2.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-36	Group 6: all accessible/ inaccessible reinforced concrete	Cracking due to expansion/ reaction with aggregates	Accessible areas: Inspection of Water-Control Structures or FERC/US Army Corps of Engineers dam inspections and maintenance programs. 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	Concrete, which is inaccessible, was constructed in accordance with the recommendations as contained in ACI 201.2R-77 for durable concrete. Cracking due to expansion/ reaction with aggregates is managed by the Structures Monitoring Program for Group 6 accessible reinforced concrete. The Structures Monitoring Program incorporates the recommendations of NUREG-1801, Section XI.S7, RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants. Further evaluation is documented in Subsection 3.5.2.2.2.4.3.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	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	For accessible areas, inspection of Water-Control Structures or FERC/US Army Corps of Engineers dam inspections and maintenance programs. 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	Concrete, which is inaccessible, was constructed in accordance with the recommendations as contained in ACI 201.2R-77 for durable concrete. Increase in porosity and permeability, loss of strength due to leaching of calcium hydroxide is managed by the Structures Monitoring Program for Group 6 accessible reinforced concrete. The Structures Monitoring Program incorporates the recommendations of NUREG-1801, Section XI.S7, Inspection of Water-Control Structures Associated with Nuclear Power Plants. Further evaluation is documented in Subsection 3.5.2.2.2.4.3.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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, plant specific	Tanks are evaluated for aging management in their respective mechanical systems. Further evaluation is documented in Subsection 3.5.2.2.2.5.
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	Yes, if not within the scope of the applicant's structures monitoring program	Loss of material due to general and pitting corrosion for Miscellaneous Structural Commodities and Component Supports is managed by the Structures Monitoring Program, External Surfaces Monitoring program, and Fire Protection program. The Fire Protection program takes exception to the NUREG-1801 AMP. Further evaluation is documented in Subsection 3.5.2.2.2.6.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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	Yes, if not within the scope of the applicant's structures monitoring program	Consistent with NUREG-1801. Reduction in concrete anchor capacity due to local concrete degradation of expansion and grouted anchors is managed by the Structures Monitoring Program. Further evaluation is documented in Subsection 3.5.2.2.2.6.
3.5.1-41	Vibration isolation elements	Reduction or loss of isolation function/ radiation hardening, temperature, humidity, sustained vibratory loading	Structures Monitoring Program	Yes, if not within the scope of the applicant's structures monitoring program	Consistent with NUREG-1801. Reduction or loss of isolation function due to radiation hardening, temperature, humidity, sustained vibratory loading for vibration isolation elements is managed by the Structures Monitoring Program. Further evaluation is documented in Subsection 3.5.2.2.2.6.
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	Further evaluation is documented in Subsection 3.5.2.2.2.7.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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	No	Cracking due to restraint shrinkage, creep, and aggressive environment of masonry block walls is managed by the Structures Monitoring Program. Cracking of masonry block walls used as fire barriers is managed by the Fire Protection program, which takes exception to the NUREG-1801 AMP. The Structures Monitoring Program incorporates the recommendations of NUREG-1801, Section XI.S5, Masonry Wall Program.
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	No	Loss of sealing of elastomer seals and gaskets due to deterioration is managed by the Work Control Process program, which is a plant-specific program, the Structures Monitoring Program, and Fire Protection programs. The Fire Protection program takes exception to the NUREG-1801 AMP.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-45	Group 6: exterior above and below grade concrete foundation; interior slab	Loss of material due to abrasion, cavitation	Inspection of Water-Control Structures or FERC/US Army Corps of Engineers dam inspections and maintenance	No	Loss of material due to abrasion, cavitation for exterior above and below grade structural concrete is managed by the Structures Monitoring Program. The Structures Monitoring Program incorporates the recommendations of NUREG-1801, Section XI.S7, RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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 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. Cracking due to stress corrosion cracking; loss of material due to pitting and crevice corrosion for fuel pool liners are managed by the Primary Water Chemistry program. Monitoring of spent fuel pool leak detection system is monitored in accordance with Operating Procedures. Cracking due to stress corrosion cracking; loss of material due to pitting and crevice corrosion for fuel transfer tube components, cask wear plates, sand plugs, and pipe supports are also managed by the Primary Water Chemistry program.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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 or FERC/US Army Corps of Engineers dam inspections and maintenance. If protective coatings are relied upon to manage aging, protective coating monitoring and maintenance provisions should be included.	No	Consistent with NUREG-1801. Loss of material due to general (steel only), pitting and crevice corrosion of steel structural members is managed by the Structures Monitoring Program. The Structures Monitoring Program incorporates the recommendations of NUREG-1801, Section XI.S7, RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants.
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 or FERC/US Army Corps of Engineers dam inspections and maintenance programs	No	NUREG-1801 item is not applicable. There are no earthen water control structures in the scope of license renewal.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-49	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	No	Not consistent with NUREG-1801. Loss of material due to pitting and crevice corrosion for junction, terminal, and pull boxes is managed by the External Surfaces Monitoring program. Loss of material due to pitting and crevice corrosion for metal enclosed bus - enclosure assemblies, dome vent penetration sleeve and weather cap, fixed louvers with bird screens, manhole access covers, and cable trays and electrical conduits is managed by the Structures Monitoring Program.
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	Integrity	No	Consistent with NUREG-1801. Loss of material due to general corrosion for high strength bolts are managed by the Bolting Integrity program.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	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	No	Consistent with NUREG-1801. Loss of mechanical function due to corrosion, distortion, dirt, overload, fatigue due to vibratory and cyclic thermal loads of sliding support surfaces is managed by the Structures Monitoring Program.
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)	No	Consistent with NUREG-1801. Loss of material due to general and pitting corrosion of steel support members is managed by the ASME Section XI, Subsection IWF program, which takes exception to the NUREG-1801 AMP.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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)	No	Consistent with NUREG-1801. Loss of mechanical function due to corrosion, distortion, dirt, overload, fatigue due to vibratory and cyclic thermal loads for steel support members is managed by the ASME Section XI, Subsection IWF program, which takes exception to the NUREG-1801 AMP.
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	No	Consistent with NUREG-1801. Loss of material due to boric acid corrosion for steel and aluminum support members is managed by Boric Acid Corrosion program.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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)	No	Consistent with NUREG-1801. Loss of mechanical function due to corrosion, distortion, dirt, overload, fatigue due to vibratory and cyclic thermal loads for steel sliding surfaces is managed by the ASME Section XI, Subsection IWF program, which takes exception to the NUREG-1801 AMP.
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)	No	NUREG-1801 item is not applicable. There are no vibration isolation elements for Groups B1.1, B1.2, and B1.3 in the scope of license renewal.

Table 3.5.1 Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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	NA - No AEM or AMP	Consistent with NUREG-1801. There are no aging effects associated with galvanized steel and aluminum support members exposed to air-indoor uncontrolled.
3.5.1-59	Stainless steel support members; welds; bolted connections; support anchorage to building structure	None	None	NA - No AEM or AMP	Consistent with NUREG-1801. There are no aging effects associated with Stainless steel support members; welds; bolted connections; support anchorage to building structure exposed to air-indoor uncontrolled or borated water leakage.

Results Tables: Containment, Structures and Component Supports AMR Results

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-1: Structures and Component Supports - Reactor Containment Vessel - Aging Management Evaluation

Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Reactor Containment Vessel	EN; EQB; FB; PB; SS	Steel	(E) Air-indoor uncontrolled	Loss of material/general, pitting, and crevice corrosion	ASME Section XI, Subsection IWE	II.A2-09	3.5.1-06	A
					Reactor Containment Leakage Testing 10 CFR 50, Appendix J	II.A2-09	3.5.1-06	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	A-079	3.3.1-89	A
Reactor Containment vessel basemat	SS	Concrete	(E) Soil	Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures Monitoring Program	T-005	3.5.1-31	A, 3
				Cracks and distortion/due to increased stress levels from settlement	Structures Monitoring Program	II.A2-05	3.5.1-02	A
				Increase in porosity and permeability, cracking, loss of material (spalling, scaling)/aggressive chemical attack	Structures Monitoring Program	II.A2-04	3.5.1-01	E
Electrical penetration nozzles	EQB; FB; PB; SS	Steel	(E) Air-indoor uncontrolled	Loss of material/general, pitting, and crevice corrosion	ASME Section XI, Subsection IWE	II.A3-01	3.5.1-18	A
					Reactor Containment Leakage Testing 10 CFR 50, Appendix J	II.A3-01	3.5.1-18	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	A-079	3.3.1-89	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-1: Structures and Component Supports - Reactor Containment Vessel - Aging Management Evaluation

Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Equipment pads / grout	SS	Concrete	(E) Air-indoor uncontrolled	Reduction in concrete anchor capacity due to local concrete degradation/service-induced cracking or other concrete aging mechanisms	Structures Monitoring Program	T-029	3.5.1-40	A
Fuel transfer tube	PB; SS	Stainless Steel	(E) Air-indoor uncontrolled	None	None	TP-005	3.5.1-59	A
			(E) Treated water-primary	Cracking, Loss of material/stress corrosion cracking, pitting and crevice corrosion	Primary Water Chemistry	T-014	3.5.1-46	C, S2
Fuel transfer tube expansion bellows	PB	Stainless Steel	(E) Air-indoor uncontrolled	None	None	TP-005	3.5.1-59	A
			(E) Treated water-primary	Cracking, Loss of material/stress corrosion cracking, pitting and crevice corrosion	Primary Water Chemistry	T-014	3.5.1-46	C, S2
Fuel transfer tube expansion bellows cover	EN; PB	Steel	(E) Air-indoor uncontrolled	Loss of material/corrosion	Structures Monitoring Program	III.A4-05	3.5.1-25	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	A-079	3.3.1-89	A
Fuel transfer tube blind flange	PB	Stainless Steel	(E) Treated water-primary	Cracking, Loss of material/stress corrosion cracking, pitting and crevice corrosion	Primary Water Chemistry	T-014	3.5.1-46	C, S2
Fuel transfer tube gate valve	PB; SS	Stainless Steel	(E) Air-indoor uncontrolled	None	None	TP-005	3.5.1-59	A
			(E) Treated water-primary	Cracking, Loss of material/stress corrosion cracking, pitting and crevice corrosion	Primary Water Chemistry	T-014	3.5.1-46	C, S2

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-1: Structures and Component Supports - Reactor Containment Vessel - Aging Management Evaluation

Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Fuel transfer tube penetration	EQB; FB; PB; SS	Stainless Steel	(E) Air-indoor uncontrolled	None	None	TP-005	3.5.1-59	A
			(E) Treated water-primary	Cracking, Loss of material/stress corrosion cracking, pitting and crevice corrosion	Primary Water Chemistry	T-014	3.5.1-46	C, S2
Gaskets (for emergency, equipment and personnel airlocks)	PB: SS	Elastomers	(E) Air-indoor uncontrolled	Loss of sealing; Leakage through containment/deterioration of seals, gaskets, and moisture barriers (caulking, flashing, and other sealants)	Reactor Containment Leakage Testing 10 CFR 50, Appendix J	II.A3-07	3.5.1-16	A
Gaskets (fuel transfer tube blind flange)	PB; SS	Elastomers	(E) Air-indoor uncontrolled	Loss of sealing; Leakage through containment/deterioration of seals, gaskets, and moisture barriers (caulking, flashing, and other sealants)	Reactor Containment Leakage Testing 10 CFR 50, Appendix J	II.A3-07	3.5.1-16	A
Guard pipes and Impingement rings	JIS; PB; SS	Steel	(E) Air-indoor uncontrolled	Loss of material/corrosion	Structures Monitoring Program	III.A4-05	3.5.1-25	A
Heating and ventilation penetrations	EQB; FB; PB; SS	Steel	(E) Air-indoor uncontrolled	Loss of material/general, pitting, and crevice corrosion	ASME Section XI, Subsection IWE	II.A3-01	3.5.1-18	A
					Reactor Containment Leakage Testing 10 CFR 50, Appendix J	II.A3-01	3.5.1-18	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	A-079	3.3.1-89	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-1: Structures and Component Supports - Reactor Containment Vessel - Aging Management Evaluation

Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Hinges, Latches, and closure mechanisms for airlocks	PB; SS	Steel	(E) Air-indoor uncontrolled	Loss of leak tightness/mechanical wear of locks, hinges and closure mechanisms	Reactor Containment Leakage Testing 10 CFR 50, Appendix J	II.A3-05	3.5.1-17	A
				Loss of material/general, pitting, and crevice corrosion	ASME Section XI, Subsection IWE	II.A3-06	3.5.1-18	A
					Reactor Containment Leakage Testing 10 CFR 50, Appendix J	II.A3-06	3.5.1-18	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	A-079	3.3.1-89	A
Masonry block walls	SS	Concrete	(E) Air-indoor uncontrolled	Cracking/due to restraint shrinkage, creep, and aggressive environment	Structures Monitoring Program	T-012	3.5.1-43	A
Miscellaneous Steel (brackets, embedded steel exposed surfaces (shapes, plates, unistrut, etc.) ladders, platforms, gratings, checkered plates, stairs, handrails)	SS	Steel	(E) Air-indoor uncontrolled	Loss of material/corrosion	Structures Monitoring Program	III.A4-05	3.5.1-25	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	A-079	3.3.1-89	A
Missile shield cover	MB	Steel	(E) Air-indoor uncontrolled	Loss of material/corrosion	Structures Monitoring Program	III.A4-05	3.5.1-25	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	A-079	3.3.1-89	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-1: Structures and Component Supports - Reactor Containment Vessel - Aging Management Evaluation

Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Moisture barrier	EN	Elastomers	(E) Air-indoor uncontrolled	Loss of sealing; Leakage through containment/deterioration of seals, gaskets, and moisture barriers (caulking, flashing, and other sealants)	ASME Section XI, Subsection IWE	II.A3-07	3.5.1-16	A
Personnel and Emergency airlocks, equipment hatch, and equalizing valves for airlocks	EQB; FB; PB; SS	Steel	(E) Air-indoor uncontrolled	Loss of material/general, pitting, and crevice corrosion	ASME Section XI, Subsection IWE	II.A3-06	3.5.1-18	A
					Reactor Containment Leakage Testing 10 CFR 50, Appendix J	II.A3-06	3.5.1-18	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	A-079	3.3.1-89	A, 1

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-1: Structures and Component Supports - Reactor Containment Vessel - Aging Management Evaluation

Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Piping penetrations (including expansion joint bellows)	EQB; FB; PB; SS	Stainless Steel	(E) Air-indoor uncontrolled	Cracking/cyclic loading (CLB fatigue analysis does not exist)	ASME Section XI, Subsection IWE	II.A3-03	3.5.1-12	A
					Reactor Containment Leakage Testing 10 CFR 50, Appendix J	II.A3-03	3.5.1-12	A
				Loss of material/general, pitting, and crevice corrosion	ASME Section XI, Subsection IWE	II.A3-01	3.5.1-18	A
					Reactor Containment Leakage Testing 10 CFR 50, Appendix J	II.A3-01	3.5.1-18	A
			(E) Borated water leakage	None	None	AP-018	3.3.1-99	A
		Steel	(E) Air-indoor uncontrolled	Cracking/cyclic loading (CLB fatigue analysis does not exist)	ASME Section XI, Subsection IWE	II.A3-03	3.5.1-12	A
					Reactor Containment Leakage Testing 10 CFR 50, Appendix J	II.A3-03	3.5.1-12	A
				Loss of material/general, pitting, and crevice corrosion	ASME Section XI, Subsection IWE	II.A3-01	3.5.1-18	A
					Reactor Containment Leakage Testing 10 CFR 50, Appendix J	II.A3-01	3.5.1-18	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	A-079	3.3.1-89	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-1: Structures and Component Supports - Reactor Containment Vessel - Aging Management Evaluation

Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Radiation shield	EN	Steel	(E) Air-indoor uncontrolled	Loss of material/corrosion	Structures Monitoring Program	III.A4-05	3.5.1-25	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	A-079	3.3.1-89	A
Reactor cavity liner	SS	Stainless Steel	(E) Air-indoor uncontrolled	None	None	TP-005	3.5.1-59	C
			(E) Borated water leakage	None	None	AP-018	3.3.1-99	C
		Steel	(E) Air-indoor uncontrolled	Loss of material/corrosion	Structures Monitoring Program	III.A4-05	3.5.1-25	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	A-079	3.3.1-89	A
Reactor cavity seal ring	EN; PB	Elastomers	(E) Air-indoor uncontrolled	Loss of sealing/deterioration of seals, gaskets, and moisture barriers (caulking, flashing, and other sealants)	Work Control Process	TP-007	3.5.1-44	E, 4
		Stainless Steel	(E) Air-indoor uncontrolled	None	None	TP-005	3.5.1-59	A, 4

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-1: Structures and Component Supports - Reactor Containment Vessel - Aging Management Evaluation

Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Reactor cavity shield wall	EN; JIS; MB; SS	Concrete	(E) Air-indoor uncontrolled	Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures Monitoring Program	III.A4-03	3.5.1-23	A
				Cracking/due to expansion and reaction with aggregates	Structures Monitoring Program	III.A4-02	3.5.1-27	A
				Increase in porosity and permeability, cracking, loss of material (spalling, scaling)/aggressive chemical attack	Structures Monitoring Program	III.A4-04	3.5.1-24	A
Refueling pool liner	PB; SS	Stainless Steel	(E) Treated water-primary	Cracking, Loss of material/stress corrosion cracking, pitting and crevice corrosion	Primary Water Chemistry	T-014	3.5.1-46	A, S2
Sand plugs	EN; SS	Stainless Steel	(E) Treated water-primary	Cracking, Loss of material/stress corrosion cracking, pitting and crevice corrosion	Primary Water Chemistry	T-014	3.5.1-46	C, S2, 2
		Steel	(E) Air-indoor uncontrolled	Loss of material/corrosion	Structures Monitoring Program	III.A4-05	3.5.1-25	A, 2

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-1: Structures and Component Supports - Reactor Containment Vessel - Aging Management Evaluation

Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Spare penetrations	EQB; FB; PB; SS	Stainless Steel	(E) Air-indoor uncontrolled	Loss of material/general, pitting, and crevice corrosion	ASME Section XI, Subsection IWE	II.A3-01	3.5.1-18	A
					Reactor Containment Leakage Testing 10 CFR 50, Appendix J	II.A3-01	3.5.1-18	A
			(E) Borated water leakage	None	None	AP-018	3.3.1-99	A
		Steel	(E) Air-indoor uncontrolled	Loss of material/general, pitting, and crevice corrosion	ASME Section XI, Subsection IWE	II.A3-01	3.5.1-18	A
					Reactor Containment Leakage Testing 10 CFR 50, Appendix J	II.A3-01	3.5.1-18	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	A-079	3.3.1-89	A
Structural Reinforced Concrete (floor slab, walls, beams, columns, missile shield cover)	EN; EQB; JIS; MB; PB; SS	Concrete	(E) Air-indoor uncontrolled	Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures Monitoring Program	III.A4-03	3.5.1-23	A
				Cracking/due to expansion and reaction with aggregates	Structures Monitoring Program	III.A4-02	3.5.1-27	A
				Increase in porosity and permeability, cracking, loss of material (spalling, scaling)/aggressive chemical attack	Structures Monitoring Program	III.A4-04	3.5.1-24	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-1: Structures and Component Supports - Reactor Containment Vessel - Aging Management Evaluation

Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Structural Steel (beams, bracing, columns and baseplates, concrete floor framing)	SS	Steel	(E) Air-indoor uncontrolled	Loss of material/corrosion	Structures Monitoring Program	III.A4-05	3.5.1-25	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	A-079	3.3.1-89	A
Sumps	PB; SS	Concrete	(E) Raw water	Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures Monitoring Program			H
				Cracking/due to expansion and reaction with aggregates	Structures Monitoring Program	III.A4-02	3.5.1-27	A
				Increase in porosity and permeability, cracking, loss of material (spalling, scaling)/aggressive chemical attack	Structures Monitoring Program			H
				Increase in porosity and permeability, loss of strength/leaching of calcium hydroxide	Structures Monitoring Program	T-016	3.5.1-37	A
				Loss of material/abrasion; cavitation	Structures Monitoring Program	T-020	3.5.1-45	A
		Stainless Steel	(E) Raw water	Loss of material/pitting, crevice, and microbiologically influenced corrosion	Structures Monitoring Program	AP-055	3.3.1-80	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-1 Notes:

Plant Standard Notes

Note - The following plant standard notes have generic applicability, but may or may not be used for each SSC:

S1. Thermal embrittlement is only applicable to CASS components that are subject to temperatures in excess of 482°F.

S2. Cracking due to SCC is only applicable to stainless steel components exposed to temperatures greater than 140°F.

S3. Selective leaching is applicable to the material group 'Steel,' but only for gray cast iron components.

System Specific Notes

1. Equalizing valves are not exposed to borated water leakage because the valves are located within the airlock doors.

2. The sand plugs are constructed of steel boxes with a stainless steel cover plate that becomes part of the refueling floor after installation of the sand plugs in the concrete floor-pit. Therefore, only the cover plate is exposed to the treated water-primary environment.

3. Reactor Containment Vessel basemat is a common foundation for both the Shield Building and the Reactor Containment Vessel.

4. The reactor cavity seal ring is constructed of a stainless steel plate with an elastomer seal, which is used only during refueling. After refueling the stainless steel plate and the elastomer seal are stored in the Auxiliary Building. Therefore, an air-indoor uncontrolled environment is considered for the stainless steel plate and the elastomer seal.

Industry Standard Notes

See last page of Section 3.5 tables.

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-2: Structures and Component Supports - Shield Building - Aging Management Evaluation

Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Annulus sumps and trenches	SS	Concrete	(E) Raw water	Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures Monitoring Program			H
				Cracking/due to expansion and reaction with aggregates	Structures Monitoring Program	III.A1-02	3.5.1-27	A
				Increase in porosity and permeability, cracking, loss of material (spalling, scaling)/aggressive chemical attack	Structures Monitoring Program			H
				Increase in porosity and permeability, loss of strength/leaching of calcium hydroxide	Structures Monitoring Program	III.A1-07	3.5.1-32	A
Dome vent penetration sleeve and weather cap	PB; SS	Stainless Steel	(E) Air-outdoor	Loss of material/pitting and crevice corrosion	Structures Monitoring Program	TP-006	3.5.1-50	A, 1
		Steel	(E) Air-indoor uncontrolled	Loss of material/corrosion	Structures Monitoring Program	III.A1-12	3.5.1-25	A, 2
			(E) Air-outdoor	Loss of material/corrosion	Structures Monitoring Program	III.A1-12	3.5.1-25	A, 2
Equipment opening door and support framing	EQB; PB; SS	Concrete	(E) Air-indoor uncontrolled	Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures Monitoring Program	III.A1-09	3.5.1-23	A
				Cracking/due to expansion and reaction with aggregates	Structures Monitoring Program	III.A1-02	3.5.1-27	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-2: Structures and Component Supports - Shield Building - Aging Management Evaluation

Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Equipment opening door and support framing	EQB; PB; SS	Concrete	(E) Air-outdoor	Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures Monitoring Program	III.A1-09	3.5.1-23	A
				Cracking/due to expansion and reaction with aggregates	Structures Monitoring Program	III.A1-02	3.5.1-27	A
				Increase in porosity and permeability, loss of strength/leaching of calcium hydroxide	Structures Monitoring Program			H
				Loss of material (spalling, scaling) and cracking/freeze-thaw	Structures Monitoring Program	III.A1-06	3.5.1-26	A
		Steel	(E) Air-indoor uncontrolled	Loss of material/corrosion	Structures Monitoring Program	III.A1-12	3.5.1-25	A
			(E) Air-outdoor	Loss of material/corrosion	Structures Monitoring Program	III.A1-12	3.5.1-25	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	A-079	3.3.1-89	A
Equipment opening door seals	EQB; PB; SS	Elastomers	(E) Air-indoor uncontrolled	Loss of sealing/deterioration of seals, gaskets, and moisture barriers (caulking, flashing, and other sealants)	Structures Monitoring Program	TP-007	3.5.1-44	A
			(E) Air-outdoor	Loss of sealing/deterioration of seals, gaskets, and moisture barriers (caulking, flashing, and other sealants)	Structures Monitoring Program	TP-007	3.5.1-44	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-2: Structures and Component Supports - Shield Building - Aging Management Evaluation

Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Equipment pads/grout	SS	Concrete	(E) Air-indoor uncontrolled	Reduction in concrete anchor capacity due to local concrete degradation/service-induced cracking or other concrete aging mechanisms	Structures Monitoring Program	T-029	3.5.1-40	A
Fuel transfer tube enclosure and enclosure access gate	EN; SS	Concrete	(E) Air-indoor uncontrolled	Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures Monitoring Program	III.A1-09	3.5.1-23	A
				Cracking/due to expansion and reaction with aggregates	Structures Monitoring Program	III.A1-02	3.5.1-27	A
		Steel	(E) Air-indoor uncontrolled	Loss of material/corrosion	Structures Monitoring Program	III.A1-12	3.5.1-25	A, 3
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	A-079	3.3.1-89	A, 3
Miscellaneous Steel [embedded steel exposed surfaces (shapes, plates, unistrut, etc.) ladders, gratings, checkered plates, stairs, handrails]	SS	Steel	(E) Air-indoor uncontrolled	Loss of material/corrosion	Structures Monitoring Program	III.A1-12	3.5.1-25	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	A-079	3.3.1-89	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-2: Structures and Component Supports - Shield Building - Aging Management Evaluation

Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Penetration seals (flexible seals, bellows seals, plates seals)	EQB; FB; PB; SS	Elastomers	(E) Air-indoor uncontrolled	Change in material properties/thermal exposure	External Surfaces Monitoring			H, 4
					Fire Protection			H, 4
				Cracking/thermal exposure	External Surfaces Monitoring			H, 4
					Fire Protection			H, 4
				Cracking; Delamination/differential movement	External Surfaces Monitoring			H, 4
					Fire Protection			H, 4
		Stainless Steel	(E) Air-indoor uncontrolled	None	None	TP-005	3.5.1-59	A, 5
			(E) Borated water leakage	None	None	TP-004	3.5.1-59	A, 5
		Steel	(E) Air-indoor uncontrolled	Loss of material/corrosion	External Surfaces Monitoring	III.A1-12	3.5.1-25	E, 6
					Fire Protection	III.A1-12	3.5.1-25	E, 6
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	A-079	3.3.1-89	A
Penetration sleeves	EQB; FB; PB; SS	Steel	(E) Air-indoor uncontrolled	Loss of material/corrosion	Structures Monitoring Program	III.A1-12	3.5.1-25	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	A-079	3.3.1-89	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-2: Structures and Component Supports - Shield Building - Aging Management Evaluation

Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Shield Building foundation basemat	SS	Concrete	(E) Soil	Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures Monitoring Program	III.A1-04	3.5.1-31	A
				Cracks and distortion/due to increased stress levels from settlement	Structures Monitoring Program	III.A1-03	3.5.1-28	A
				Increase in porosity and permeability, cracking, loss of material (spalling, scaling)/aggressive chemical attack	Structures Monitoring Program	III.A1-05	3.5.1-31	A
Shield Building shell structure (cylindrical wall above and below grade, and dome)	EN; EQB; FB; MB; PB; SS	Concrete	(E) Air-indoor uncontrolled	Concrete cracking and spalling/aggressive chemical attack, and reaction with aggregates	Fire Protection	A-090	3.3.1-65	B
					Structures Monitoring Program	A-090	3.3.1-65	A
				Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures Monitoring Program	III.A1-09	3.5.1-23	A
				Cracking/due to expansion and reaction with aggregates	Structures Monitoring Program	III.A1-02	3.5.1-27	A
				Loss of material/corrosion of embedded steel	Fire Protection	A-091	3.3.1-67	B
					Structures Monitoring Program	A-091	3.3.1-67	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-2: Structures and Component Supports - Shield Building - Aging Management Evaluation

Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Shield Building shell structure (cylindrical wall above and below grade, and dome)	EN; EQB; FB; MB; PB; SS	Concrete	(E) Air-outdoor	Concrete cracking and spalling/freeze-thaw, aggressive chemical attack, and reaction with aggregates	Fire Protection	A-092	3.3.1-66	B
					Structures Monitoring Program	A-092	3.3.1-66	A
				Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures Monitoring Program	III.A1-09	3.5.1-23	A
				Cracking/due to expansion and reaction with aggregates	Structures Monitoring Program	III.A1-02	3.5.1-27	A
				Increase in porosity and permeability, loss of strength/leaching of calcium hydroxide	Structures Monitoring Program			H
				Loss of material (spalling, scaling) and cracking/freeze-thaw	Structures Monitoring Program	III.A1-06	3.5.1-26	A
				Loss of material/corrosion of embedded steel	Fire Protection	A-093	3.3.1-67	B
					Structures Monitoring Program	A-093	3.3.1-67	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-2: Structures and Component Supports - Shield Building - Aging Management Evaluation

Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Shield Building shell structure (cylindrical wall above and below grade, and dome)	EN; EQB; FB; MB; PB; SS	Concrete	(E) Soil	Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures Monitoring Program	III.A1-04	3.5.1-31	A
				Cracks and distortion/due to increased stress levels from settlement	Structures Monitoring Program	III.A1-03	3.5.1-28	A
				Increase in porosity and permeability, cracking, loss of material (spalling, scaling)/aggressive chemical attack	Structures Monitoring Program	III.A1-05	3.5.1-31	A
Structural Reinforced Concrete (slab and curb)	EN; SS	Concrete	(E) Air-indoor uncontrolled	Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures Monitoring Program	III.A1-09	3.5.1-23	A
				Cracking/due to expansion and reaction with aggregates	Structures Monitoring Program	III.A1-02	3.5.1-27	A
Structural Steel (beams, bracing, platform framings, trolley supports)	SS	Steel	(E) Air-indoor uncontrolled	Loss of material/corrosion	Structures Monitoring Program	III.A1-12	3.5.1-25	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	A-079	3.3.1-89	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-2 Notes:

Plant Standard Notes

Note - The following plant standard notes have generic applicability, but may or may not be used for each SSC:

S1. Thermal embrittlement is only applicable to CASS components that are subject to temperatures in excess of 482°F.

S2. Cracking due to SCC is only applicable to stainless steel components exposed to temperatures greater than 140°F.

S3. Selective leaching is applicable to the material group 'Steel,' but only for gray cast iron components.

System Specific Notes

1. Applies to wire mesh screen and straps.

2. Applies to weather cap and sleeve.

3. Applies to enclosure access gate

4. Applies to flexible seals. Flexible seals are constructed of elastomer-impregnated canvas material that is tied with stainless steel straps to the process line and the embedded penetration sleeve.

5. Applies to expansion bellows seals. Expansion bellows seals, used for hot piping penetrations, are constructed of a stainless steel bellows with carbon steel closure plate welded to the embedded penetration sleeve.

6. Applies to plates seals. A plate seal is constructed of steel or stainless steel plate attached to the process line and is welded to the embedded penetration sleeve.

Industry Standard Notes

See last page of Section 3.5 tables.

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-3: Structures and Component Supports - Administration Building - Aging Management Evaluation

Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Air intake structures (walls, slabs, columns, spread footings, and birdscreen)	MB; SS	Concrete	(E) Air-outdoor	Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures Monitoring Program	III.A3-09	3.5.1-23	A
				Cracking/due to expansion and reaction with aggregates	Structures Monitoring Program	III.A3-02	3.5.1-27	A
				Increase in porosity and permeability, loss of strength/leaching of calcium hydroxide	Structures Monitoring Program			H
				Loss of material (spalling, scaling) and cracking/freeze-thaw	Structures Monitoring Program	III.A3-06	3.5.1-26	A
			(E) Soil	Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures Monitoring Program	III.A3-04	3.5.1-31	A
				Cracks and distortion/due to increased stress levels from settlement	Structures Monitoring Program	III.A3-03	3.5.1-28	A
				Increase in porosity and permeability, cracking, loss of material (spalling, scaling)/aggressive chemical attack	Structures Monitoring Program	III.A3-05	3.5.1-31	A
		Steel	(E) Air-outdoor	Loss of material/corrosion	Structures Monitoring Program	III.A3-12	3.5.1-25	A, 1

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-3: Structures and Component Supports - Administration Building - Aging Management Evaluation

Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Air outlet structure (walls, slabs, louver housing, and grating)	MB; SS	Concrete	(E) Air-outdoor	Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures Monitoring Program	III.A3-09	3.5.1-23	A
				Cracking/due to expansion and reaction with aggregates	Structures Monitoring Program	III.A3-02	3.5.1-27	A
				Increase in porosity and permeability, loss of strength/leaching of calcium hydroxide	Structures Monitoring Program			H
				Loss of material (spalling, scaling) and cracking/freeze-thaw	Structures Monitoring Program	III.A3-06	3.5.1-26	A
			(E) Soil	Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures Monitoring Program	III.A3-04	3.5.1-31	A
				Cracks and distortion/due to increased stress levels from settlement	Structures Monitoring Program	III.A3-03	3.5.1-28	A
				Increase in porosity and permeability, cracking, loss of material (spalling, scaling)/aggressive chemical attack	Structures Monitoring Program	III.A3-05	3.5.1-31	A
		Steel	(E) Air-outdoor	Loss of material/corrosion	Structures Monitoring Program	III.A3-12	3.5.1-25	A, 2

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-3: Structures and Component Supports - Administration Building - Aging Management Evaluation

Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Duct bank entrance area	EN; SS	Concrete	(E) Air-indoor uncontrolled	Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures Monitoring Program	III.A3-09	3.5.1-23	A
				Cracking/due to expansion and reaction with aggregates	Structures Monitoring Program	III.A3-02	3.5.1-27	A
			(E) Air-outdoor	Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures Monitoring Program	III.A3-09	3.5.1-23	A
				Cracking/due to expansion and reaction with aggregates	Structures Monitoring Program	III.A3-02	3.5.1-27	A
				Increase in porosity and permeability, loss of strength/leaching of calcium hydroxide	Structures Monitoring Program			H
				Loss of material (spalling, scaling) and cracking/freeze-thaw	Structures Monitoring Program	III.A3-06	3.5.1-26	A
			(E) Soil	Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures Monitoring Program	III.A3-04	3.5.1-31	A
				Cracks and distortion/due to increased stress levels from settlement	Structures Monitoring Program	III.A3-03	3.5.1-28	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-3: Structures and Component Supports - Administration Building - Aging Management Evaluation

Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Duct bank entrance area	EN; SS	Concrete	(E) Soil	Increase in porosity and permeability, cracking, loss of material (spalling, scaling)/aggressive chemical attack	Structures Monitoring Program	III.A3-05	3.5.1-31	A
Equipment pads/grout	SS	Concrete	(E) Air-indoor uncontrolled	Reduction in concrete anchor capacity due to local concrete degradation/service-induced cracking or other concrete aging mechanisms	Structures Monitoring Program	T-029	3.5.1-40	A
Foundation Basemat	SS	Concrete	(E) Soil	Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures Monitoring Program	III.A3-04	3.5.1-31	A
				Cracks and distortion/due to increased stress levels from settlement	Structures Monitoring Program	III.A3-03	3.5.1-28	A
				Increase in porosity and permeability, cracking, loss of material (spalling, scaling)/aggressive chemical attack	Structures Monitoring Program	III.A3-05	3.5.1-31	A
Masonry block walls	FB; SS	Concrete	(E) Air-indoor uncontrolled	Cracking/due to restraint shrinkage, creep, and aggressive environment	Fire Protection	III.A3-11	3.5.1-43	E, 3
					Structures Monitoring Program	III.A3-11	3.5.1-43	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-3: Structures and Component Supports - Administration Building - Aging Management Evaluation

Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Miscellaneous Steel [embedded steel exposed surfaces (plates, unistrut, etc.) ladders, gratings, handrails, plates]	SS	Steel	(E) Air-indoor uncontrolled	Loss of material/corrosion	Structures Monitoring Program	III.A3-12	3.5.1-25	A
Structural Reinforced Concrete (slab and walls)	EN; FB; MB; SS	Concrete	(E) Air-indoor uncontrolled	Concrete cracking and spalling/aggressive chemical attack, and reaction with aggregates	Fire Protection	A-090	3.3.1-65	B
					Structures Monitoring Program	A-090	3.3.1-65	A
				Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures Monitoring Program	III.A3-09	3.5.1-23	A
				Cracking/due to expansion and reaction with aggregates	Structures Monitoring Program	III.A3-02	3.5.1-27	A
				Loss of material/corrosion of embedded steel	Fire Protection	A-091	3.3.1-67	B
					Structures Monitoring Program	A-091	3.3.1-67	A
			(E) Air-outdoor	Concrete cracking and spalling/freeze-thaw, aggressive chemical attack, and reaction with aggregates	Fire Protection	A-092	3.3.1-66	B
					Structures Monitoring Program	A-092	3.3.1-66	A
				Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures Monitoring Program	III.A3-09	3.5.1-23	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-3: Structures and Component Supports - Administration Building - Aging Management Evaluation

Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Structural Reinforced Concrete (slab and walls)	EN; FB; MB; SS	Concrete	(E) Air-outdoor	Cracking/due to expansion and reaction with aggregates	Structures Monitoring Program	III.A3-02	3.5.1-27	A
				Increase in porosity and permeability, loss of strength/leaching of calcium hydroxide	Structures Monitoring Program			H
				Loss of material (spalling, scaling) and cracking/freeze-thaw	Structures Monitoring Program	III.A3-06	3.5.1-26	A
				Loss of material/corrosion of embedded steel	Fire Protection	A-093	3.3.1-67	B
					Structures Monitoring Program	A-093	3.3.1-67	A
			(E) Soil	Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures Monitoring Program	III.A3-04	3.5.1-31	A
				Cracks and distortion/due to increased stress levels from settlement	Structures Monitoring Program	III.A3-03	3.5.1-28	A
				Increase in porosity and permeability, cracking, loss of material (spalling, scaling)/aggressive chemical attack	Structures Monitoring Program	III.A3-05	3.5.1-31	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-3: Structures and Component Supports - Administration Building - Aging Management Evaluation

Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Structural Steel (beams, posts)	SS	Steel	(E) Air-indoor uncontrolled	Loss of material/corrosion	Structures Monitoring Program	III.A3-12	3.5.1-25	A
Trench	FLB; SS	Concrete	(E) Air-indoor uncontrolled	Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures Monitoring Program	III.A3-09	3.5.1-23	A
				Cracking/due to expansion and reaction with aggregates	Structures Monitoring Program	III.A3-02	3.5.1-27	A

Table 3.5.2-3 Notes:

Plant Standard Notes

Note - The following plant standard notes have generic applicability, but may or may not be used for each SSC:

S1. Thermal embrittlement is only applicable to CASS components that are subject to temperatures in excess of 482°F.

S2. Cracking due to SCC is only applicable to stainless steel components exposed to temperatures greater than 140°F.

S3. Selective leaching is applicable to the material group 'Steel,' but only for gray cast iron components.

System Specific Notes

1. Applies to steel birdscreen.
2. Applies to steel louver housing and grating.
3. The Fire Protection program is utilized in addition to the Structures Monitoring Program to examine Masonry Walls for the specific Masonry Walls identified in the Fire Protection program.

Industry Standard Notes

See last page of Section 3.5 tables.

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-4: Structures and Component Supports - Auxiliary Building - Aging Management Evaluation

Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Cask wear plate	SS	Stainless Steel	(E) Treated water-primary	Cracking, Loss of material/stress corrosion cracking, pitting and crevice corrosion	Primary Water Chemistry	T-014	3.5.1-46	A
Control room ceiling and supports	SS	Aluminum	(E) Air-indoor controlled	None	None	AP-036	3.3.1-95	C
		Steel	(E) Air-indoor controlled	None	None	AP-002	3.3.1-95	C
Missile hood and bird screen	MB; SS	Steel	(E) Air-outdoor	Loss of material/corrosion	Structures Monitoring Program	III.A3-12	3.5.1-25	A
Equipment pads/grout	SS	Concrete	(E) Air-indoor uncontrolled	Reduction in concrete anchor capacity due to local concrete degradation/service-induced cracking or other concrete aging mechanisms	Structures Monitoring Program	T-029	3.5.1-40	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-4: Structures and Component Supports - Auxiliary Building - Aging Management Evaluation

Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Exhaust Vent Stack, missile cover, and screen	MB; SS	Concrete	(E) Air-outdoor	Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures Monitoring Program	III.A3-09	3.5.1-23	A, 1
				Cracking/due to expansion and reaction with aggregates	Structures Monitoring Program	III.A3-02	3.5.1-27	A, 1
				Increase in porosity and permeability, loss of strength/leaching of calcium hydroxide	Structures Monitoring Program			H, 1
				Loss of material (spalling, scaling) and cracking/freeze-thaw	Structures Monitoring Program	III.A3-06	3.5.1-26	A, 1
		Steel	(E) Air-outdoor	Loss of material/corrosion	Structures Monitoring Program	III.A3-12	3.5.1-25	A, 2
Fixed louvers with bird screens	SS	Aluminum	(E) Air-outdoor	Loss of material/pitting and crevice corrosion	Structures Monitoring Program	TP-006	3.5.1-50	A
		Stainless Steel	(E) Air-outdoor	Loss of material/pitting and crevice corrosion	Structures Monitoring Program	TP-006	3.5.1-50	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-4: Structures and Component Supports - Auxiliary Building - Aging Management Evaluation

Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Floor and roof hatch covers	EN; FB; MB; SS	Concrete	(E) Air-indoor uncontrolled	Concrete cracking and spalling/aggressive chemical attack, and reaction with aggregates	Fire Protection	A-090	3.3.1-65	B
					Structures Monitoring Program	A-090	3.3.1-65	A
				Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures Monitoring Program	III.A3-09	3.5.1-23	A
				Cracking/due to expansion and reaction with aggregates	Structures Monitoring Program	III.A3-02	3.5.1-27	A
				Loss of material/corrosion of embedded steel	Fire Protection	A-091	3.3.1-67	B
					Structures Monitoring Program	A-091	3.3.1-67	A
			(E) Air-outdoor	Concrete cracking and spalling/freeze-thaw, aggressive chemical attack, and reaction with aggregates	Fire Protection	A-092	3.3.1-66	B
					Structures Monitoring Program	A-092	3.3.1-66	A
				Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures Monitoring Program	III.A3-09	3.5.1-23	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-4: Structures and Component Supports - Auxiliary Building - Aging Management Evaluation

Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Floor and roof hatch covers	EN; FB; MB; SS	Concrete	(E) Air-outdoor	Cracking/due to expansion and reaction with aggregates	Structures Monitoring Program	III.A3-02	3.5.1-27	A
				Increase in porosity and permeability, loss of strength/leaching of calcium hydroxide	Structures Monitoring Program			H
				Loss of material (spalling, scaling) and cracking/freeze-thaw	Structures Monitoring Program	III.A3-06	3.5.1-26	A
				Loss of material/corrosion of embedded steel	Fire Protection	A-093	3.3.1-67	B
					Structures Monitoring Program	A-093	3.3.1-67	A
		Steel	(E) Air-indoor uncontrolled	Loss of material/corrosion	Structures Monitoring Program	III.A3-12	3.5.1-25	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	A-079	3.3.1-89	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-4: Structures and Component Supports - Auxiliary Building - Aging Management Evaluation

Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Foundation basemat	SS	Concrete	(E) Soil	Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures Monitoring Program	III.A3-04	3.5.1-31	A
				Cracks and distortion/due to increased stress levels from settlement	Structures Monitoring Program	III.A3-03	3.5.1-28	A
				Increase in porosity and permeability, cracking, loss of material (spalling, scaling)/aggressive chemical attack	Structures Monitoring Program	III.A3-05	3.5.1-31	A
Fuel transfer tube shield	EN; SS	Concrete	(E) Air-indoor uncontrolled	Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures Monitoring Program	III.A3-09	3.5.1-23	A
				Cracking/due to expansion and reaction with aggregates	Structures Monitoring Program	III.A3-02	3.5.1-27	A
Fuel transfer tube sleeve	SS	Stainless Steel	(E) Treated water-primary	Cracking, Loss of material/stress corrosion cracking, pitting and crevice corrosion	Primary Water Chemistry	T-014	3.5.1-46	A
Jet impingement shields	JIS; SS	Steel	(E) Air-indoor uncontrolled	Loss of material/corrosion	Structures Monitoring Program	III.A3-12	3.5.1-25	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	A-079	3.3.1-89	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-4: Structures and Component Supports - Auxiliary Building - Aging Management Evaluation

Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Masonry block walls	FB; SS	Concrete	(E) Air-indoor uncontrolled	Cracking/due to restraint shrinkage, creep, and aggressive environment	Fire Protection	III.A3-11	3.5.1-43	E, 7
					Structures Monitoring Program	III.A3-11	3.5.1-43	A
Metal siding blow in/out panels and fasteners	EN; SS	Steel	(E) Air-indoor uncontrolled	Loss of material/corrosion	Structures Monitoring Program	III.A3-12	3.5.1-25	A
			(E) Air-outdoor	Loss of material/corrosion	Structures Monitoring Program	III.A3-12	3.5.1-25	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	A-079	3.3.1-89	A
Miscellaneous Steel [embedded steel exposed surfaces (shapes, plates, unistrut, etc.) ladders, gratings, checkered plates, stairs, handrails]	SS	Steel	(E) Air-indoor uncontrolled	Loss of material/corrosion	Structures Monitoring Program	III.A3-12	3.5.1-25	A
			(E) Air-outdoor	Loss of material/corrosion	Structures Monitoring Program	III.A3-12	3.5.1-25	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	A-079	3.3.1-89	A
New fuel storage structure including planking and cover	SS	Concrete	(E) Air-indoor uncontrolled	Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures Monitoring Program	III.A3-09	3.5.1-23	A, 3
				Cracking/due to expansion and reaction with aggregates	Structures Monitoring Program	III.A3-02	3.5.1-27	A, 3
		Non-Metallic	(E) Air-indoor uncontrolled	None	None			H, 4
		Stainless Steel	(E) Air-indoor uncontrolled	None	None	TP-005	3.5.1-59	A, 5

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-4: Structures and Component Supports - Auxiliary Building - Aging Management Evaluation

Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Refueling water storage tank shield wall	EN; MB; SS	Concrete	(E) Air-indoor uncontrolled	Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures Monitoring Program	III.A3-09	3.5.1-23	A
				Cracking/due to expansion and reaction with aggregates	Structures Monitoring Program	III.A3-02	3.5.1-27	A
Roof deck release panels and fasteners	EN; SS	Steel	(E) Air-indoor uncontrolled	Loss of material/corrosion	Structures Monitoring Program	III.A3-12	3.5.1-25	A
			(E) Air-outdoor	Loss of material/corrosion	Structures Monitoring Program	III.A3-12	3.5.1-25	A
Spent fuel pool gate	EN; PB; SS	Stainless Steel	(E) Air-indoor uncontrolled	None	None	TP-005	3.5.1-59	A
Spent fuel pool gate seal	EN; PB; SS	Elastomers	(E) Air-indoor uncontrolled	Loss of sealing/deterioration of seals, gaskets, and moisture barriers (caulking, flashing, and other sealants)	Work Control Process	TP-007	3.5.1-44	E
Spent fuel pool liner	EN; PB; SS	Stainless Steel	(E) Treated water-primary	Cracking, Loss of material/stress corrosion cracking, pitting and crevice corrosion	Primary Water Chemistry	T-014	3.5.1-46	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-4: Structures and Component Supports - Auxiliary Building - Aging Management Evaluation

Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Structural Reinforced Concrete (slabs, beams, columns, roof slabs, walls, panels, shielding, trenches, cubicles for airlocks and special ventilation)	EN; EQB; FB; FLB; JIS; MB; PB; SS	Concrete	(E) Air-indoor uncontrolled	Concrete cracking and spalling/aggressive chemical attack, and reaction with aggregates	Fire Protection	A-090	3.3.1-65	B
					Structures Monitoring Program	A-090	3.3.1-65	A
				Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures Monitoring Program	III.A3-09	3.5.1-23	A
				Cracking/due to expansion and reaction with aggregates	Structures Monitoring Program	III.A3-02	3.5.1-27	A
				Loss of material/corrosion of embedded steel	Fire Protection	A-091	3.3.1-67	B
					Structures Monitoring Program	A-091	3.3.1-67	A
			(E) Air-outdoor	Concrete cracking and spalling/freeze-thaw, aggressive chemical attack, and reaction with aggregates	Fire Protection	A-092	3.3.1-66	B
					Structures Monitoring Program	A-092	3.3.1-66	A
				Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures Monitoring Program	III.A3-09	3.5.1-23	A
				Cracking/due to expansion and reaction with aggregates	Structures Monitoring Program	III.A3-02	3.5.1-27	A
				Increase in porosity and permeability, loss of strength/leaching of calcium hydroxide	Structures Monitoring Program			H

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-4: Structures and Component Supports - Auxiliary Building - Aging Management Evaluation

Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Structural Reinforced Concrete (slabs, beams, columns, roof slabs, walls, panels, shielding, trenches, cubicles for airlocks and special ventilation)	EN; EQB; FB; FLB; JIS; MB; PB; SS	Concrete	(E) Air-outdoor	Loss of material (spalling, scaling) and cracking/freeze-thaw	Structures Monitoring Program	III.A3-06	3.5.1-26	A
				Loss of material/corrosion of embedded steel	Fire Protection	A-093	3.3.1-67	B
					Structures Monitoring Program	A-093	3.3.1-67	A
			(E) Soil	Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures Monitoring Program	III.A3-04	3.5.1-31	A
				Cracks and distortion/due to increased stress levels from settlement	Structures Monitoring Program	III.A3-03	3.5.1-28	A
				Increase in porosity and permeability, cracking, loss of material (spalling, scaling)/aggressive chemical attack	Structures Monitoring Program	III.A3-05	3.5.1-31	A
Structural Steel (beams, bracing, columns, crane girders, concrete floor framing and decking, truss, roof framing and decking)	SS	Steel	(E) Air-indoor uncontrolled	Loss of material/corrosion	Structures Monitoring Program	III.A3-12	3.5.1-25	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	A-079	3.3.1-89	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-4: Structures and Component Supports - Auxiliary Building - Aging Management Evaluation

Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Sumps and trenches	FLB; SS	Concrete	(E) Raw water	Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures Monitoring Program			H, 6
				Cracking/due to expansion and reaction with aggregates	Structures Monitoring Program	III.A3-02	3.5.1-27	A, 6
				Increase in porosity and permeability, cracking, loss of material (spalling, scaling)/aggressive chemical attack	Structures Monitoring Program			H, 6
				Increase in porosity and permeability, loss of strength/leaching of calcium hydroxide	Structures Monitoring Program	III.A3-07	3.5.1-32	A, 6
Tank storage enclosure footings and tank foundation rings	SS	Concrete	(E) Soil	Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures Monitoring Program	III.A3-04	3.5.1-31	A
				Cracks and distortion/due to increased stress levels from settlement	Structures Monitoring Program	III.A3-03	3.5.1-28	A
				Increase in porosity and permeability, cracking, loss of material (spalling, scaling)/aggressive chemical attack	Structures Monitoring Program	III.A3-05	3.5.1-31	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-4 Notes:

Plant Standard Notes

Note - The following plant standard notes have generic applicability, but may or may not be used for each SSC:

S1. Thermal embrittlement is only applicable to CASS components that are subject to temperatures in excess of 482°F.

S2. Cracking due to SCC is only applicable to stainless steel components exposed to temperatures greater than 140°F.

S3. Selective leaching is applicable to the material group 'Steel,' but only for gray cast iron components.

System Specific Notes

1. Applies to concrete missile cover.
2. Applies to steel exhaust vent and screen.
3. Applies to new fuel storage concrete floor and walls.
4. Applies to new fuel storage wood planking.
5. Applies to new fuel storage stainless steel cover on the top of the structure.
6. Sumps and trenches are exposed to a raw water environment. This raw water is water that leaks from any system.
7. The Fire Protection program is utilized in addition to the Structures Monitoring Program to examine Masonry Walls for the specific Masonry Walls identified in the Fire Protection program.

Industry Standard Notes

See last page of Section 3.5 tables.

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-5: Structures and Component Supports - Screenhouse Access Tunnel - Aging Management Evaluation

Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Flood Ramp	FLB	Concrete	(E) Air-indoor uncontrolled	Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures Monitoring Program	III.A3-09	3.5.1-23	A
				Cracking/due to expansion and reaction with aggregates	Structures Monitoring Program	III.A3-02	3.5.1-27	A
Miscellaneous Steel [Embedded Steel-Exposed Surfaces (shapes and plates)]	SS	Steel	(E) Air-indoor uncontrolled	Loss of material/corrosion	Structures Monitoring Program	III.A3-12	3.5.1-25	A
Structural Reinforced Concrete (foundation mat slab, walls, roof slab)	EN; FB; SS	Concrete	(E) Air-indoor uncontrolled	Concrete cracking and spalling/aggressive chemical attack, and reaction with aggregates	Fire Protection	A-090	3.3.1-65	B
					Structures Monitoring Program	A-090	3.3.1-65	A
				Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures Monitoring Program	III.A3-09	3.5.1-23	A
				Cracking/due to expansion and reaction with aggregates	Structures Monitoring Program	III.A3-02	3.5.1-27	A
				Loss of material/corrosion of embedded steel	Fire Protection	A-091	3.3.1-67	B
					Structures Monitoring Program	A-091	3.3.1-67	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-5: Structures and Component Supports - Screenhouse Access Tunnel - Aging Management Evaluation

Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Structural Reinforced Concrete (foundation mat slab, walls, roof slab)	EN; FB; SS	Concrete	(E) Soil	Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures Monitoring Program	III.A3-04	3.5.1-31	A
				Cracks and distortion/due to increased stress levels from settlement	Structures Monitoring Program	III.A3-03	3.5.1-28	A
				Increase in porosity and permeability, cracking, loss of material (spalling, scaling)/aggressive chemical attack	Structures Monitoring Program	III.A3-05	3.5.1-31	A

Table 3.5.2-5 Notes:

Plant Standard Notes

Note - The following plant standard notes have generic applicability, but may or may not be used for each SSC:

S1. Thermal embrittlement is only applicable to CASS components that are subject to temperatures in excess of 482°F.

S2. Cracking due to SCC is only applicable to stainless steel components exposed to temperatures greater than 140°F.

S3. Selective leaching is applicable to the material group 'Steel,' but only for gray cast iron components.

Industry Standard Notes

See last page of Section 3.5 tables.

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-6: Structures and Component Supports - Technical Support Center - Aging Management Evaluation

Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Equipment pads / grout	SS	Concrete	(E) Air-indoor uncontrolled	Reduction in concrete anchor capacity due to local concrete degradation/service-induced cracking or other concrete aging mechanisms	Structures Monitoring Program	T-029	3.5.1-40	A
Louvers and bird screens	SS	Steel	(E) Air-indoor uncontrolled	Loss of material/corrosion	Structures Monitoring Program	III.A3-12	3.5.1-25	A
			(E) Air-outdoor	Loss of material/corrosion	Structures Monitoring Program	III.A3-12	3.5.1-25	A
Masonry block walls	EN; FB; SS	Concrete	(E) Air-indoor uncontrolled	Cracking/due to restraint shrinkage, creep, and aggressive environment	Fire Protection	III.A3-11	3.5.1-43	E, 1
					Structures Monitoring Program	III.A3-11	3.5.1-43	A
Miscellaneous Steel [Embedded Steel-Exposed Surfaces (shapes and plates)]	SS	Steel	(E) Air-indoor uncontrolled	Loss of material/corrosion	Structures Monitoring Program	III.A3-12	3.5.1-25	A
Structural Reinforced Concrete (foundation mat slab, floor slabs, walls, roof slab)	EN; FB; SS	Concrete	(E) Air-indoor uncontrolled	Concrete cracking and spalling/aggressive chemical attack, and reaction with aggregates	Fire Protection	A-090	3.3.1-65	B
					Structures Monitoring Program	A-090	3.3.1-65	A
				Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures Monitoring Program	III.A3-09	3.5.1-23	A
				Cracking/due to expansion and reaction with aggregates	Structures Monitoring Program	III.A3-02	3.5.1-27	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-6: Structures and Component Supports - Technical Support Center - Aging Management Evaluation

Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Structural Reinforced Concrete (foundation mat slab, floor slabs, walls, roof slab)	EN; FB; SS	Concrete	(E) Air-indoor uncontrolled	Loss of material/corrosion of embedded steel	Fire Protection	A-091	3.3.1-67	B
					Structures Monitoring Program	A-091	3.3.1-67	A
			(E) Air-outdoor	Concrete cracking and spalling/freeze-thaw, aggressive chemical attack, and reaction with aggregates	Fire Protection	A-092	3.3.1-66	B
					Structures Monitoring Program	A-092	3.3.1-66	A
				Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures Monitoring Program	III.A3-09	3.5.1-23	A
				Cracking/due to expansion and reaction with aggregates	Structures Monitoring Program	III.A3-02	3.5.1-27	A
				Increase in porosity and permeability, loss of strength/leaching of calcium hydroxide	Structures Monitoring Program			H
				Loss of material (spalling, scaling) and cracking/freeze-thaw	Structures Monitoring Program	III.A3-06	3.5.1-26	A
				Loss of material/corrosion of embedded steel	Fire Protection	A-093	3.3.1-67	B
					Structures Monitoring Program	A-093	3.3.1-67	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-6: Structures and Component Supports - Technical Support Center - Aging Management Evaluation

Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Structural Reinforced Concrete (foundation mat slab, floor slabs, walls, roof slab)	EN; FB; SS	Concrete	(E) Soil	Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures Monitoring Program	III.A3-04	3.5.1-31	A
				Cracks and distortion/due to increased stress levels from settlement	Structures Monitoring Program	III.A3-03	3.5.1-28	A
				Increase in porosity and permeability, cracking, loss of material (spalling, scaling)/aggressive chemical attack	Structures Monitoring Program	III.A3-05	3.5.1-31	A
Structural Steel (beams, bracing, columns, baseplates, floor framing and decking, roof framing and decking)	SS	Steel	(E) Air-indoor uncontrolled	Loss of material/corrosion	Structures Monitoring Program	III.A3-12	3.5.1-25	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-6 Notes:

Plant Standard Notes

Note - The following plant standard notes have generic applicability, but may or may not be used for each SSC:

S1. Thermal embrittlement is only applicable to CASS components that are subject to temperatures in excess of 482°F.

S2. Cracking due to SCC is only applicable to stainless steel components exposed to temperatures greater than 140°F.

S3. Selective leaching is applicable to the material group 'Steel,' but only for gray cast iron components.

System Specific Notes

1. The Fire Protection program is utilized in addition to the Structures Monitoring Program to examine Masonry Walls for the specific Masonry Walls identified in the Fire Protection program.

Industry Standard Notes

See last page of Section 3.5 tables.

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-7: Structures and Component Supports - Turbine Building - Aging Management Evaluation

Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Equipment pads/grout	SS	Concrete	(E) Air-indoor uncontrolled	Reduction in concrete anchor capacity due to local concrete degradation/service-induced cracking or other concrete aging mechanisms	Structures Monitoring Program	T-029	3.5.1-40	A
Foundation Basemat	SS	Concrete	(E) Soil	Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures Monitoring Program	III.A3-04	3.5.1-31	A
				Cracks and distortion/due to increased stress levels from settlement	Structures Monitoring Program	III.A3-03	3.5.1-28	A
				Increase in porosity and permeability, cracking, loss of material (spalling, scaling)/aggressive chemical attack	Structures Monitoring Program	III.A3-05	3.5.1-31	A
Masonry block walls	FB; SS	Concrete	(E) Air-indoor uncontrolled	Cracking/due to restraint shrinkage, creep, and aggressive environment	Fire Protection	III.A3-11	3.5.1-43	E, 2
					Structures Monitoring Program	III.A3-11	3.5.1-43	A
			(E) Air-outdoor	Cracking/due to restraint shrinkage, creep, and aggressive environment	Fire Protection	III.A3-11	3.5.1-43	E, 2
					Structures Monitoring Program	III.A3-11	3.5.1-43	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-7: Structures and Component Supports - Turbine Building - Aging Management Evaluation

Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Metal siding blow in/out panels and fasteners	EN; SS	Steel	(E) Air-indoor uncontrolled	Loss of material/corrosion	Structures Monitoring Program	III.A3-12	3.5.1-25	A
			(E) Air-outdoor	Loss of material/corrosion	Structures Monitoring Program	III.A3-12	3.5.1-25	A
Miscellaneous Steel [embedded steel exposed surfaces (shapes, plates, unistrut, etc.) ladders, gratings, checkered plates, stairs, handrails]	SS	Steel	(E) Air-indoor uncontrolled	Loss of material/corrosion	Structures Monitoring Program	III.A3-12	3.5.1-25	A
Roof deck release panels and fasteners	EN; SS	Steel	(E) Air-indoor uncontrolled	Loss of material/corrosion	Structures Monitoring Program	III.A3-12	3.5.1-25	A
			(E) Air-outdoor	Loss of material/corrosion	Structures Monitoring Program	III.A3-12	3.5.1-25	A
Steam exclusion plate	EQB; SS	Steel	(E) Air-indoor uncontrolled	Loss of material/corrosion	Structures Monitoring Program	III.A3-12	3.5.1-25	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-7: Structures and Component Supports - Turbine Building - Aging Management Evaluation

Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Structural Reinforced Concrete (slabs, beams, columns, and walls)	EN; EQB; FB; FLB; MB; SS	Concrete	(E) Air-indoor uncontrolled	Concrete cracking and spalling/aggressive chemical attack, and reaction with aggregates	Fire Protection	A-090	3.3.1-65	B
					Structures Monitoring Program	A-090	3.3.1-65	A
				Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures Monitoring Program	III.A3-09	3.5.1-23	A
				Cracking/due to expansion and reaction with aggregates	Structures Monitoring Program	III.A3-02	3.5.1-27	A
				Loss of material/corrosion of embedded steel	Fire Protection	A-091	3.3.1-67	B
					Structures Monitoring Program	A-091	3.3.1-67	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-7: Structures and Component Supports - Turbine Building - Aging Management Evaluation

Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Structural Reinforced Concrete (slabs, beams, columns, and walls)	EN; EQB; FB; FLB; MB; SS	Concrete	(E) Air-outdoor	Concrete cracking and spalling/freeze-thaw, aggressive chemical attack, and reaction with aggregates	Fire Protection	A-092	3.3.1-66	B
					Structures Monitoring Program	A-092	3.3.1-66	A
				Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures Monitoring Program	III.A3-09	3.5.1-23	A
				Cracking/due to expansion and reaction with aggregates	Structures Monitoring Program	III.A3-02	3.5.1-27	A
				Increase in porosity and permeability, loss of strength/leaching of calcium hydroxide	Structures Monitoring Program			H
				Loss of material (spalling, scaling) and cracking/freeze-thaw	Structures Monitoring Program	III.A3-06	3.5.1-26	A
				Loss of material/corrosion of embedded steel	Fire Protection	A-093	3.3.1-67	B
					Structures Monitoring Program	A-093	3.3.1-67	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-7: Structures and Component Supports - Turbine Building - Aging Management Evaluation

Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Structural Reinforced Concrete (slabs, beams, columns, and walls)	EN; EQB; FB; FLB; MB; SS	Concrete	(E) Soil	Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures Monitoring Program	III.A3-04	3.5.1-31	A
				Cracks and distortion/due to increased stress levels from settlement	Structures Monitoring Program	III.A3-03	3.5.1-28	A
				Increase in porosity and permeability, cracking, loss of material (spalling, scaling)/aggressive chemical attack	Structures Monitoring Program	III.A3-05	3.5.1-31	A
Structural Steel (beams, bracing, columns, crane girders, concrete floor framing and decking, truss, roof framing and decking)	SS	Steel	(E) Air-indoor uncontrolled	Loss of material/corrosion	Structures Monitoring Program	III.A3-12	3.5.1-25	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-7: Structures and Component Supports - Turbine Building - Aging Management Evaluation

Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Sump and trench	FLB; SS	Concrete	(E) Air-indoor uncontrolled	Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures Monitoring Program	III.A3-09	3.5.1-23	A
				Cracking/due to expansion and reaction with aggregates	Structures Monitoring Program	III.A3-02	3.5.1-27	A
			(E) Raw water	Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures Monitoring Program			H, 1
				Cracking/due to expansion and reaction with aggregates	Structures Monitoring Program	III.A3-02	3.5.1-27	A, 1
				Increase in porosity and permeability, cracking, loss of material (spalling, scaling)/aggressive chemical attack	Structures Monitoring Program			H, 1
				Increase in porosity and permeability, loss of strength/leaching of calcium hydroxide	Structures Monitoring Program	III.A3-07	3.5.1-32	A, 1

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-7 Notes:

Plant Standard Notes

Note - The following plant standard notes have generic applicability, but may or may not be used for each SSC:

S1. Thermal embrittlement is only applicable to CASS components that are subject to temperatures in excess of 482°F.

S2. Cracking due to SCC is only applicable to stainless steel components exposed to temperatures greater than 140°F.

S3. Selective leaching is applicable to the material group 'Steel,' but only for gray cast iron components.

System Specific Notes

1. Sump is exposed to a raw water environment. This raw water is water that leaks from any system.
2. The Fire Protection program is utilized in addition to the Structures Monitoring Program to examine Masonry Walls for the specific Masonry Walls identified in the Fire Protection program.

Industry Standard Notes

See last page of Section 3.5 tables.

Table 3.5.2-8: Structures and Component Supports - Yard Structures - Aging Management Evaluation

Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Duct Banks	EN; SS	Concrete	(E) Soil	Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures Monitoring Program	III.A3-04	3.5.1-31	A
				Cracks and distortion/due to increased stress levels from settlement	Structures Monitoring Program	III.A3-03	3.5.1-28	A
				Increase in porosity and permeability, cracking, loss of material (spalling, scaling)/aggressive chemical attack	Structures Monitoring Program	III.A3-05	3.5.1-31	A
Fire Hose Houses	EN; SS	Steel	(E) Air-outdoor	Loss of material/corrosion	Structures Monitoring Program	III.A3-12	3.5.1-25	A
Foundations (EDG fuel oil storage tanks, lighting poles, fire hose houses, outdoor transformer walls, RAT & TAT transformers, substation/switchyard structures, transmission towers)	SS	Concrete	(E) Air-outdoor	Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures Monitoring Program	III.A3-09	3.5.1-23	A
				Cracking/due to expansion and reaction with aggregates	Structures Monitoring Program	III.A3-02	3.5.1-27	A
				Increase in porosity and permeability, loss of strength/leaching of calcium hydroxide	Structures Monitoring Program			H

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-8: Structures and Component Supports - Yard Structures - Aging Management Evaluation

Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Foundations (EDG fuel oil storage tanks, lighting poles, fire hose houses, outdoor transformer walls, RAT & TAT transformers, substation/switchyard structures, transmission towers)	SS	Concrete	(E) Air-outdoor	Loss of material (spalling, scaling) and cracking/freeze-thaw	Structures Monitoring Program	III.A3-06	3.5.1-26	A
			(E) Soil	Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures Monitoring Program	III.A3-04	3.5.1-31	A
				Cracks and distortion/due to increased stress levels from settlement	Structures Monitoring Program	III.A3-03	3.5.1-28	A
				Increase in porosity and permeability, cracking, loss of material (spalling, scaling)/aggressive chemical attack	Structures Monitoring Program	III.A3-05	3.5.1-31	A
Lighting Poles	SS	Steel	(E) Air-outdoor	Loss of material/corrosion	Structures Monitoring Program	III.A3-12	3.5.1-25	A
Manhole Access Covers	EN; SS	Aluminum	(E) Air-outdoor	Loss of material/pitting and crevice corrosion	Structures Monitoring Program	TP-006	3.5.1-50	C
		Steel	(E) Air-outdoor	Loss of material/corrosion	Structures Monitoring Program	III.A3-12	3.5.1-25	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-8: Structures and Component Supports - Yard Structures - Aging Management Evaluation

Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Manholes	EN; SS	Concrete	(E) Air-outdoor	Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures Monitoring Program	III.A3-09	3.5.1-23	A
				Cracking/due to expansion and reaction with aggregates	Structures Monitoring Program	III.A3-02	3.5.1-27	A
				Increase in porosity and permeability, loss of strength/leaching of calcium hydroxide	Structures Monitoring Program			H
				Loss of material (spalling, scaling) and cracking/freeze-thaw	Structures Monitoring Program	III.A3-06	3.5.1-26	A
			(E) Soil	Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures Monitoring Program	III.A3-04	3.5.1-31	A
				Cracks and distortion/due to increased stress levels from settlement	Structures Monitoring Program	III.A3-03	3.5.1-28	A
				Increase in porosity and permeability, cracking, loss of material (spalling, scaling)/aggressive chemical attack	Structures Monitoring Program	III.A3-05	3.5.1-31	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-8: Structures and Component Supports - Yard Structures - Aging Management Evaluation

Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Outdoor RAT Bay Miscellaneous Steel [embedded steel exposed surfaces (shapes, plates)]	SS	Steel	(E) Air-outdoor	Loss of material/corrosion	Structures Monitoring Program	III.A3-12	3.5.1-25	A
Outdoor Transformer Bays Structural Reinforced Concrete (beams, columns, walls, floor, curbs)	FB; SS	Concrete	(E) Air-outdoor	Concrete cracking and spalling/freeze-thaw, aggressive chemical attack, and reaction with aggregates	Fire Protection	A-092	3.3.1-66	B
					Structures Monitoring Program	A-092	3.3.1-66	A
				Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures Monitoring Program	III.A3-09	3.5.1-23	A
				Cracking/due to expansion and reaction with aggregates	Structures Monitoring Program	III.A3-02	3.5.1-27	A
				Increase in porosity and permeability, loss of strength/leaching of calcium hydroxide	Structures Monitoring Program			H
				Loss of material (spalling, scaling) and cracking/freeze-thaw	Structures Monitoring Program	III.A3-06	3.5.1-26	A
				Loss of material/corrosion of embedded steel	Fire Protection	A-093	3.3.1-67	B
					Structures Monitoring Program	A-093	3.3.1-67	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-8: Structures and Component Supports - Yard Structures - Aging Management Evaluation

Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Steel Bar Straps (EDG fuel oil storage tanks)	SS	Steel	(E) Soil	Loss of material/general, pitting, crevice, and microbiologically influenced corrosion	Buried Piping and Tanks Inspection	A-001	3.3.1-19	C
Substation/Switchyard Concrete Structure (13.8 kV take-off structure)	SS	Concrete	(E) Air-outdoor	Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures Monitoring Program	III.A3-09	3.5.1-23	A
				Cracking/due to expansion and reaction with aggregates	Structures Monitoring Program	III.A3-02	3.5.1-27	A
				Increase in porosity and permeability, loss of strength/leaching of calcium hydroxide	Structures Monitoring Program			H
				Loss of material (spalling, scaling) and cracking/freeze-thaw	Structures Monitoring Program	III.A3-06	3.5.1-26	A
			(E) Soil	Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures Monitoring Program	III.A3-04	3.5.1-31	A
				Cracks and distortion/due to increased stress levels from settlement	Structures Monitoring Program	III.A3-03	3.5.1-28	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-8: Structures and Component Supports - Yard Structures - Aging Management Evaluation

Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Substation/Switchyard Concrete Structure (13.8 kV take-off structure)	SS	Concrete	(E) Soil	Increase in porosity and permeability, cracking, loss of material (spalling, scaling)/aggressive chemical attack	Structures Monitoring Program	III.A3-05	3.5.1-31	A
Substation/Switchyard Steel Structures (138 kV take-off tower, supports for 138 kV & 13.8 kV disconnect switches, 13.8 kV take-off structure)	SS	Steel	(E) Air-outdoor	Loss of material/corrosion	Structures Monitoring Program	III.A3-12	3.5.1-25	A
Transmission Towers	SS	Steel	(E) Air-outdoor	Loss of material/corrosion	Structures Monitoring Program	III.A3-12	3.5.1-25	A

Table 3.5.2-8 Notes:

Plant Standard Notes

Note - The following plant standard notes have generic applicability, but may or may not be used for each SSC:

S1. Thermal embrittlement is only applicable to CASS components that are subject to temperatures in excess of 482°F.

S2. Cracking due to SCC is only applicable to stainless steel components exposed to temperatures greater than 140°F.

S3. Selective leaching is applicable to the material group 'Steel,' but only for gray cast iron components.

Industry Standard Notes

See last page of Section 3.5 tables.

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-9: Structures and Component Supports - Discharge Structure - Aging Management Evaluation

Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Structural Reinforced Concrete (foundation floor slab, walls, beams, roof slabs)	PB; SS	Concrete	(E) Air-outdoor	Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures Monitoring Program	III.A6-01	3.5.1-34	A
				Cracking/due to expansion and reaction with aggregates	Structures Monitoring Program	III.A6-02	3.5.1-36	A
				Increase in porosity and permeability, loss of strength/leaching of calcium hydroxide	Structures Monitoring Program			H
				Loss of material (spalling, scaling) and cracking/freeze-thaw	Structures Monitoring Program	III.A6-05	3.5.1-35	A
			(E) Soil	Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures Monitoring Program	T-005	3.5.1-31	A
				Cracks and distortion/due to increased stress levels from settlement	Structures Monitoring Program	III.A6-04	3.5.1-28	A
				Increase in porosity and permeability, cracking, loss of material (spalling, scaling)/aggressive chemical attack	Structures Monitoring Program	III.A6-03	3.5.1-34	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-9: Structures and Component Supports - Discharge Structure - Aging Management Evaluation

Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Structural Reinforced Concrete (foundation floor slab, walls, beams, roof slabs)	PB; SS	Concrete	(I) Raw water	Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures Monitoring Program			H
				Cracking/due to expansion and reaction with aggregates	Structures Monitoring Program	III.A6-02	3.5.1-36	A
				Increase in porosity and permeability, cracking, loss of material (spalling, scaling)/aggressive chemical attack	Structures Monitoring Program			H
				Increase in porosity and permeability, loss of strength/leaching of calcium hydroxide	Structures Monitoring Program	III.A6-06	3.5.1-37	A
				Loss of material (spalling, scaling) and cracking/freeze-thaw	Structures Monitoring Program			H
				Loss of material/abrasion; cavitation	Structures Monitoring Program	III.A6-07	3.5.1-45	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-9: Structures and Component Supports - Discharge Structure - Aging Management Evaluation

Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Structural Steel (sheet piling)	SS	Steel	(E) Air-outdoor	Loss of material/general (steel only), pitting and crevice corrosion	Structures Monitoring Program	III.A6-11	3.5.1-47	A
			(E) Raw water	Loss of material/erosion	Structures Monitoring Program			H
				Loss of material/general (steel only), pitting and crevice corrosion	Structures Monitoring Program	III.A6-11	3.5.1-47	A
			(E) Soil	None	None			H

Table 3.5.2-9 Notes:

Plant Standard Notes

Note - The following plant standard notes have generic applicability, but may or may not be used for each SSC:

S1. Thermal embrittlement is only applicable to CASS components that are subject to temperatures in excess of 482°F.

S2. Cracking due to SCC is only applicable to stainless steel components exposed to temperatures greater than 140°F.

S3. Selective leaching is applicable to the material group 'Steel,' but only for gray cast iron components.

Industry Standard Notes

See last page of Section 3.5 tables.

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-10: Structures and Component Supports - Discharge Tunnel & Pipe - Aging Management Evaluation

Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Concrete Pipe - Structural Reinforced Concrete	PB; SS	Concrete	(E) Soil	Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures Monitoring Program	T-005	3.5.1-31	A
				Cracks and distortion/due to increased stress levels from settlement	Structures Monitoring Program	III.A6-04	3.5.1-28	A
				Increase in porosity and permeability, cracking, loss of material (spalling, scaling)/aggressive chemical attack	Structures Monitoring Program	III.A6-03	3.5.1-34	A
			(I) Raw water	Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures Monitoring Program			H
				Cracking/due to expansion and reaction with aggregates	Structures Monitoring Program	III.A6-02	3.5.1-36	A
				Increase in porosity and permeability, cracking, loss of material (spalling, scaling)/aggressive chemical attack	Structures Monitoring Program			H
				Increase in porosity and permeability, loss of strength/leaching of calcium hydroxide	Structures Monitoring Program	III.A6-06	3.5.1-37	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-10: Structures and Component Supports - Discharge Tunnel & Pipe - Aging Management Evaluation

Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Concrete Pipe - Structural Reinforced Concrete	PB; SS	Concrete	(I) Raw water	Loss of material/abrasion; cavitation	Structures Monitoring Program	III.A6-07	3.5.1-45	A
Steel Pipe - Concrete Encased	PB; SS	Steel	(E) Concrete	None	None	AP-003	3.3.1-96	A
			(I) Raw water	Loss of material/erosion	Structures Monitoring Program			H
				Loss of material/general (steel only), pitting and crevice corrosion	Structures Monitoring Program	III.A6-11	3.5.1-47	A, 1
Tunnel - Structural Reinforced Concrete (foundation mat slab, walls, roof slabs)	PB; SS	Concrete	(E) Soil	Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures Monitoring Program	T-005	3.5.1-31	A
				Cracks and distortion/due to increased stress levels from settlement	Structures Monitoring Program	III.A6-04	3.5.1-28	A
				Increase in porosity and permeability, cracking, loss of material (spalling, scaling)/aggressive chemical attack	Structures Monitoring Program	III.A6-03	3.5.1-34	A
			(I) Raw water	Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures Monitoring Program			H
				Cracking/due to expansion and reaction with aggregates	Structures Monitoring Program	III.A6-02	3.5.1-36	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-10: Structures and Component Supports - Discharge Tunnel & Pipe - Aging Management Evaluation

Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Tunnel - Structural Reinforced Concrete (foundation mat slab, walls, roof slabs)	PB; SS	Concrete	(I) Raw water	Increase in porosity and permeability, cracking, loss of material (spalling, scaling)/aggressive chemical attack	Structures Monitoring Program			H
				Increase in porosity and permeability, loss of strength/leaching of calcium hydroxide	Structures Monitoring Program	III.A6-06	3.5.1-37	A
				Loss of material/abrasion; cavitation	Structures Monitoring Program	III.A6-07	3.5.1-45	A

Table 3.5.2-10 Notes:

Plant Standard Notes

Note - The following plant standard notes have generic applicability, but may or may not be used for each SSC:

S1. Thermal embrittlement is only applicable to CASS components that are subject to temperatures in excess of 482°F.

S2. Cracking due to SCC is only applicable to stainless steel components exposed to temperatures greater than 140°F.

S3. Selective leaching is applicable to the material group 'Steel,' but only for gray cast iron components.

System Specific Notes

1. In addition to inspecting for loss of material due to general, pitting and crevice corrosion, the inspection includes looking for zebra mussels and organic macro fouling.

Industry Standard Notes

See last page of Section 3.5 tables.

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-11: Structures and Component Supports - Intake Structure - Aging Management Evaluation

Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Inlet Cones	SCW; SS	Steel	(E) Raw water	Loss of material/general (steel only), pitting and crevice corrosion	Structures Monitoring Program	III.A6-11	3.5.1-47	A, 1
Ring Foundation	SS	Concrete	(E) Raw water	Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures Monitoring Program			H
				Cracking/due to expansion and reaction with aggregates	Structures Monitoring Program	III.A6-02	3.5.1-36	A
				Increase in porosity and permeability, cracking, loss of material (spalling, scaling)/aggressive chemical attack	Structures Monitoring Program			H
				Increase in porosity and permeability, loss of strength/leaching of calcium hydroxide	Structures Monitoring Program	III.A6-06	3.5.1-37	A
				Loss of material/abrasion; cavitation	Structures Monitoring Program	III.A6-07	3.5.1-45	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-11: Structures and Component Supports - Intake Structure - Aging Management Evaluation

Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Ring Foundation	SS	Concrete	(E) Soil	Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures Monitoring Program	T-005	3.5.1-31	A
				Cracks and distortion/due to increased stress levels from settlement	Structures Monitoring Program	III.A6-04	3.5.1-28	A
				Increase in porosity and permeability, cracking, loss of material (spalling, scaling)/aggressive chemical attack	Structures Monitoring Program	III.A6-03	3.5.1-34	A
Trash Grilles	SCW; SS	Steel	(E) Raw water	Loss of material/general (steel only), pitting and crevice corrosion	Structures Monitoring Program	III.A6-11	3.5.1-47	A, 1
Trash Grilles Anchorage	SS	Stainless Steel	(E) Raw water	Loss of material/pitting, crevice, and microbiologically influenced corrosion	Structures Monitoring Program	AP-055	3.3.1-80	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-11 Notes:

Plant Standard Notes

Note - The following plant standard notes have generic applicability, but may or may not be used for each SSC:

S1. Thermal embrittlement is only applicable to CASS components that are subject to temperatures in excess of 482°F.

S2. Cracking due to SCC is only applicable to stainless steel components exposed to temperatures greater than 140°F.

S3. Selective leaching is applicable to the material group 'Steel,' but only for gray cast iron components.

System Specific Notes

1. In addition to inspecting for loss of material due to general, pitting and crevice corrosion, the inspection includes looking for zebra mussels and organic macro fouling.

Industry Standard Notes

See last page of Section 3.5 tables.

Table 3.5.2-12: Structures and Component Supports - Screenhouse - Aging Management Evaluation

Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Duct bank entrance area	EN; SS	Concrete	(E) Air-indoor uncontrolled	Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures Monitoring Program	III.A6-01	3.5.1-34	A
				Cracking/due to expansion and reaction with aggregates	Structures Monitoring Program	III.A6-02	3.5.1-36	A
			(E) Air-outdoor	Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures Monitoring Program	III.A6-01	3.5.1-34	A
				Cracking/due to expansion and reaction with aggregates	Structures Monitoring Program	III.A6-02	3.5.1-36	A
				Increase in porosity and permeability, loss of strength/leaching of calcium hydroxide	Structures Monitoring Program			H
				Loss of material (spalling, scaling) and cracking/freeze-thaw	Structures Monitoring Program	III.A6-05	3.5.1-35	A
			(E) Soil	Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures Monitoring Program	T-005	3.5.1-31	A
				Cracks and distortion/due to increased stress levels from settlement	Structures Monitoring Program	III.A6-04	3.5.1-28	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-12: Structures and Component Supports - Screenhouse - Aging Management Evaluation

Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Duct bank entrance area	EN; SS	Concrete	(E) Soil	Increase in porosity and permeability, cracking, loss of material (spalling, scaling)/aggressive chemical attack	Structures Monitoring Program	III.A6-03	3.5.1-34	A
Equipment pads / grout	SS	Concrete	(E) Air-indoor uncontrolled	Reduction in concrete anchor capacity due to local concrete degradation/service-induced cracking or other concrete aging mechanisms	Structures Monitoring Program	T-029	3.5.1-40	A
Exterior bulkhead doors	FLB	Steel	(E) Air-outdoor	Loss of material/general, pitting and crevice corrosion	Structures Monitoring Program	III.A6-11	3.5.1-47	A
Floor cover plates	FLB	Steel	(E) Air-indoor uncontrolled	Loss of material/general (steel only), pitting and crevice corrosion	Structures Monitoring Program	III.A6-11	3.5.1-47	A
Gaskets and Seals	FLB	Elastomers	(E) Air-indoor uncontrolled	Loss of sealing/deterioration of seals, gaskets, and moisture barriers (caulking, flashing, and other sealants)	Structures Monitoring Program	III.A6-12	3.5.1-44	A
			(E) Air-outdoor	Loss of sealing/deterioration of seals, gaskets, and moisture barriers (caulking, flashing, and other sealants)	Structures Monitoring Program	III.A6-12	3.5.1-44	A
			(I) Raw water	Loss of sealing/deterioration of seals, gaskets, and moisture barriers (caulking, flashing, and other sealants)	Structures Monitoring Program	III.A6-12	3.5.1-44	A, 2

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-12: Structures and Component Supports - Screenhouse - Aging Management Evaluation

Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Hatches	FB; MB; SS	Concrete	(E) Air-outdoor	Concrete cracking and spalling/freeze-thaw, aggressive chemical attack, and reaction with aggregates	Fire Protection	A-092	3.3.1-66	B
					Structures Monitoring Program	A-092	3.3.1-66	A
				Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures Monitoring Program	III.A6-01	3.5.1-34	A
				Cracking/due to expansion and reaction with aggregates	Structures Monitoring Program	III.A6-02	3.5.1-36	A
				Increase in porosity and permeability, loss of strength/leaching of calcium hydroxide	Structures Monitoring Program			H
				Loss of material (spalling, scaling) and cracking/freeze-thaw	Structures Monitoring Program	III.A6-05	3.5.1-35	A
				Loss of material/corrosion of embedded steel	Fire Protection	A-093	3.3.1-67	B
					Structures Monitoring Program	A-093	3.3.1-67	A
		Steel	(E) Air-outdoor	Loss of material/general (steel only), pitting and crevice corrosion	Structures Monitoring Program	III.A6-11	3.5.1-47	A
Lower interior bulkhead door	FLB	Steel	(E) Air-indoor uncontrolled	Loss of material/general (steel only), pitting and crevice corrosion	Structures Monitoring Program	III.A6-11	3.5.1-47	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-12: Structures and Component Supports - Screenhouse - Aging Management Evaluation

Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Manhole covers	FLB	Steel	(E) Air-indoor uncontrolled	Loss of material/general (steel only), pitting and crevice corrosion	Structures Monitoring Program	III.A6-11	3.5.1-47	A
Miscellaneous Steel [Embedded Steel-Exposed Steel Surfaces (shapes, plates, unistrut, etc.)]	SS	Steel	(E) Air-indoor uncontrolled	Loss of material/general (steel only), pitting and crevice corrosion	Structures Monitoring Program	III.A6-11	3.5.1-47	A
Penthouse air intake covers	SS	Steel	(E) Air-outdoor	Loss of material/general (steel only), pitting and crevice corrosion	Structures Monitoring Program	III.A6-11	3.5.1-47	A
Penthouse air intakes	MB; SS	Concrete	(E) Air-outdoor	Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures Monitoring Program	III.A6-01	3.5.1-34	A
				Cracking/due to expansion and reaction with aggregates	Structures Monitoring Program	III.A6-02	3.5.1-36	A
				Increase in porosity and permeability, loss of strength/leaching of calcium hydroxide	Structures Monitoring Program			H
				Loss of material (spalling, scaling) and cracking/freeze-thaw	Structures Monitoring Program	III.A6-05	3.5.1-35	A
Steel frame (traveling water screen covers)	FLB; SS	Steel	(E) Air-indoor uncontrolled	Loss of material/general (steel only), pitting and crevice corrosion	Structures Monitoring Program	III.A6-11	3.5.1-47	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-12: Structures and Component Supports - Screenhouse - Aging Management Evaluation

Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Structural Reinforced Concrete (Foundation mat, walls, beams, columns, floor slabs, roof slab)	EN; FB; FLB; MB; SS	Concrete	(E) Air-indoor uncontrolled	Concrete cracking and spalling/aggressive chemical attack, and reaction with aggregates	Fire Protection	A-090	3.3.1-65	B
					Structures Monitoring Program	A-090	3.3.1-65	A
				Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures Monitoring Program	III.A6-01	3.5.1-34	A
				Cracking/due to expansion and reaction with aggregates	Structures Monitoring Program	III.A6-02	3.5.1-36	A
				Loss of material/corrosion of embedded steel	Fire Protection	A-091	3.3.1-67	B
					Structures Monitoring Program	A-091	3.3.1-67	A
			(E) Air-outdoor	Concrete cracking and spalling/freeze-thaw, aggressive chemical attack, and reaction with aggregates	Fire Protection	A-092	3.3.1-66	B
					Structures Monitoring Program	A-092	3.3.1-66	A
				Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures Monitoring Program	III.A6-01	3.5.1-34	A
				Cracking/due to expansion and reaction with aggregates	Structures Monitoring Program	III.A6-02	3.5.1-36	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-12: Structures and Component Supports - Screenhouse - Aging Management Evaluation

Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Structural Reinforced Concrete (Foundation mat, walls, beams, columns, floor slabs, roof slab)	EN; FB; FLB; MB; SS	Concrete	(E) Air-outdoor	Increase in porosity and permeability, loss of strength/leaching of calcium hydroxide	Structures Monitoring Program			H
				Loss of material (spalling, scaling) and cracking/freeze-thaw	Structures Monitoring Program	III.A6-05	3.5.1-35	A
				Loss of material/corrosion of embedded steel	Fire Protection	A-093	3.3.1-67	B
					Structures Monitoring Program	A-093	3.3.1-67	A
			(E) Raw water	Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures Monitoring Program			H
				Cracking/due to expansion and reaction with aggregates	Structures Monitoring Program	III.A6-02	3.5.1-36	A
				Increase in porosity and permeability, cracking, loss of material (spalling, scaling)/aggressive chemical attack	Structures Monitoring Program			H
				Increase in porosity and permeability, loss of strength/leaching of calcium hydroxide	Structures Monitoring Program	III.A6-06	3.5.1-37	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-12: Structures and Component Supports - Screenhouse - Aging Management Evaluation

Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Structural Reinforced Concrete (Foundation mat, walls, beams, columns, floor slabs, roof slab)	EN; FB; FLB; MB; SS	Concrete	(E) Raw water	Loss of material (spalling, scaling) and cracking/freeze-thaw	Structures Monitoring Program			H
				Loss of material/abrasion; cavitation	Structures Monitoring Program	III.A6-07	3.5.1-45	A
			(E) Soil	Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures Monitoring Program	T-005	3.5.1-31	A
				Cracks and distortion/due to increased stress levels from settlement	Structures Monitoring Program	III.A6-04	3.5.1-28	A
				Increase in porosity and permeability, cracking, loss of material (spalling, scaling)/aggressive chemical attack	Structures Monitoring Program	III.A6-03	3.5.1-34	A
Traveling water screen covers	FLB	Non-Metallic	(E) Air-indoor uncontrolled	None	None			H
			(I) Raw water	None	None			H
Traveling water screen support frame	SS	Steel	(E) Raw water	Loss of material/general (steel only), pitting and crevice corrosion	Structures Monitoring Program	III.A6-11	3.5.1-47	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-12: Structures and Component Supports - Screenhouse - Aging Management Evaluation

Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Water conduit inlets	SS	Concrete	(E) Soil	Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures Monitoring Program	T-005	3.5.1-31	A, 1
				Cracks and distortion/due to increased stress levels from settlement	Structures Monitoring Program	III.A6-04	3.5.1-28	A, 1
				Increase in porosity and permeability, cracking, loss of material (spalling, scaling)/aggressive chemical attack	Structures Monitoring Program	III.A6-03	3.5.1-34	A, 1
			(I) Raw water	Cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel	Structures Monitoring Program			H, 1
				Cracking/due to expansion and reaction with aggregates	Structures Monitoring Program	III.A6-02	3.5.1-36	A, 1

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-12: Structures and Component Supports - Screenhouse - Aging Management Evaluation

Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Water conduit inlets	SS	Concrete	(I) Raw water	Increase in porosity and permeability, cracking, loss of material (spalling, scaling)/aggressive chemical attack	Structures Monitoring Program			H, 1
				Increase in porosity and permeability, loss of strength/leaching of calcium hydroxide	Structures Monitoring Program	III.A6-06	3.5.1-37	A, 1
				Loss of material/abrasion; cavitation	Structures Monitoring Program	III.A6-07	3.5.1-45	A, 1

Table 3.5.2-12 Notes:

Plant Standard Notes

Note - The following plant standard notes have generic applicability, but may or may not be used for each SSC:

S1. Thermal embrittlement is only applicable to CASS components that are subject to temperatures in excess of 482°F.

S2. Cracking due to SCC is only applicable to stainless steel components exposed to temperatures greater than 140°F.

S3. Selective leaching is applicable to the material group 'Steel,' but only for gray cast iron components.

System Specific Notes

1. The water conduit inlets, located underground, refers to the reinforced concrete conduits that pass lake water from the end of the 10 foot steel pipe to the forebay.
2. Gaskets and sealants for the traveling water screen covers.

Industry Standard Notes

See last page of Section 3.5 tables.

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-13: Structures and Component Supports - Component Supports - Aging Management Evaluation

Component Type / Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Battery Racks	SS	Steel	(E) Air-indoor uncontrolled	Loss of material/general and pitting corrosion	Structures Monitoring Program	III.B3-07	3.5.1-39	C
Cable Trays and Electrical Conduit	SS	Aluminum	(E) Air-indoor uncontrolled	None	None	III.B2-04	3.5.1-58	C
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	III.B2-06	3.5.1-55	C
		Steel	(E) Air-indoor uncontrolled	None	None	III.B2-05	3.5.1-58	C, 1
			(E) Air-outdoor	Loss of material/pitting and crevice corrosion	Structures Monitoring Program	III.B2-07	3.5.1-50	C
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	III.B2-06	3.5.1-55	C
Supports for cable trays, conduit, HVAC ducts, Tube Track and Instrument Tubing	SS	Stainless Steel	(E) Air-indoor uncontrolled	None	None	III.B2-08	3.5.1-59	A
			(E) Borated water leakage	None	None	III.B2-09	3.5.1-59	A
		Steel	(E) Air-indoor uncontrolled	Loss of material/general and pitting corrosion	Structures Monitoring Program	III.B2-10	3.5.1-39	A
			(E) Air-outdoor	Loss of material/general and pitting corrosion	Structures Monitoring Program	III.B2-10	3.5.1-39	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	III.B2-11	3.5.1-55	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-13: Structures and Component Supports - Component Supports - Aging Management Evaluation

Component Type / Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Supports for Electrical and I &C (racks, cabinets, panels, junction boxes, enclosures, etc.)	SS	Stainless Steel	(E) Air-indoor uncontrolled	None	None	III.B3-05	3.5.1-59	A
			(E) Borated water leakage	None	None	III.B3-06	3.5.1-59	A
		Steel	(E) Air-indoor uncontrolled	Loss of material/general and pitting corrosion	Structures Monitoring Program	III.B3-07	3.5.1-39	A
			(E) Air-outdoor	Loss of material/general and pitting corrosion	Structures Monitoring Program	III.B3-07	3.5.1-39	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	III.B3-08	3.5.1-55	A
Supports for Mechanical Equipment (diesel generators including exhaust system, HVAC system components, pumps, fans, heat exchangers, RCV sump screens, etc.)	SS	Elastomers	(E) Air-indoor uncontrolled	Reduction or loss of isolation function/radiation hardening, temperature, humidity, sustained vibratory loading	Structures Monitoring Program	III.B4-12	3.5.1-41	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-13: Structures and Component Supports - Component Supports - Aging Management Evaluation

Component Type / Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Supports for Mechanical Equipment (diesel generators including exhaust system, HVAC system components, pumps, fans, heat exchangers, RCV sump screens, etc.)	SS	Stainless Steel	(E) Air-indoor uncontrolled	None	None	III.B4-08	3.5.1-59	A
			(E) Borated water leakage	None	None	III.B4-09	3.5.1-59	A
		Steel	(E) Air-indoor uncontrolled	Loss of material/general and pitting corrosion	Structures Monitoring Program	III.B4-10	3.5.1-39	A
			(E) Air-outdoor	Loss of material/general and pitting corrosion	Structures Monitoring Program	III.B4-10	3.5.1-39	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	III.B4-11	3.5.1-55	A
Supports for Miscellaneous Components [pipe whip restraints, seismic (masonry block walls), fire hose stations, ladders, tool boxes, etc.]	SS	Stainless Steel	(E) Air-indoor uncontrolled	None	None	III.B5-05	3.5.1-59	A
			(E) Borated water leakage	None	None	III.B5-06	3.5.1-59	A
		Steel	(E) Air-indoor uncontrolled	Loss of material/general and pitting corrosion	Fire Protection	III.B5-07	3.5.1-39	E, 2
					Structures Monitoring Program	III.B5-07	3.5.1-39	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	III.B5-08	3.5.1-55	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-13: Structures and Component Supports - Component Supports - Aging Management Evaluation

Component Type / Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Supports for Piping & Components (plates and structural shapes, spring hangers, sliding surfaces, welds, bolted connections, etc.)	SS	Stainless Steel	(E) Air-indoor uncontrolled	None	None	III.B1.1-09	3.5.1-59	A
						III.B1.2-07	3.5.1-59	A
						III.B2-08	3.5.1-59	A
			(E) Borated water leakage	None	None	III.B1.1-10	3.5.1-59	A
						III.B2-09	3.5.1-59	A
						III.B1.2-08	3.5.1-59	A
			(E) Treated water-primary	Cracking, Loss of material/stress corrosion cracking, pitting and crevice corrosion	Primary Water Chemistry	T-014	3.5.1-46	A, S2, 3
		Steel	(E) Air-indoor uncontrolled	Loss of material/general and pitting corrosion	ASME Section XI, Subsection IWF	III.B1.2-10	3.5.1-53	B
						III.B1.1-13	3.5.1-53	B
					Structures Monitoring Program	III.B2-10	3.5.1-39	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-13: Structures and Component Supports - Component Supports - Aging Management Evaluation

Component Type / Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Supports for Piping & Components (plates and structural shapes, spring hangers, sliding surfaces, welds, bolted connections, etc.)	SS	Steel	(E) Air-indoor uncontrolled	Loss of mechanical function/corrosion, distortion, dirt, overload, fatigue due to vibratory and cyclic thermal loads	ASME Section XI, Subsection IWF	III.B1.2-02	3.5.1-54	B
						III.B1.2-03	3.5.1-56	B
						III.B1.1-05	3.5.1-56	B
						III.B1.1-02	3.5.1-54	B
					Structures Monitoring Program	III.B2-02	3.5.1-52	A
			(E) Air-outdoor	Loss of material/general and pitting corrosion	Structures Monitoring Program	III.B2-10	3.5.1-39	A
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	III.B1.2-11	3.5.1-55	A
						III.B2-11	3.5.1-55	A
						III.B1.1-14	3.5.1-55	A
			(E) Raw water	Loss of material/general (steel only), pitting and crevice corrosion	Structures Monitoring Program	T-021	3.5.1-47	A, 4

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-13 Notes:

Plant Standard Notes

Note - The following plant standard notes have generic applicability, but may or may not be used for each SSC:

S1. Thermal embrittlement is only applicable to CASS components that are subject to temperatures in excess of 482°F.

S2. Cracking due to SCC is only applicable to stainless steel components exposed to temperatures greater than 140°F.

S3. Selective leaching is applicable to the material group 'Steel,' but only for gray cast iron components.

System Specific Notes

1. These cable trays and electrical conduits are galvanized steel and are not subject to loss of material due to corrosion in an air-indoor uncontrolled environment.

2. The Fire Protection AMP inspects the supports for the Fire Hose Stations.

3. This environment is applicable to pipe supports located in the spent fuel pool and refueling cavity.

4. This environment is applicable to pipe supports located in the Screenhouse and the Intake Structure.

Industry Standard Notes

See last page of Section 3.5 tables.

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-14: Structures and Component Supports - Miscellaneous Structural Commodities - Aging Management Evaluation

Commodity Group	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Metal enclosed bus - enclosure assemblies	EN	Aluminum	(E) Air-indoor uncontrolled	None	None	TP-008	3.5.1-58	C
			(E) Air-outdoor	Loss of material/pitting and crevice corrosion	Structures Monitoring Program	TP-006	3.5.1-50	C
		Elastomers	(E) Air-indoor uncontrolled	Hardening and loss of strength due to elastomer degradation	Structures Monitoring Program	LP-010	3.6.1-10	A
			(E) Air-outdoor	Hardening and loss of strength due to elastomer degradation	Structures Monitoring Program	LP-010	3.6.1-10	A
Cable tray covers	FB; SS	Aluminum	(E) Air-indoor uncontrolled	None	None	TP-008	3.5.1-58	C
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	TP-003	3.5.1-55	C
		Steel	(E) Air-indoor uncontrolled	None	None	TP-011	3.5.1-58	C, 2
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	T-025	3.5.1-55	C
Control room cabinet covers	EN; FB	Aluminum	(E) Air-indoor controlled	None	None	AP-036	3.3.1-95	C

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-14: Structures and Component Supports - Miscellaneous Structural Commodities - Aging Management Evaluation

Commodity Group	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Doors (fire, rolling fire, Steam Exclusion, Special Ventilation, Control Room Environmental Zone, plant access and flood)	EN; EQB; FB; FLB; PB; SS	Elastomers	(E) Air-indoor uncontrolled	Loss of sealing/deterioration of seals, gaskets, and moisture barriers (caulking, flashing, and other sealants)	Fire Protection	TP-007	3.5.1-44	E, 1
		Steel	(E) Air-indoor uncontrolled	Loss of material/wear	Fire Protection	A-021	3.3.1-63	B, 1
				Loss of material/general and pitting corrosion	Fire Protection	T-030	3.5.1-39	E, 1
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	T-025	3.5.1-55	C, 1
Electrical component supports within panels and cabinets	SS	Steel	(E) Air-indoor uncontrolled	None	None	TP-011	3.5.1-58	C
Expansion Joint/Seismic gap material (fire rated walls)	FB; SS	Non-Metallic	(E) Air-indoor uncontrolled	Change in material properties/irradiation	Fire Protection			H
				Cracking; Delamination/vibration	Fire Protection			H
				Loss of material/abrasion	Fire Protection			H
				Loss of material/flaking	Fire Protection			H
		Steel	(E) Air-indoor uncontrolled	Loss of material/general and pitting corrosion	Fire Protection	T-030	3.5.1-39	E
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	T-025	3.5.1-55	C

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-14: Structures and Component Supports - Miscellaneous Structural Commodities - Aging Management Evaluation

Commodity Group	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Expansion Joint/Seismic gap sealant material (between adjacent buildings/structures)	SS	Elastomers	(E) Air-indoor uncontrolled	Change in material properties/thermal exposure	Structures Monitoring Program			H
				Cracking/thermal exposure	Structures Monitoring Program			H
				Cracking/irradiation	Structures Monitoring Program			H
			(E) Air-outdoor	Loss of sealing/deterioration of seals, gaskets, and moisture barriers (caulking, flashing, and other sealants)	Structures Monitoring Program	TP-007	3.5.1-44	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-14: Structures and Component Supports - Miscellaneous Structural Commodities - Aging Management Evaluation

Commodity Group	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Fire barrier Penetration seals assemblies	EN; EQB; FB; PB	Elastomers	(E) Air-indoor uncontrolled	Change in material properties/thermal exposure	Fire Protection			H
				Change in material properties/irradiation	Fire Protection			H
				Cracking/thermal exposure	Fire Protection			H
				Cracking/irradiation	Fire Protection			H
				Cracking; Delamination/vibration	Fire Protection			H
				Cracking; Delamination/differential movement	Fire Protection			H
				Increased hardness, shrinkage and loss of strength/weathering	Fire Protection	A-019	3.3.1-61	B
				Loss of material/abrasion	Fire Protection			H
			(E) Air-outdoor	Cracking; Delamination/differential movement	Fire Protection			H
				Cracking; Delamination/vibration	Fire Protection			H
				Loss of material/abrasion	Fire Protection			H

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-14: Structures and Component Supports - Miscellaneous Structural Commodities - Aging Management Evaluation

Commodity Group	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Fire barrier Penetration seals assemblies	EN; EQB; FB; PB	Non-Metallic	(E) Air-indoor uncontrolled	Change in material properties/irradiation	Fire Protection			H
				Cracking; Delamination/vibration	Fire Protection			H
				Loss of material/flaking	Fire Protection			H
				Loss of material/abrasion	Fire Protection			H
		Steel	(E) Air-indoor uncontrolled	Loss of material/general and pitting corrosion	Fire Protection	T-030	3.5.1-39	E
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	T-025	3.5.1-55	C
Fire boots	FB	Elastomers	(E) Air-indoor uncontrolled	Change in material properties/thermal exposure	Fire Protection			H
				Cracking/thermal exposure	Fire Protection			H
				Cracking/irradiation	Fire Protection			H
		Non-Metallic	(E) Air-indoor uncontrolled	None	None			H
Fire rated steel coating (pyrocrete)	FB	Non-Metallic	(E) Air-indoor uncontrolled	Change in material properties/irradiation	Fire Protection			H
				Cracking; Delamination/vibration	Fire Protection			H
				Loss of material/abrasion	Fire Protection			H
				Loss of material/flaking	Fire Protection			H

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-14: Structures and Component Supports - Miscellaneous Structural Commodities - Aging Management Evaluation

Commodity Group	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Firewalls (gypsum)	FB; SS	Non-Metallic	(E) Air-indoor uncontrolled	Change in material properties/irradiation	Fire Protection			H
				Cracking; Delamination/vibration	Fire Protection			H
				Loss of material/flaking	Fire Protection			H
				Loss of material/abrasion	Fire Protection			H
Flood barriers and gaskets/sealant	FLB; SS	Elastomers	(E) Air-indoor uncontrolled	Change in material properties/thermal exposure	Structures Monitoring Program			H
				Cracking/thermal exposure	Structures Monitoring Program			H
				Cracking/irradiation	Structures Monitoring Program			H
		Steel	(E) Air-indoor uncontrolled	Loss of material/general and pitting corrosion	Structures Monitoring Program	T-030	3.5.1-39	C
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	T-025	3.5.1-55	C
Gaskets/seals in junction, terminal, pull boxes	EN	Elastomers	(E) Air-outdoor	Loss of sealing/deterioration of seals, gaskets, and moisture barriers (caulking, flashing, and other sealants)	Work Control Process	TP-007	3.5.1-44	E

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-14: Structures and Component Supports - Miscellaneous Structural Commodities - Aging Management Evaluation

Commodity Group	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Insulation	SS	Aluminum	(E) Air-indoor uncontrolled	None	None	TP-008	3.5.1-58	C, 3
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	TP-003	3.5.1-55	C, 3
		Non-Metallic	(E) Air-indoor uncontrolled	None	None			H
		Stainless Steel	(E) Air-indoor uncontrolled	None	None	AP-017	3.3.1-94	C
Junction, terminal, and pull boxes	EN	Stainless Steel	(E) Air-outdoor	Loss of material/pitting and crevice corrosion	External Surfaces Monitoring	TP-006	3.5.1-50	E
		Steel	(E) Air-indoor uncontrolled	Loss of material/general and pitting corrosion	External Surfaces Monitoring	T-030	3.5.1-39	E
			(E) Air-outdoor	Loss of material/pitting and crevice corrosion	External Surfaces Monitoring	TP-006	3.5.1-50	E
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	T-025	3.5.1-55	C
Panels and cabinets	EN; SS	Steel	(E) Air-indoor uncontrolled	Loss of material/general and pitting corrosion	Structures Monitoring Program	T-030	3.5.1-39	C
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	T-025	3.5.1-55	C
Radient energy shields (3M Interam wraps)	FB	Non-Metallic	(E) Air-indoor uncontrolled	Change in material properties/irradiation	Fire Protection			H
				Loss of material/flaking	Fire Protection			H
				Loss of material/abrasion	Fire Protection			H

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-14 Notes:

Plant Standard Notes

Note - The following plant standard notes have generic applicability, but may or may not be used for each SSC:

S1. Thermal embrittlement is only applicable to CASS components that are subject to temperatures in excess of 482°F.

S2. Cracking due to SCC is only applicable to stainless steel components exposed to temperatures greater than 140°F.

S3. Selective leaching is applicable to the material group "Steel," but only for gray cast iron components.

System Specific Notes

1. Doors includes fire doors, rolling fire doors, SE doors, SV doors, CREZ doors, plant access doors, and flood doors. Some of the SE, SV, CREZ, and flood doors have a fire barrier function. All of these doors are inspected by the Fire Protection program.

2. Material is galvanized steel and no aging management is required.

3. In addition to providing an insulation jacket, the aluminum jacket installed on Service Water A and B train piping in Safeguards Alley (Rooms 5B &5B-1) and Room 2B (Diesel Generator Room 1A) also serves as a spray shield for electrical equipment susceptible to water spray damage.

Industry Standard Notes

See last page of Section 3.5 tables.

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-15: Structures and Component Supports - NSSS Supports - Aging Management Evaluation

Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Pressurizer Support:	SS	Steel	(E) Air-indoor uncontrolled	Loss of material/general and pitting corrosion	ASME Section XI, Subsection IWF	III.B1.1-13	3.5.1-53	B
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	III.B1.1-14	3.5.1-55	A
Reactor Coolant Pumps Support: Plates and Structural Shapes (columns, brackets, tie bars, etc.)	SS	Steel	(E) Air-indoor uncontrolled	Loss of material/general and pitting corrosion	ASME Section XI, Subsection IWF	III.B1.1-13	3.5.1-53	B
				Loss of material/general corrosion	Bolting Integrity	III.B1.1-04	3.5.1-51	A, 1
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	III.B1.1-14	3.5.1-55	A
Reactor Vessel Support: Plates and Structural Shapes (columns, beams, bracing, band ring, etc.)	SS	Steel	(E) Concrete	None	None	AP-003	3.3.1-96	C, 2
Reactor Vessel Support: Plates and Structural Shapes (ventilated support pads, vendor supplied support shoes and shim plates)	SS	Steel	(E) Air-indoor uncontrolled	Loss of material/general and pitting corrosion	ASME Section XI, Subsection IWF	III.B1.1-13	3.5.1-53	B
				Loss of mechanical function/corrosion, distortion, dirt, overload, fatigue due to vibratory and cyclic thermal loads	ASME Section XI, Subsection IWF	III.B1.1-05	3.5.1-56	B, 3
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	III.B1.1-14	3.5.1-55	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-15: Structures and Component Supports - NSSS Supports - Aging Management Evaluation

Structural Member	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Steam Generator Support: Plates and Structural Shapes (columns, lower lateral support system, upper lateral support system, attachments for hydraulic suppressor, spring hangers, cable restraints and anchors)	SS	Steel	(E) Air-indoor uncontrolled	Loss of material/general and pitting corrosion	ASME Section XI, Subsection IWF	III.B1.1-13	3.5.1-53	B
				Loss of mechanical function/corrosion, distortion, dirt, overload, fatigue due to vibratory and cyclic thermal loads	ASME Section XI, Subsection IWF	III.B1.1-02	3.5.1-54	B
			(E) Borated water leakage	Loss of material/boric acid corrosion	Boric Acid Corrosion	III.B1.1-14	3.5.1-55	A
		Stainless Steel	(E) Air-indoor uncontrolled	None	None	III.B1.1-09	3.5.1-59	A, 4
			(E) Borated water leakage	None	None	III.B1.1-10	3.5.1-59	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.5.2-15 Notes:

Plant Standard Notes

Note - The following plant standard notes have generic applicability, but may or may not be used for each SSC:

S1. Thermal embrittlement is only applicable to CASS components that are subject to temperatures in excess of 482°F.

S2. Cracking due to SCC is only applicable to stainless steel components exposed to temperatures greater than 140°F.

S3. Selective leaching is applicable to the material group 'Steel,' but only for gray cast iron components.

System Specific Notes

1. The steel in an air-indoor uncontrolled environment, which is subject to loss of material due to general corrosion, applies to the reactor coolant pumps. The thread rods, referred to as connecting bolts to the pumps, are high strength Maraging alloy steels with a yield strength greater than 150 ksi. These connecting bolts are hand tighten at each end and are not torqued. Since these bolts do not encounter tensile stresses, cracking due to stress corrosion cracking is not an aging effect requiring aging management. Loss of material due to general corrosion is the only aging effect requiring aging management.

2. All steel support members are embedded in biological shield concrete.

3. The steel shim plates, which are integral with the reactor vessel nozzles and support lugs, is a graphitic tool steel that contains a uniform dispersion of graphite particles. This makes the steel self-lubricating.

4. The footbolts, which attach the Steam Generator to the columns top plate, are high strength stainless steel (Carpenter Custom 455) with yield strength greater than 150 ksi. There are three parameters required for stress corrosion cracking (SCC) to occur; a susceptible material, a corrosive environment, and tensile stresses. The stainless steel footbolts inherently have good resistance to SCC, are not subjected to a corrosive environment, and have relatively low tensile stresses. Therefore, cracking due to SCC is not an aging effect requiring management for stainless steel footbolts.

Industry Standard Notes

See last page of Section 3.5 tables.

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Notes for Tables 3.5.2-1 through 3.5.2-15

Industry 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 component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

D. Component is different, but 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 item for component, 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. (Not used. See discussion in Section 3.0)

G. Environment not in NUREG-1801 for this component and material. (Not used. See discussion in Section 3.0)

H. Aging effect not in NUREG-1801 for this component, material and environment combination.

I. Aging effect in NUREG-1801 for this component, material and environment combination is not applicable. (Not used. See discussion in Section 3.0)

J. Neither the component nor the material and environment combination is evaluated in NUREG-1801. (Not used. See discussion in Section 3.0)

3.6 AGING MANAGEMENT OF ELECTRICAL AND INSTRUMENTATION AND CONTROLS

3.6.1 INTRODUCTION

This section provides the results of the aging management review for those electrical components identified in Section 2.5, Electrical and Instrumentation and Controls Systems. The electrical components, which are addressed in this section, are described in the indicated sections.

- Cables and Connections (Section 2.5.1)
- Fuse Holders (Section 2.5.2)
- Metal Enclosed Bus (includes switchyard buses) (Section 2.5.3)

Table 3.6.1, Summary of Aging Management Programs for the Electrical Components Evaluated in Chapter VI of NUREG-1801, provides the summary of the programs evaluated in NUREG-1801 for the Electrical Components components that are relied on for license renewal.

This table uses the format described in Section 3.0 above.

3.6.2 RESULTS

The following tables summarize the results of the aging management review for the components in the Electrical Components group:

Table 3.6.2-1, Cables and Connections - Aging Management Evaluation

Table 3.6.2-2, Fuse Holders - Aging Management Evaluation

Table 3.6.2-3, Metal Enclosed Bus - Aging Management Evaluation

The materials from which components are fabricated, the environments to which components 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 Components group in the following subsections of Section 3.6.2.1, Materials, Environment, Aging Effects Requiring Management and Aging Management Programs:

Section 3.6.2.1.1, Cables and Connections

Section 3.6.2.1.2, Fuse Holders

Section 3.6.2.1.3, Metal Enclosed Bus

3.6.2.1 MATERIALS, ENVIRONMENT, AGING EFFECTS REQUIRING MANAGEMENT AND AGING MANAGEMENT PROGRAMS

3.6.2.1.1 Cables and Connections

Materials

The materials of construction for the Cables and Connections commodity groups/component types are:

- Electrical Conductor Material
- Electrical Insulation Material (except Porcelain)

Environment

The Cables and Connections commodity groups/component types are exposed to the following environments:

- Adverse localized environment
- Air-indoor uncontrolled
- Air-outdoor
- Borated water leakage

Aging Effects Requiring Management

The following aging effects, associated with the Cables and Connections commodity groups/component types, require management:

- Corrosion of connector contact surfaces
- Localized damage and breakdown of insulation leading to electrical failure
- Loosening of bolted connections
- Reduced Insulation Resistance, Electrical Failure

Aging Management Programs

The following aging management programs manage the aging effects for the Cables and Connections commodity groups/component types:

- Boric Acid Corrosion
- Non-EQ Electrical Cables and Connections
- Non-EQ Electrical Cable Connections

- Non-EQ Inaccessible Medium-Voltage Cables
- Non-EQ Instrumentation Circuits Subject to Sensitive, High-Voltage, Low-Level Signals

3.6.2.1.2 Fuse Holders

Materials

The materials of construction for the Fuse Holders component types are:

- Copper Alloys

Environment

The Fuse Holders component types are exposed to the following environments:

- Air-indoor controlled

Aging Effects Requiring Management

Based on a review of the environment of the fuse holders installation and the materials of construction, there are no aging effects requiring management during the period of extended operation for the fuse holders (metallic clamps) within the scope of license renewal.

Aging Management Programs

There are no aging management programs required for fuse holders (metallic clamps).

3.6.2.1.3 Metal Enclosed Bus

Materials

The materials of construction for the Metal Enclosed Bus component types are:

- Electrical Conductor Material
- Electrical Insulation Material (except Porcelain)
- Electrical Insulation Material (Porcelain)

Environment

The Metal Enclosed Bus component types are exposed to the following environments:

- Air-indoor uncontrolled
- Air-outdoor

Aging Effects Requiring Management

The following aging effects, associated with the Metal Enclosed Bus component types, require management:

- Loosening of bolted connections
- Reduced Insulation Resistance, Electrical Failure

Aging Management Programs

The following aging management programs manage the aging effects for the Metal Enclosed Bus component types:

- Metal Enclosed Bus

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 in the license renewal application. For the electrical components, those programs are addressed in the following sections.

3.6.2.2.1 Electrical Equipment Subject to Environmental Qualification

Environmental qualification of electrical equipment is a TLAA as defined in 10 CFR 54.3. TLAAs are required to be evaluated in accordance with 10 CFR 54.21(c)(1). The evaluation of this TLAA is addressed separately in Section 4.4, Environmental Qualification of Electric Equipment and Appendix B, Section B3.1, Environmental Qualification (EQ) of Electric Components.

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 plant is located in a rural environment with no major industry in close proximity, therefore contamination from industrial effluents is not significant. Lake Michigan is a fresh water lake used for cooling and salt spray is not a concern for the insulators. Seasonal rainwater or snows prevent any accumulation of surface contamination buildup. Review of operating experience has identified no concerns related to the occurrence of degradation of insulator quality due to the presence of salt deposits or surface contamination in the switchyard high voltage insulators. Therefore, degradation of insulator quality due to the presence of salt deposits or surface contamination is not a credible aging mechanism requiring management.

There are two configurations of high voltage insulators in the scope of license renewal: post-type and suspension-type. The switchyard bus is rigid aluminum tube material or aluminum angle supported by post type insulators mounted on steel structures with concrete foundations. The bus runs are short lengths, rigidly supported and therefore, the post insulators are not subject to vibration or wind abrasion and do not require management of loss of material due to mechanical wear. The overhead line from the switchyard to the Reserve Auxiliary Transformer has suspension type insulators and the span lengths between towers are short which minimize wind effect. Experience has shown that the transmission conductors do not normally swing and that when they do, due to a substantial wind, do not continue to swing for very long once the wind has subsided. Wind loading that can cause a transmission line and insulators to vibrate or sway is considered in the design and installation. No high voltage insulator failures have been experienced. Therefore, these suspension insulators do not require aging management for loss of material due to mechanical wear. Review of operating experience has identified no concerns related to the occurrence of loss of material due to mechanical wear as a result of wind blowing on transmission conductors in the switchyard high voltage insulators.

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

The switchyard bus material consists of continuous runs of aluminum angle or tubular bus connected to rigid post insulator supports and no aging effects for the ambient air environment have been identified that could cause a loss of intended function for the period of extended operation. The switchyard buses have terminations that are part of the active components (i.e., breakers, disconnect switches, etc.), or are evaluated as part of the Cable and Connections component types. Therefore, no aging management is required for the bus or connections. Review of operating experience has identified no concerns related to the occurrence of loss of material or loss of conductor strength due to wind induced abrasion and fatigue or corrosion of the switchyard bus and connections due to aging.

The transmission conductors in the scope of license renewal are 138kV, 795MCM ACSR conductors connecting the 138kV switchyard to the RAT. The most prevalent mechanism contributing to loss of conductor strength of an ACSR transmission conductor is corrosion, which includes corrosion of the steel core and aluminum strand pitting. For ACSR conductors, degradation begins as a loss of zinc from the galvanized steel core wires. Corrosion rates depend largely on air quality, which includes suspended particles chemistry, SO_2 concentrations in air, precipitation, fog chemistry, and meteorological conditions. The plant is located in a rural area and does not experience urban or industrial air pollutants. The corrosion of aluminum in air is very slow, particularly in the rural, non-industrial location of the plant. Additionally, the ACSR steel core is the primary strength component of the conductor. The loss of conductor strength through corrosion of the steel core is not considered a credible aging effect based on the Ontario Hydro testing of an 80-year old 4/0 ACSR conductor that retained a 37% safety margin of the heavy load tensile strength when compared to the ultimate strength. The NESC requires that the maximum tension a conductor be designed to withstand be not more than 60% of the ultimate conductor strength. Also, the NESC sets the maximum tension a conductor can be designed to withstand under heavy load requirements, which includes consideration of ice, wind, and temperature. The installed (795MCM - 45/7 strands) conductor has a ultimate conductor strength of 22,100 pounds and was installed with 5000 pound tension for NESC heavy loading. The installed margin of this conductor is 77.3% of the ultimate strength which is well above the 67% installed margin of the Ontario Hydro conductor that was tested.

Therefore, the loss of conductor strength through corrosion is not a credible aging mechanism requiring management.

The NESC design of these conductors included the effects of wind loading and sway through span lengths, which are short, and the sag/tension criteria of the lines. Also, experience has shown that when substantial wind causes a line to sway, the line does not continue to sway or vibrate once the wind subsides. Therefore, the loss of material due to wind induced abrasion and fatigue is not a credible aging mechanism requiring management.

The increased resistance of aluminum conductor connections due to oxidation or loss of pre-load is minimized through the use of compatible aluminum hardware, the use of lock washers in bolted connections, and no-oxide compounds at connection surfaces in all termination types. Therefore, increased resistance of aluminum conductor connections due to oxidation or loss of pre-load is not a credible aging mechanism requiring management.

Review of operating experience has identified no concerns related to the occurrence of loss of material, loss of strength, or increased resistance of connections in the high voltage transmission conductors due to aging.

3.6.2.3 TIME-LIMITED AGING ANALYSIS

The TLAAs identified below are associated with the Electrical and Instrumentation and Controls components. The section of the LRA that contains the TLAA review results is indicated in parenthesis.

- Environmental Qualification of Electrical Equipment (Section 4.4)

3.6.3 CONCLUSION

The Electrical Components that are subject to aging management review have been identified in accordance with the requirements of 10 CFR 54.4. The aging management programs selected to manage aging effects for the Electrical Components components are identified in the summary tables and Section 3.6.2.1.

A description of these aging management programs is provided in Appendix B, along with the demonstration that the identified aging effects will be managed for the period of extended operation.

Therefore, based on the demonstrations provided in Appendix B, the effects of aging associated with the Electrical Components will be adequately managed so that there is reasonable assurance that the intended function(s) will be maintained consistent with the current licensing basis during the period of extended operation.

Results Tables: Electrical and Instrumentation and Controls Systems

Table 3.6.1 Summary of Aging Management Programs for the Electrical Components Evaluated in Chapter VI of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	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	Yes, TLAA	Further evaluation is documented 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	No	Reduced insulation resistance and electrical failure for conductor insulation for electrical cables and connections not subject to 10 CFR 50.49 EQ requirements is managed by the Non-EQ Electrical Cables and Connections program. Aging management is not required for fuse holder insulation.

Table 3.6.1 Summary of Aging Management Programs for the Electrical Components Evaluated in Chapter VI of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	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	No	Consistent with NUREG-1801. Reduced insulation resistance and electrical failure for electrical cables and connections used in sensitive Instrumentation Circuits not subject to 10 CFR 50.49 EQ requirements is managed by the Non-EQ Instrumentation Circuits Subject to Sensitive, High-Voltage, Low-Level Signals.
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	No	Consistent with NUREG-1801. Localized damage and breakdown of insulation leading to electrical failure for inaccessible medium-voltage (2 kV to 15 kV) cables is managed by the Non-EQ Inaccessible Medium-Voltage Cables.

Table 3.6.1 Summary of Aging Management Programs for the Electrical Components Evaluated in Chapter VI of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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	No	Consistent with NUREG-1801. Corrosion of connector contact surfaces due to intrusion of borated water is managed by the Boric Acid Corrosion program.
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	A review of all installed fuse-holders to determine those that were not part of a larger assembly and within the scope of license renewal concluded that only the fuse holders in two enclosed cabinets located in the Relay Room required evaluation. These fuse holders are in a controlled air environment, are not subject to fatigue due to ohmic heating, thermal cycling, electrical transients, frequent manipulation, vibration, chemical contamination, corrosion, and oxidation. Therefore, no aging management is required.

Table 3.6.1 Summary of Aging Management Programs for the Electrical Components Evaluated in Chapter VI of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.6.1-07	Metal enclosed bus - Bus/connections	Loosening of bolted connections due to thermal cycling and ohmic heating	Metal Enclosed Bus	No	Consistent with NUREG-1801. Loosening of bolted connections is managed by the Metal Enclosed Bus program.
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	Consistent with NUREG-1801. Reduced insulation resistance and electrical failure for metal enclosed bus conductor insulation requiring aging management is managed by the Metal Enclosed Bus program.

Table 3.6.1 Summary of Aging Management Programs for the Electrical Components Evaluated in Chapter VI of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.6.1-09	Metal enclosed bus – Enclosure assemblies	Loss of material due to general corrosion	Structures Monitoring Program	No	The installed metal enclosed bus - enclosure assemblies are constructed of aluminum and evaluated for aging with Miscellaneous Structural Commodities. As indicated in Table 3.5.2-14: Structures and Component Supports - Miscellaneous Structural Commodities - Aging Management Evaluation, loss of material for the aluminum metal enclosed bus - enclosure assemblies is managed by the Structures Monitoring Program.

Table 3.6.1 Summary of Aging Management Programs for the Electrical Components Evaluated in Chapter VI of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.6.1-10	Metal enclosed bus – Enclosure assemblies	Hardening and loss of strength due to elastomers degradation	Structures Monitoring Program	No	Consistent with NUREG-1801. The installed metal enclosed bus - enclosure assemblies are evaluated for aging with Miscellaneous Structural Commodities. As indicated in Table 3.5.2-14: Structures and Component Supports - Miscellaneous Structural Commodities - Aging Management Evaluation, hardening and loss of strength due to elastomers degradation for metal enclosed bus - enclosure assemblies is managed by the Structures Monitoring Program.

Table 3.6.1 Summary of Aging Management Programs for the Electrical Components Evaluated in Chapter VI of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	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, plant specific	Degradation of insulation quality due to presence of any salt deposits and surface contamination, and loss of material caused by mechanical wear due to wind blowing on transmission conductors are not aging effects requiring management based on a review of the environments and materials of construction. Further evaluation is documented in Subsection 3.6.2.2.2.

Table 3.6.1 Summary of Aging Management Programs for the Electrical Components Evaluated in Chapter VI of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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, plant specific	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 preload are not aging effects requiring management based on a review of the environments and materials of construction. Further evaluation is documented 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	No	Consistent with NUREG-1801. Loosening of bolted connections due to thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion, and oxidation for cable connections - metallic parts is managed by the Non-EQ Electrical Cable Connections program.

Table 3.6.1 Summary of Aging Management Programs for the Electrical Components Evaluated in Chapter VI of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.6.1-14	Fuse Holders (Not Part of a Larger Assembly) Insulation material	None	None	NA - No AEM or AMP	Consistent with NUREG-1801. Aging management is not required for fuse holders (not part of a larger assembly) insulation material.

Results Tables: Electrical and Instrumentation and Controls AMR Results

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.6.2-1: Electrical Components - Cables and Connections - Aging Management Evaluation

Commodity Group / Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Cable Connections (Metallic Parts)	CE	Electrical Conductor Material	(E) Air-indoor uncontrolled	Loosening of bolted connections/due to thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion, and oxidation	Non-EQ Electrical Cable Connections	VI.A-01	3.6.1-13	A
			(E) Air-outdoor	Loosening of bolted connections/due to thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion, and oxidation	Non-EQ Electrical Cable Connections	VI.A-01	3.6.1-13	A
			(E) Borated water leakage	Corrosion of connector contact surfaces due to intrusion of borated water	Boric Acid Corrosion	VI.A-05	3.6.1-05	A
Conductor insulation for electrical cables and connections used in sensitive Instrumentation Circuits	IN	Electrical Insulation Material (except Porcelain)	(E) Adverse localized environment	Embrittlement, cracking, melting, discoloration, swelling, or loss of dielectric strength leading to reduced insulation resistance (IR); electrical failure/ degradation of organics (Thermal/ thermoxidative), radiolysis and photolysis (UV sensitive materials only) of organics; radiation-induced oxidation, and moisture intrusion	Non-EQ Instrumentation Circuits Subject to Sensitive, High-Voltage, Low-Level Signals	VI.A-03	3.6.1-03	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.6.2-1: Electrical Components - Cables and Connections - Aging Management Evaluation

Commodity Group / Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Conductor insulation for electrical cables and connections	IN	Electrical Insulation Material (except Porcelain)	(E) Adverse localized environment	Embrittlement, cracking, melting, discoloration, swelling, or loss of dielectric strength leading to reduced insulation resistance (IR); electrical failure/ degradation of organics (Thermal/ thermoxidative), radiolysis and photolysis (UV sensitive materials only) of organics; radiation-induced oxidation, and moisture intrusion	Non-EQ Electrical Cables and Connections	VI.A-02	3.6.1-02	A
Conductor insulation for inaccessible medium voltage (2kV to 35kV) cables	IN	Electrical Insulation Material (except Porcelain)	(E) Adverse localized environment	Localized damage and breakdown of insulation leading to electrical failure/moisture intrusion, water trees	Non-EQ Inaccessible Medium-Voltage Cables	VI.A-04	3.6.1-04	A
Electrical equipment subject to 10 CFR 50.49 EQ requirements	CE	Electrical Conductor Material	(E) Adverse localized environment	Various degradation/various mechanisms	TLAA	VI.B-01	3.6.1-01	A
	IN	Electrical Insulation Material (except Porcelain)	(E) Adverse localized environment	Various degradation/various mechanisms	TLAA	VI.B-01	3.6.1-01	A
Fuse Holders insulation	IN	Electrical Insulation Material (except Porcelain)	(E) Adverse localized environment	None	None			H, 1
			(E) Air-indoor uncontrolled	None	None	VI.A-07	3.6.1-14	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.6.2-1: Electrical Components - Cables and Connections - Aging Management Evaluation

Commodity Group / Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Transmission conductors and connections	CE	Electrical Conductor Material	(E) Air-outdoor	None	None			H

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.6.2-1 Notes:

Plant Standard Notes

Note - The following plant standard notes have generic applicability, but may or may not be used for each SSC:

S1. Thermal embrittlement is only applicable to CASS components that are subject to temperatures in excess of 482°F.

S2. Cracking due to SCC is only applicable to stainless steel components exposed to temperatures greater than 140°F.

S3. Selective leaching is applicable to the material group "Steel," but only for gray cast iron components.

System Specific Notes

1. The Fuse Holders determined to be in the scope of license renewal are located in the Relay Room in enclosed cabinets, in a controlled air environment, and are not subjected to an adverse localized environment.

Industry Standard Notes

See last page of Section 3.6 tables.

Table 3.6.2-2: Electrical Components - Fuse Holders - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Fuse holders (Not Part of a Larger Assembly) Metallic Clamp	CE	Copper Alloys	(E) Air-indoor controlled	None	None			H

Table 3.6.2-2 Notes:

Plant Standard Notes

Note - The following plant standard notes have generic applicability, but may or may not be used for each SSC:

S1. Thermal embrittlement is only applicable to CASS components that are subject to temperatures in excess of 482°F.

S2. Cracking due to SCC is only applicable to stainless steel components exposed to temperatures greater than 140°F.

S3. Selective leaching is applicable to the material group 'Steel,' but only for gray cast iron components.

Industry Standard Notes

See last page of Section 3.6 tables.

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.6.2-3: Electrical Components - Metal Enclosed Bus - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Conductor Insulation, MEB	IN	Electrical Insulation Material (except Porcelain)	(E) Air-indoor uncontrolled	Embrittlement, cracking, melting, discoloration, swelling, or loss of dielectric strength leading to reduced insulation resistance (IR); electrical failure/ thermal/thermoxidative degradation of organics/thermoplastics, radiation-induced oxidation; moisture/debris intrusion, and ohmic heating	Metal Enclosed Bus	VI.A-14	3.6.1-08	A
			(E) Air-outdoor	Embrittlement, cracking, melting, discoloration, swelling, or loss of dielectric strength leading to reduced insulation resistance (IR); electrical failure/ thermal/thermoxidative degradation of organics/thermoplastics, radiation-induced oxidation; moisture/debris intrusion, and ohmic heating	Metal Enclosed Bus	VI.A-14	3.6.1-08	A
Metallic Conductor, MEB	CE	Electrical Conductor Material	(E) Air-indoor uncontrolled	Loosening of bolted connections/thermal cycling and ohmic heating	Metal Enclosed Bus	VI.A-11	3.6.1-07	A
			(E) Air-outdoor	Loosening of bolted connections/thermal cycling and ohmic heating	Metal Enclosed Bus	VI.A-11	3.6.1-07	A

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Table 3.6.2-3: Electrical Components - Metal Enclosed Bus - Aging Management Evaluation

Component Type	Intended Function(s)	Material	Environment	Aging Effect/Mechanism Requiring Management	Aging Management Programs	NUREG-1801 Volume 2 Reference	Table 1 Item	Notes
Metallic Conductor, Switchyard Bus	CE	Electrical Conductor Material	(E) Air-outdoor	None	None			H
Support Insulation, High Voltage	IN; SS	Electrical Insulation Material (Porcelain)	(E) Air-indoor uncontrolled	None	None			H
			(E) Air-outdoor	None	None			H
Support Insulation, MEB	IN; SS	Electrical Insulation Material (Porcelain)	(E) Air-indoor uncontrolled	None	None			H
			(E) Air-outdoor	None	None			H

Table 3.6.2-3 Notes:

Plant Standard Notes

Note - The following plant standard notes have generic applicability, but may or may not be used for each SSC:

S1. Thermal embrittlement is only applicable to CASS components that are subject to temperatures in excess of 482°F.

S2. Cracking due to SCC is only applicable to stainless steel components exposed to temperatures greater than 140°F.

S3. Selective leaching is applicable to the material group 'Steel,' but only for gray cast iron components.

Industry Standard Notes

See last page of Section 3.6 tables.

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

Notes for Tables 3.6.2-1 through 3.6.2-3

Industry 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 component, material, environment, and aging effect. AMP is consistent with NUREG-1801 AMP.

D. Component is different, but 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 item for component, 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. (Not used. See discussion in Section 3.0)

G. Environment not in NUREG-1801 for this component and material. (Not used. See discussion in Section 3.0)

H. Aging effect not in NUREG-1801 for this component, material and environment combination.

I. Aging effect in NUREG-1801 for this component, material and environment combination is not applicable. (Not used. See discussion in Section 3.0)

J. Neither the component nor the material and environment combination is evaluated in NUREG-1801. (Not used. See discussion in Section 3.0)

See Table 2.0-1 for definitions of intended function and Table 3.0-1 for definitions of service environments.

4.0 TIME-LIMITED AGING ANALYSES

Two areas of plant technical assessment are required to support an application for a renewed operating license. The first area of technical review is the Integrated Plant Assessment, which is described in Sections 2 and 3 of the License Renewal Application. The second area of technical review that is required for license renewal is the identification and evaluation of plant-specific time-limited aging analyses and exemptions. The identification and evaluation of TLAAs included in this section meets the requirements contained within 10 CFR 54.21(c) in order to allow the NRC to make the findings associated with 10 CFR 54.29(a)(2).

A listing of the abbreviations used within this section is contained in Section 1.4.

4.1 IDENTIFICATION OF TIME-LIMITED AGING ANALYSES

Description

10 CFR 54.21(c) requires that an evaluation of time-limited aging analyses be provided as part of the application for a renewed license. Time-limited aging analyses are defined in 10 CFR 54.3 as those licensee calculations and analyses that meet the following criteria:

1. Involve systems, structures and components within the scope of license renewal, as delineated in 10 CFR 54.4(a).
2. Consider the effects of aging.
3. Involve time-limited assumptions defined by the current operating term, for example, 40 years.
4. Were determined by the licensee to be relevant 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 function as delineated in 10 CFR 54.4(b).
6. Are contained or incorporated by reference in the current licensing basis.

4.1.1 IDENTIFICATION PROCESS OF TIME-LIMITED AGING ANALYSES

The process used to identify time-limited aging analyses is consistent with the guidance provided in NEI 95-10 (Reference 4.8-1). Calculations and analyses that meet the six criteria of 10 CFR 54.3 were identified by searching the current licensing basis, which includes the USAR, engineering calculations, technical reports, licensing correspondence, and applicable vendor reports.

Once a TLAA was identified, an evaluation was performed to demonstrate that at least one of the following criteria is applicable:

(i) The analysis remains valid for the period of extended operation.

(ii) The analysis has been projected to the end of the period of extended operation.

(iii) The effects of aging on the intended function(s) will be adequately managed for the period of extended operation.

The results of these evaluations are provided in Table 4.1-1 and discussed in Sections 4.2 through 4.7. Table 4.1-2 compares the Kewaunee time-limited aging analyses to those time-limited aging analyses identified in NUREG-1800 (Reference 4.8-2).

4.1.2 IDENTIFICATION OF EXEMPTIONS

Description

The requirements of 10 CFR 54.21(c) also stipulate that the application for a renewed operating license should include a list of unit-specific exemptions granted pursuant to 10 CFR 50.12, that are in effect and based on time-limited aging analyses as defined in 10 CFR 54.3. Each active exemption has been reviewed to determine whether the exemption is based on a time-limited aging analysis.

Conclusion

As a result of this review, one active exemption was found that is based on a time-limited aging analysis. A request for exemption from the requirements of 10 CFR 50.61 and 10 CFR 50 Appendices G and H was granted in a May, 2001 letter from NRC to M. Reddemann, NMC (Reference 4.8-3). Specifically, the NRC issued an exemption to: (1) establish the use of a new methodology to meet the requirements of Appendix G to 10 CFR 50; (2) establish the use of a new methodology to meet the requirements of 10 CFR 50.61; and (3) modify the basis for the Kewaunee reactor pressure vessel surveillance program (required by Appendix H to 10 CFR 50) to incorporate the acquisition of fracture toughness data. The new methodology for assessing the RPV circumferential beltline weld is based on the use of the 1997 Edition of ASTM Standard Test Method E-1921 and ASME Code Case N-629. The exemption was necessary for the reactor vessel beltline weld to meet the pressurized thermal shock criterion of 10 CFR 50.61. Pressurized thermal shock is evaluated as a TLAA in Section 4.2.

Table 4.1-1 Time-Limited Aging Analyses

TLAA CATEGORY	ANALYSIS	SECTION	RESOLUTION
REACTOR VESSEL NEUTRON EMBRITTLEMENT	Upper Shelf Energy	4.2.2	(ii)
	Pressurized Thermal Shock	4.2.3	(ii)
	Pressure-Temperature Limits	4.2.4	(iii)
METAL FATIGUE	Class 1 Components	4.3.1	(i), (ii), (iii)
	Non-Class 1 Components	4.3.2	(i), (ii), (iii)
ENVIRONMENTAL QUALIFICATION of ELECTRIC EQUIPMENT	Electrical Equipment	4.4	(iii)
CONCRETE CONTAINMENT TENDON PRESTRESS	Concrete Containment Tendon Prestress	4.5	Not Applicable
CONTAINMENT LINER PLATE, METAL CONTAINMENTS, AND PENETRATIONS	Containment Liner Plate, Metal Containments, and Penetrations	4.6	(i)
OTHER UNIT-SPECIFIC TLAAs	Crane Load Cycle Limit	4.7.1	(i)
	Reactor Coolant Pump Flywheel	4.7.2	(iii)
	Leak-Before-Break	4.7.3	(i), (ii)
	Reactor Vessel Underclad Cracking	4.7.4	(i)
	RC Loop Piping Flaw Tolerance Evaluation	4.7.5	Not Applicable

(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.

(iii) 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 Generic TLAAs Listed On Tables 4.1-2 and 4.1-3 of NUREG-1800

NUREG-1800 Generic TLAA Example	Applicability to Kewaunee	Section
NUREG-1800, Table 4.1-2		
Reactor vessel neutron embrittlement	Yes	4.2
Concrete containment tendon prestress	No – Kewaunee is a metal containment vessel design	4.5
Metal fatigue	Yes	4.3
Environmental qualification of electrical equipment	Yes	4.4
Metal corrosion allowance	No – no corrosion allowance evaluations met TLAA criteria	N/A
Inservice flaw growth analyses that demonstrate structure stability for 40 years	No – No potential TLAA identified	N/A
Inservice local metal containment corrosion analyses	No – No potential TLAA identified	N/A
High-energy line-break postulation based on fatigue cumulative usage factor	No – No potential TLAA identified	N/A
NUREG-1800, Table 4.1-3		
Intergranular separation in the heat affected zone (HAZ) of reactor vessel low alloy steel under austenitic SS cladding.	Yes	4.7.4
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	4.3.2
Fatigue analysis for the reactor coolant pump flywheel	Yes	4.7.2
Fatigue analysis of polar crane	Yes	4.7.1
Flow-induced vibration endurance limit for the reactor vessel internals	No – No potential TLAA identified	N/A
Transient cycle count assumptions for the reactor vessel internals	No – No potential TLAA identified	N/A
Ductility reduction of fracture toughness for the reactor vessel internals	No – No potential TLAA identified	N/A
Leak before break	Yes	4.7.3

Table 4.1-2 Review of Generic TLAAs Listed On Tables 4.1-2 and 4.1-3 of NUREG-1800

NUREG-1800 Generic TLAA Example	Applicability to Kewaunee	Section
Fatigue analysis for the containment liner plate	No – Kewaunee is a metal containment vessel design	N/A
Containment penetration pressurization cycles	No – No potential TLAA identified	N/A
Reactor vessel circumferential weld inspection relief (BWR)	No – BWR only	N/A

4.2 REACTOR VESSEL NEUTRON EMBRITTLEMENT

Description

Neutron embrittlement produces changes in mechanical properties of reactor vessel materials by increasing yield strength and ultimate strength and, correspondingly, decreasing ductility and fracture toughness. These changes in material properties result primarily from exposure over time to a fast neutron flux in the vicinity of the reactor core. The most pronounced material change occurs within the reactor vessel beltline region, manifesting itself as a reduction in fracture toughness. As fracture toughness decreases with cumulative fast neutron exposure, the material's resistance to crack propagation decreases. Prevention of reactor vessel failure depends upon maintaining reactor vessel fracture toughness high enough to resist brittle fracture over the period of extended operation.

The NRC has established a series of regulations to address neutron embrittlement. 10 CFR 50.60 requires that licensees comply with the requirements of 10 CFR 50, Appendix G and 10 CFR 50, Appendix H. 10 CFR 50, Appendix G requires that reactor vessel beltline materials have a Charpy upper shelf energy of not less than 50 ft-lb. through the licensed period of operation unless otherwise approved by the NRC, while 10 CFR 50, Appendix H establishes the requirements for developing plant specific surveillance data. Both 10 CFR 50, Appendix G, and 10 CFR 50.61 establish limits on neutron embrittlement.

Analyses have been performed to address the effects of neutron embrittlement of the reactor vessel and to ensure compliance with the applicable regulations. These analyses are TLAAs since the effects of neutron embrittlement are cumulative over time and the analyses are part of the current licensing basis of the plant. The following TLAAs are addressed for reactor vessel neutron embrittlement:

- Upper Shelf Energy (Section 4.2.2)
- Pressurized Thermal Shock (Section 4.2.3)
- Pressure - Temperature Limits (including Low Temperature Overpressure Protection) (Section 4.2.4)

4.2.1 NEUTRON FLUENCE

The calculation of neutron fluence to which reactor vessel materials are exposed is an important input to the evaluation of reactor vessel neutron embrittlement and is governed by regulatory requirements. WCAP-16641 (Reference 4.8-4) provides the calculation of Kewaunee reactor vessel neutron fluence projections to EOLR (i.e., 60 year plant lifetime) based on 52.1 EFPY. Neutron exposure up to Cycle 27 was based upon actual plant operating history, including power uprate that occurred during Cycle 26. Neutron exposure projections beyond the end of Cycle 27 were based upon an operating scenario that consisted of a series of 18 month operating cycles followed by a 25 day refueling outage. The reactor was considered to be operating at full power for the entire 18 month cycle. This full power period coupled with the 25 day refueling outage resulted in a net capacity factor of 95.6% with a total operating time of 33.0 EFPY at EOL and 52.1 EFPY at EOLR. The neutron exposure projections were also based on the continued use of low neutron leakage fuel management.

Kewaunee reactor vessel surveillance capsule T was removed in 2004 (the fifth capsule removed from the reactor) and WCAP-16641 documents the results of the fluence evaluation for the specimens. All of the calculations and dosimetry evaluations were based on the latest available nuclear cross-section data derived from ENDF/B-VI and made use of the latest available calculational tools. Furthermore, the neutron transport and dosimetry evaluation methodologies follow the guidance of Regulatory Guide 1.190, "Calculational and Dosimetry Methods for Determining Pressure Vessel Neutron Fluence."

The power distributions used in the plant specific transport analysis were based on the individual core designs for each of the first twenty seven fuel cycles at Kewaunee. Specifically, the data utilized included cycle dependent fuel assembly initial enrichments, burnups, and axial power distributions. This information was used to develop spatial and energy dependent core source distributions averaged over each fuel cycle. Therefore, the results from the neutron transport calculations provided data in terms of fuel cycle averaged neutron flux, which when multiplied by the appropriate fuel cycle length, generated the incremental fast neutron exposure for each fuel cycle. In constructing these core source distributions, the energy distribution of the source was computed using an appropriate fission split for uranium and plutonium isotopes based on the initial enrichment and burnup history of each fuel assembly. From these assembly-dependent fission splits, composite values of energy release per fission, neutron yield per fission, and fission spectrum were determined.

All of the transport calculations supporting the analysis were carried out using the DORT discrete ordinates code Version 3.1 and the BUGLE-96 cross-section library. The calculations account for a core power uprate from 1650 MWt to 1772 MWt that occurred during Cycle 26. The projections were based on the assumption that the core power distributions and associated plant operating characteristics from the Cycle 27 uprated core design were representative of future plant operation. The future projections are also based on the current reactor power level of 1772 MWt.

The fluence calculations concluded that capsule T surveillance specimens received a fluence of 5.62E+19 n/cm^2 (E>1.0 MeV) after irradiation to 24.6 EFPY and the peak reactor vessel clad/base metal interface fluence after 24.6 EFPY of plant operation was 2.60E+19 n/cm^2 (E>1.0 MeV).

Table 4.2-1 provides fast neutron fluence (E > 1.0 MeV) projections for 60 calendar years of operation (52.1 EFPY) at the clad/base metal interface for all materials comprising the beltline and the extended beltline region of the Kewaunee reactor pressure vessel. Based on these projections, the capsule T specimens have received a fluence equivalent to slightly greater than 52.1 EFPY. The information included in the table shows that the maximum vessel exposures occur on the intermediate shell base material with all other vessel materials experiencing a lower neutron exposure. The table also shows that materials in the extended beltline (inlet nozzles, inlet and outlet nozzle to upper shell welds, upper shell forging, and intermediate shell to upper shell girth weld) are projected to receive fluence greater than 1.0E+17 n/cm^2 during the 40 - 60 year operating period.

4.2.2 UPPER SHELF ENERGY

Description

10 CFR 50, Appendix G contains screening criteria that establish limits on how far the USE values for a reactor pressure vessel material may be allowed to decrease due to neutron irradiation exposure. The regulation requires the initial USE value to be greater than 75 ft-lbs in the unirradiated condition and that the value be greater than 50 ft-lbs in the fully irradiated condition as determined by Charpy V-notch specimen testing throughout the licensed life of the plant. USE values of less than 50 ft-lbs may be acceptable to the NRC if it can be demonstrated that these lower values will provide margins of safety against brittle fracture equivalent to those required by ASME Section XI, Appendix G.

Per Regulatory Guide 1.99, Revision 2, the Charpy USE should be assumed to decrease as a function of fluence and copper content according to Figure 2 of the guide when surveillance data are not used. If surveillance data are used, the decrease in USE may be obtained by plotting the reduced plant surveillance data on Figure 2 of the guide and fitting the data with a line drawn parallel to the existing lines as the upper bound of all the data. Charpy USE for the beltline forgings and weld were determined using surveillance data (Position 2.2), and the Charpy USE for the extended beltline materials was determined without the use of surveillance data (Position 1.2).

WCAP-16642 (Reference 4.8-5) provides a prediction of Charpy USE for EOLR (52.1 EFPY) using the corresponding 1/4T fluence projection, the copper and nickel content of the beltline materials and/or the results of the capsule specimens tested to date using Figure 2 in Regulatory Guide 1.99. The USE values for the beltline and extended beltline materials remain above the 50 ft-lb requirement for EOLR as indicated in Table 4.2-2.

Conclusion

Acceptable USE values have been calculated in accordance with Regulatory Guide 1.99, Revision 2 to the end of the period of extended operation. Calculated USE values for the most limiting reactor pressure vessel forging and weld materials remain greater than 50 ft-lbs. Therefore, the TLAA associated with USE values has been projected to be acceptable to the end of the period of extended operation per 10 CFR 54.21(c)(1)(ii).

4.2.3 PRESSURIZED THERMAL SHOCK

Description

Reactor pressure vessel beltline fluence is one of the factors used in determining the margin of acceptability of the reactor pressure vessel to pressurized thermal shock as a result of radiation embrittlement. The margin is the difference between the maximum nil ductility reference temperature in the limiting beltline material and the screening criteria established in accordance with 10 CFR 50.61(b)(2). The screening criteria for the limiting reactor vessel materials are 270°F for beltline plates, forging, and axial weld materials, and 300°F for beltline circumferential weld materials.

The reactor pressure vessel was fabricated using two ring forgings with a circumferential weld in the area surrounding the active core. This beltline region is composed of three different materials. All three materials were included in the reactor pressure vessel surveillance program. WCAP-16642 evaluated the forgings using the 10 CFR 50.61 procedure to define RT_{PTS} for materials that have surveillance data that are judged to be not credible. The data scatter requirements are exceeded for the two forging materials and, therefore, higher chemistry factors based on the measured copper and nickel contents are used with a 2σ margin applied.

The materials in the reactor vessel extended beltline region have been evaluated using the 10 CFR 50.61 procedure to define RT_{PTS}. None of the materials in the extended beltline were determined to be controlling.

For the circumferential weld metal (heat 1P3571), an exemption to 10 CFR 50.61 (as identified in Section 4.1.2) was granted for Kewaunee (Reference 4.8-6) based upon use of the Master Curve method as defined in ASME Code Case N-629, coupled with measured fracture toughness data using pre-cracked Charpy specimens. WCAP-16609 (Reference 4.8-7) re-evaluated RT_{PTS} for the circumferential weld metal using fracture toughness data determined from Capsule T specimens, and applying the methodology defined in the NRC Safety Evaluation for the exemption. The Master Curve approach for determining fracture toughness of a material is discussed in detail in WCAP-16609 for weld heat 1P3571. Master Curve fracture toughness data for irradiated weld metal heat 1P3571 from capsule T was evaluated to derive a direct measurement of irradiated RT_{To} for use in place of adjusted RT_{NDT} for this reactor vessel limiting circumferential weld.

The RT_{To} for a fluence corresponding to EOLR (52.1 EFPY) was determined by making direct measurement of irradiated 1P3571 weld metal fracture toughness using fatigue pre-cracked Charpy surveillance specimens. Fracture toughness data generated on the same weld wire heat from a previous capsule (Capsule S) and from another nuclear plant surveillance program (Maine Yankee Capsule A-35) were also included in the evaluation.

The CFs for beltline materials were calculated using Regulatory Guide 1.99 Revision 2, Positions 1.1 and 2.1. Position 1.1 uses the Tables from the Regulatory Guide along with the best estimate copper and nickel weight percents. Position 2.1 uses the surveillance capsule data from all capsules withdrawn to date. The extended beltline materials had CFs determined in accordance with Position 1.1 of Regulatory Guide

1.99, Revision 2 only. A summary of the CFs is shown in Table 4.2-3. The fluence values used to determine the CFs were the calculated fluence values at the surveillance capsule locations.

Conclusion

The results of RT_{PTS} calculations from WCAP-16642 for the reactor vessel beltline and extended beltline materials are shown in Table 4.2-3. The screening criteria of 10 CFR 50.61(b)(2) are met for all materials. Therefore, acceptable RT_{PTS} values have been calculated in accordance with 10 CFR 50.61, and the approved exemption to 10 CFR 50.61 requirements, to the end of the period of extended operation per 10 CFR 54.21(c)(1)(ii).

4.2.4 PRESSURE-TEMPERATURE LIMITS

Description

10 CFR Part 50 Appendix G requires that heatup and cooldown of the reactor vessel be accomplished within established pressure-temperature limits. These limits identify the maximum allowable pressure as a function of reactor coolant temperature. As the reactor vessel becomes irradiated and its fracture toughness is reduced, the allowable pressure at low temperatures is reduced. Therefore, in order to heatup and cooldown the vessel, the reactor coolant temperature and pressure must be maintained within the limits of Appendix G as defined by the evaluation of reactor vessel neutron irradiation embrittlement.

Heatup and cooldown limit curves have been calculated using the adjusted RT_{NDT} corresponding to the limiting beltline material of the reactor vessel for the current period of licensed operation. Current pressure - temperature limits and LTOP requirements were approved in license amendment 144 (Reference 4.8-8).

In accordance with 10 CFR 50, Appendix G, updated pressure-temperature limits for the period of extended operation have been developed in WCAP-16643 (Reference 4.8-9) and will be implemented prior to the period of extended operation. The LTOP enable temperature requirements will be updated concurrently with the pressure-temperature limits in order to ensure that these limits are not exceeded for postulated plant transients during the period of extended operation.

Conclusion

Consistent with 10 CFR 54.21(c)(1)(iii), acceptable pressure-temperature limits have been developed and will be implemented in accordance with 10 CFR 50, Appendix G prior to the period of extended operation in accordance with the Reactor Vessel Surveillance program.

Table 4.2-1 Calculated Maximum Neutron Fluence for Kewaunee Beltline and Extended Beltline Locations for EOLR (52.1 EFPY)

Reactor Vessel Location	Neutron Fluence (E > 1.0 MeV) [n/cm^2]
Lower Shell to Lower Closure Head Weld	< 1.00E+17
Lower Shell Forging	5.22E+19
Intermediate Shell to Lower Shell Girth Weld	5.07E+19
Intermediate Shell Forging	5.37E+19
Intermediate Shell to Upper Shell Girth Weld	5.33E+18
Upper Shell Forging	5.33E+18
Inlet Nozzle to Upper Shell Weld	1.34E+17
Inlet Nozzle	1.20E+17
Outlet Nozzle to Upper Shell Weld	1.10E+17
Outlet Nozzle	< 1.00E+17
Safety Injection Nozzle	< 1.00E+17
Vessel Support Bracket	< 1.00E+17
Core Support Guide Lugs	< 1.00E+17

Table 4.2-2 EOLR (52.1 EFPY) USE Projection

Material	Material Heat	Inside Surface Fluence (n/cm^2)	1/4T Fluence (n/cm^2)	Weight% Cu	Initial USE (ft-lb)	Projected USE Decrease (%)	Projected USE (ft-lb)
Intermediate Shell Forging	122X208VA1	5.37E+19[(a)]	3.636E+19	0.06	92	12	81[(b)]
Lower Shell Forging	123X167VA1	5.37E+19[(a)]	3.636E+19	0.06	97	8	89[(b)]
Intermediate Shell to Lower Shell Girth Weld	1P3571	5.37E+19[(a)]	3.636E+19	0.287	126	52	60[(b)]
Intermediate Shell to Upper Shell Girth Weld	21935	5.33E+18	3.61E+18	0.183	97	26	72
	BOLH	5.33E+18	3.61E+18	0.04	140	15	119
	IAGI	5.33E+18	3.61E+18	0.03	156	15	133
Upper Shell Forging	123W250VA1	5.33E+18	3.61E+18	0.12	86	17	71
Inlet Nozzle to Upper Shell Weld	DOAJ	1.34E+17	9.07E+16	0.02	157	8	144
	AOFJ	1.34E+17	9.07E+16	0.03	111	8	102
	EOEJ	1.34E+17	9.07E+16	0.01	152	8	140
	BOLH	1.34E+17	9.07E+16	0.04	140	8	129
	CAFJ	1.34E+17	9.07E+16	0.03	98	8	90
	EODJ	1.34E+17	9.07E+16	0.02	156	8	144
	DBIJ	1.34E+17	9.07E+16	0.02	123	8	113
Inlet Nozzle	122W496VA1	1.20E+17	8.12E+16	0.13	89	9	81
	122W515VA1	1.20E+17	8.12E+16	0.13	86	9	78
Outlet Nozzle to Upper Shell Weld	EODJ	1.10E+17	7.45E+16	0.02	156	8	144
	CAFJ	1.10E+17	7.45E+16	0.03	98	8	90
	AOFJ	1.10E+17	7.45E+16	0.03	111	8	102
	EOEJ	1.10E+17	7.45E+16	0.01	152	8	140
	BOBJ	1.10E+17	7.45E+16	0.02	120	8	110
	LOBI	1.10E+17	7.45E+16	0.03	114	8	105
	BOLH	1.10E+17	7.45E+16	0.04	140	8	129
	DBIJ	1.10E+17	7.45E+16	0.02	123	8	113
	FOIJ	1.10E+17	7.45E+16	0.03	104	8	96

a. For the Intermediate Shell Forging, Lower Shell Forging, and the Intermediate Shell to Lower Shell Girth Weld, the fluence values are the limiting value for all three beltline materials and are, therefore, considered conservative.

b. Projected USE was determined using plant surveillance data (Position 2.2 of Regulatory Guide 1.99, Revision 2)

Table 4.2-3 RT_{PTS} Results for Kewaunee Power Station Beltline and Extended Beltline Region Materials at EOLR (52.1 EFPY)

Reactor Vessel Beltline Region Location	Heat	Chemistry Data			Surface Fluence[(b)] (E+19 n/cm^2)	ΔRT_{PTS} (°F)	I[(c)] (°F)	M[(d)] (°F)	RT_{PTS}[(e)] (°F)
		Cu (%)	Ni (%)	CF (°F)					
Intermediate Shell Forging	122X208VA1	0.06	0.71	37	5.37	52.39	60	34	146
Intermediate Shell Forging using Surveillance Data[(a)]	122X208VA1	0.06	0.71	34.5	5.37	48.85	60	34	143
Intermediate Shell to Lower Shell Girth Weld[(f)]	1P3571	0.287	0.756	-	5.37	-	-	-	297.5
Lower Shell Forging	123X167VA1	0.06	0.75	37	5.37	52.39	20	34	106
Lower Shell Forging using Surveillance Data[(a)]	123X167VA1	0.06	0.75	28.81	5.37	40.78	20	34	95
Upper Shell Forging	123W250VA1	0.12	0.71	84.65	0.533	69.75	60	34	164
Upper Shell to Intermediate Shell Girth Weld	21935	0.183	0.704	172.22	0.533	141.91	-56	65.5	151
	BOLH	0.04	1.01	54	0.533	44.50	10	65.5	120
	IAGI	0.03	1.07	41	0.533	33.78	10	47.93	92
Inlet Nozzles	122W496VA1	0.13	0.68	93	0.012	11.53	0	11.53	23
	122W515VA1	0.13	0.75	94.75	0.012	11.75	-50	11.75	-27

Table 4.2-3 RT_{PTS} Results for Kewaunee Power Station Beltline and Extended Beltline Region Materials at EOLR (52.1 EFPY)

Reactor Vessel Beltline Region Location	Heat	Chemistry Data			Surface Fluence[(b)] (E+19 n/cm²)	ΔRT_{PTS} (°F)	I[(c)] (°F)	M[(d)] (°F)	RT_{PTS}[(e)] (°F)
		Cu (%)	Ni (%)	CF (°F)					
Inlet Nozzle to Upper Shell Welds	DOAJ	0.02	0.92	27	0.0134	3.59	10	34.19	48
	AOFJ	0.03	0.93	41	0.0134	5.45	10	34.43	50
	EOEJ	0.01	1.03	20	0.0134	2.66	10	34.10	47
	BOLH	0.04	1.01	54	0.0134	7.18	10	34.75	52
	CAFJ	0.03	1.01	41	0.0134	5.45	10	34.43	50
	EODJ	0.02	1.04	27	0.0134	3.59	10	34.19	48
	DBIJ	0.02	0.97	27	0.0134	3.59	10	34.19	48
Outlet Nozzle to Upper Shell Welds	EODJ	0.02	1.04	27	0.011	3.16	10	34.15	47
	CAFJ	0.03	1.01	41	0.011	4.80	10	34.34	49
	AOFJ	0.03	0.93	41	0.011	4.80	10	34.34	49
	EOEJ	0.01	1.03	20	0.011	2.34	10	34.08	46
	BOBJ	0.02	0.91	27	0.011	3.16	10	34.15	47
	LOBI	0.03	0.94	41	0.011	4.80	10	34.34	49
	BOLH	0.04	1.01	54	0.011	6.32	10	34.58	51
	DBIJ	0.02	0.97	27	0.011	3.16	10	34.15	47
	FOIJ	0.03	0.94	41	0.011	4.80	10	34.34	49

a. Chemistry Factor using Regulatory Guide 1.99 Revision 2, Position 2.1

b. The fluence, f, is at the clad/base metal interface and was taken from the peak azimuthal location. For the Intermediate Shell Forging, Lower Shell Forging, and the Intermediate Shell to Lower Shell Girth Weld, the fluence values are the limiting value for all three beltline materials and are, therefore, considered conservative.

c. Initial RT_{NDT} ($RT_{NDT(U)}$), values are measured values

d. Margin term

e. $RT_{PTS} = RT_{NDT(U)} + \Delta RT_{PTS}$ + Margin (°F)

f. RT_{PTS} for the Intermediate Shell to Lower Shell Girth Weld was determined using the Master Curve method

4.3 METAL FATIGUE

The Kewaunee design basis addresses the effects of metal fatigue. ASME Class 1 vessels, and the pressurizer surge line piping, have been explicitly analyzed in accordance with ASME B&PV Code requirements using assumptions for thermal and mechanical loading cycles over the component life. Other plant piping systems were designed and constructed to USAS B31.1.0 Power Piping Code requirements, and have been evaluated for the effects of thermal fatigue using stress range reduction factor methodology based on expected full thermal cycles. If the cyclic behavior of the plant systems and components were evaluated for a 40-year plant life, the associated analyses are considered time-limited aging analyses according to 10 CFR 54.3(a)(3), and the fatigue-related analysis must be evaluated for the period of extended operation. If a component has a fatigue TLAA that remains valid to the end of the period of extended operation (demonstration in accordance with 10 CFR 54.21(c)(1)(i)), or is projected to the end of the period of extended operation (demonstration in accordance with 10 CFR 54.21(c)(1)(ii)), then cracking due to metal fatigue is not an aging effect requiring management for that component. If the fatigue TLAA cannot be demonstrated to remain valid by either of these methods, then an aging management program is needed to manage the effects of fatigue on the intended function of the affected component(s) (demonstration in accordance with 10 CFR 54.21(c)(1)(iii)).

The following sections provide the results of the evaluation of metal fatigue-related TLAAs for Kewaunee systems:

- Section 4.3.1, Fatigue of ASME Class 1 Components
- Section 4.3.2, Fatigue of Non-ASME Class 1 Components

4.3.1 FATIGUE OF ASME CLASS 1 COMPONENTS

The Kewaunee design incorporates the requirements of the ASME B&PV Code, Section III, for Class 1 pressure vessels, which requires a discrete analysis of the thermal, mechanical, and dynamic stress cycles for portions of components that make up the reactor coolant pressure boundary. Although original design specifications commonly state that the transient conditions are for a 40-year design life, the fatigue analyses are based on the specified number of occurrences of each transient rather than on this lifetime. The number of occurrences of each design transient was selected based on operating experience and on assumptions for future plant operation during the 40-year design life.

In addition to the original design transients, fatigue loading transients related to insurge / outsurge from the pressurizer and associated thermal stratification transients were subsequently identified that are not part of the original fatigue analyses. As a result, an ASME Code fatigue analysis has been performed for the pressurizer surge line, in response to NRC Bulletin 88-11: Pressurizer Surge Line Thermal Stratification, and incorporated into the Kewaunee design basis.

The ASME Class 1 reactor coolant loop piping was designed and constructed to the requirements of USAS B31.1.0-1967 and, with the exception of the pressurizer surge line piping, there are no design basis fatigue analyses. The reactor coolant loop piping and branch connections are subject to the stress range reduction factor thermal cycle limits of the design code (i.e., 7000 cycles without stress range reduction).

The additional consideration of the reactor coolant environmental effects on the fatigue usage factor, in accordance with the resolution of Generic Safety Issue 190, must be considered for the period of extended operation. These effects have been evaluated for the required ASME Class 1 locations.

The results of TLAA evaluations for ASME Class 1 components are presented in the following sections:

- Section 4.3.1.1, Component Design Transient Cycles
- Section 4.3.1.2, ASME Class 1 Vessels and Surge Line Piping
- Section 4.3.1.3, Reactor Coolant Loop Piping
- Section 4.3.1.4, Pressurizer Lower Head and Surge Line
- Section 4.3.1.5, Effects of Reactor Coolant Environment on Fatigue Life of ASME Class 1 Piping and Components

4.3.1.1 COMPONENT DESIGN TRANSIENT CYCLES

Operating experience at Kewaunee and other Westinghouse NSSS units has demonstrated that the analyzed numbers of design basis transients are generally conservative for a 40 year life. USAR Table 4.1-8 provides a summary of the Reactor Coolant System design transients. Table 4.3-1, Reactor Coolant System Operating Transients, provides a listing of these transients and indicates those that are monitored by the Metal Fatigue of Reactor Coolant Pressure Boundary program. The program monitors transients and components to assure that actual plant operation remains bounded by the assumptions used in the design analyses. This program tracks cycles of design basis transient events and evaluates the number of occurrences against the design basis. For transients not monitored, Table 4.3-1 provides the basis for not being monitored.

A projection of the number of occurrences of transient cycles, monitored by the Metal Fatigue of Reactor Coolant Pressure Boundary program, to the end of the period of extended operation has been provided in Table 4.3-1. The projection is based on doubling the number of transient occurrences as of July, 2006 (representing more than 32 years of operation) and provides a conservative estimate of transient occurrences for a 60-year plant lifetime. The allowable number of transient cycles, cumulative cycles to date, and projected transient occurrences at 60-years plant life are provided for the transients listed in USAR Table 4.1-8. The projections provide reasonable assurance that the design basis number of transients will not be exceeded during the period of extended operation. These transients will continue to be tracked in accordance with the Metal Fatigue of Reactor Coolant Pressure Boundary program for the remaining plant life.

4.3.1.2 ASME CLASS 1 VESSELS AND SURGE LINE PIPING

Description

The reactor vessel (including the control rod drive mechanism pressure housings), steam generators, pressurizer, reactor coolant pumps, and the pressurizer surge line, have been analyzed for fatigue usage in accordance with ASME Code, Section III, requirements for Class 1 components. As an input to the fatigue analysis, design basis operational transients were defined. To provide assurance of the necessary high degree of integrity for the components in the Reactor Coolant System, transient conditions were selected for fatigue evaluation based on a conservative estimate of the magnitude and frequency of the temperature and pressure transients resulting from normal operation, normal and abnormal load transients and accident conditions. Those transients were chosen which are representative of transients to be expected during plant operation and which are sufficiently severe or frequent to be of possible significance to component cyclic behavior. An assumed number of occurrences of each of the design transients during the plant lifetime were used as input to the design basis fatigue calculations.

As discussed in Section 4.3.1.1, the design transient occurrence projections for a 60-year plant life are expected to be within the limit on transient occurrences used in the design basis fatigue analyses. As a result, since the originally assumed number of transient occurrences analyzed for 40 years of plant operation are expected to remain bounding for 60 years, the existing fatigue analyses are not affected and no re-analysis of fatigue usage was required for these components.

Conclusion

Therefore, based on the transient cycle projections, which will be confirmed by continued monitoring through the Metal Fatigue of Reactor Coolant Pressure Boundary program, the design fatigue analyses remain valid for 60 years, and the ASME Class 1 vessels and surge line piping fatigue TLAA has been demonstrated to be acceptable for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i) and (iii).

4.3.1.3 REACTOR COOLANT LOOP PIPING

Description

The reactor coolant loop piping was designed to the requirements of USAS B31.1.0-1967. There is no general requirement in this code for an explicit fatigue analysis; however, piping systems are required to be evaluated for thermal expansion cycles, and a thermal expansion stress range reduction factor is to be applied if cycling is excessive. The code allows 7000 full temperature thermal expansion cycles without penalty.

The design transients defined for the Reactor Coolant System ASME Class 1 vessels are also applicable to the reactor coolant loop piping. An evaluation of these transients, and the 60-year cycle projections discussed in Section 4.3.1.1, concluded that thermal cycling of the reactor coolant loop piping will remain well below the 7000 thermal expansion cycles allowed by USAS B31.1.0. As a result, the design basis stress analysis for the reactor coolant loop piping remains valid for 60 years of plant operation.

Conclusion

The expected number of thermal transients affecting the reactor coolant loop piping is significantly below the design basis limit of 7000 cycles. Therefore, the piping stress analysis remains acceptable, and the TLAA remains valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

4.3.1.4 PRESSURIZER LOWER HEAD AND SURGE LINE

Description

The NRC staff has indicated, through Renewal Applicant Action Item 3.3.1.1-1 contained in WCAP-14574-A (Reference 4.8-10) safety evaluation report, that insurge / outsurge fatigue effects on the pressurizer lower head and the surge line must be evaluated for license renewal. For Kewaunee, these effects were evaluated using stress-based fatigue monitoring software (EPRI FatiguePro) as part of the Metal Fatigue of Reactor Coolant Pressure Boundary program. For license renewal, stress-based fatigue monitoring software modules have been developed for critical locations in the pressurizer lower head and in the surge line, including the pressurizer and hot leg nozzles. The fatigue monitoring software calculates the cumulative usage factor for these locations based on actual plant conditions such as temperature, pressure, and other parameters affecting component material stresses and fatigue usage. The software accounts for loading due to pressurizer insurges and outsurges, and any thermal stratification conditions present. The software also provides a fatigue CUF projection based on analysis of several years of collected plant data. Kewaunee has always operated with a ‘Modified Steam Bubble’ method of start-up and shutdown, such that recent operating data is representative of past operations. In order to further reduce thermal fatigue in the pressurizer lower head and surge line, operating procedures were changed at the end of cycle 28 (March, 2008) to incorporate the 'Water Solid' method of startup and shutdown. The fatigue CUF projection currently does not take into account these improved startup and shutdown operating methods as a conservative measure. The highest projected 60-year CUF for these locations is 0.318 at a pressurizer heater penetration, which is less than the design limit CUF = 1.0.

Conclusion

Therefore, the design limits are not challenged due to pressurizer insurge / outsurge fatigue effects for a 60-year plant life, and the pressurizer lower head and surge line fatigue will be managed using stress-based fatigue monitoring under the Metal Fatigue of the Reactor Coolant Pressure Boundary Program. As such, the TLAA has been demonstrated to be acceptable for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(iii).

4.3.1.5 EFFECTS OF REACTOR COOLANT ENVIRONMENT ON FATIGUE LIFE OF ASME CLASS 1 PIPING AND COMPONENTS

GSI-190 addressed fatigue life of metal components and was closed by the NRC in December 1999 (Reference 4.8-11). In the closure letter, however, the NRC concluded that licensees should address the effects of the reactor coolant environment on the fatigue life of selected components as aging management programs are formulated in support of license renewal. These environmentally-assisted fatigue effects were evaluated for the plant-specific locations identified in NUREG/CR-6260 for the older vintage Westinghouse plant. Table 4.3-2 provides the locations evaluated for the effects of the reactor coolant environment on fatigue. The environmental life correction factor, F_{en}, relationships from NUREG/CR-5704 for stainless steel components and from NUREG/CR-6583 for carbon and low-alloy steel components were used.

Since the Kewaunee design did not include the requirement for fatigue analysis of piping locations, the four piping locations to be evaluated required the development of specific fatigue calculations. These calculations were performed based on the guidance of ASME B&PV Code, Section III 1989 edition with 1989 addenda.

The locations evaluated were shown to be acceptable for 60 years, considering projected plant operation. The evaluation results for each of the specific locations is summarized in Table 4.3-2 and discussed below.

4.3.1.5.1 Reactor Vessel Shell and Lower Head

The cumulative usage factor determined from the design basis ASME Code fatigue analysis for the vessel shell-to-head transition, where the support guides are welded to the interior of the shell of the reactor vessel, is 0.204 based on a Westinghouse 40-year design calculation. The calculation is based on the design transients discussed in Section 4.3.1.1, which are monitored by the Metal Fatigue of Reactor Coolant Pressure Boundary program. Since the number of transient cycles assumed in the fatigue calculation is not expected to be exceeded during the 60-year plant life, this CUF value is the 60-year CUF to which the appropriate F_{en} value should be applied. Although this location is clad with stainless steel and nickel-based alloy, in accordance with the ASME Code methodology, it is appropriate to perform the fatigue analysis of the low alloy steel vessel wall beneath the cladding, as was done in the NUREG/CR-6260 analysis. Therefore, the maximum environmental factor of 2.455 for low alloy steel from NUREG/CR-6583 for a low dissolved oxygen environment has been applied. The resulting environmental fatigue adjusted value of 0.501 is less than 1.0, and therefore acceptable for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii).

4.3.1.5.2 Reactor Vessel Inlet and Outlet Nozzles

From the design basis ASME Code fatigue analysis, the maximum CUF for the reactor vessel inlet and outlet nozzles are 0.0331 and 0.126, respectively. The fatigue analysis is based on the design transients discussed in Section 4.3.1.1, which are monitored by the Metal Fatigue of Reactor Coolant Pressure Boundary program. Since the number of transient cycles assumed in this analysis is not expected to be exceeded during the 60-year plant life, this CUF value is the 60-year CUF to which the appropriate F_{en} value should be applied. The maximum environmental factor of 2.455 for low alloy steel from NUREG/CR-6583 for a low dissolved oxygen environment has been applied and results in environmental fatigue adjusted values of 0.0813 and 0.309, respectively, which are less than 1.0 and therefore acceptable for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii).

4.3.1.5.3 Surge Line Hot Leg Nozzle

In order to perform the EAF evaluation, the surge line hot leg nozzle has been modeled using finite element methods, and stress-based fatigue monitoring and projection have been utilized. The fatigue projection is based on fatigue calculations incorporating several years of actual plant data and projected to the end of a 60-year plant life. The projected CUF for this location at the end of 60 years of operation is 0.00108. The maximum environmental factor of 15.35 for stainless steel from NUREG/CR-5704 has been applied and results in an environmental fatigue adjusted value of 0.0166, which is less than 1.0 and therefore acceptable.

The surge line hot leg nozzle location is monitored as part of the Metal Fatigue of Reactor Coolant Pressure Boundary program to ensure the CUF does not exceed the limit of 1.0, including environmental effects.

Therefore, the metal fatigue at this location will be managed for the period of extended operation by the Metal Fatigue of Reactor Coolant Pressure Boundary program in accordance with 10 CFR 54.21(c)(1)(iii).

4.3.1.5.4 Safety Injection Cold Leg Nozzle

There is no design basis fatigue analysis for this location at Kewaunee. Therefore, in order to perform the EAF evaluation of this location, the safety injection cold leg nozzle was analyzed using the ASME Code, Section III, Subsection NB-3600 rules. The results of the analysis, which was based on limiting numbers and severity of transients typically defined for this nozzle location, is a 60-year CUF of 0.0306. The maximum environmental factor of 15.35 for stainless steel from NUREG/CR-5704 has been applied and results in an environmental fatigue adjusted value of 0.470, which is less than 1.0 and therefore acceptable for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii).

4.3.1.5.5 Charging Line Nozzle

In order to perform the EAF evaluation, the charging nozzle has been modeled, and stress-based fatigue monitoring and projection have been utilized. The fatigue projection is based on fatigue calculations incorporating several years of actual plant data and projected to the end of a 60-year plant life. The projected CUF for this location at the end of 60 years of operation is 0.0368. The maximum environmental factor of 15.35 for stainless steel from NUREG/CR-5704 has been applied and results in an environmental fatigue adjusted value of 0.565, which is less than 1.0 and therefore acceptable.

The charging nozzle location is monitored as part of the Metal Fatigue of Reactor Coolant Pressure Boundary program to ensure the CUF does not exceed the limit of 1.0, including environmental effects.

Therefore, the metal fatigue at this location will be managed for the period of extended operation by the Metal Fatigue of Reactor Coolant Pressure Boundary program in accordance with 10 CFR 54.21(c)(1)(iii).

4.3.1.5.6 Residual Heat Removal System Tee at Safety Injection Accumulator Line

There is no design basis fatigue analysis for this location at Kewaunee. Therefore, in order to perform the EAF evaluation of this location, the residual heat removal piping tee fitting was analyzed using the ASME Code, Section III, Subsection NB-3600 rules. The results of the analysis, which was based on limiting numbers and severity of transients typically defined for this piping tee location, is a 60-year CUF of 0.0364. The environmental factor of 2.55 for low-temperature (<200^{o}C) stainless steel from NUREG/CR-5704 has been applied and results in an environmental fatigue adjusted value of 0.0928, which is less than 1.0 and therefore acceptable for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii).

4.3.2 FATIGUE OF NON-ASME CLASS 1 COMPONENTS

The results of TLAA evaluations for non-ASME Class 1 components are presented in the following sections:

- Section 4.3.2.1, Non-Class 1 Piping
- Section 4.3.2.2, Auxiliary Heat Exchangers

4.3.2.1 NON-CLASS 1 PIPING

Description

Non-Class 1 piping systems at Kewaunee were designed and constructed to the requirements of USAS B31.1.0-1967. There is no general requirement in this code for an explicit fatigue analysis. However, piping systems are required to be evaluated for thermal expansion cycles, and a thermal expansion stress range reduction factor is to be applied if cycling is excessive. The code allows 7000 full temperature thermal expansion cycles without penalty. Since a limit is placed on thermal cycles, and these cycles can be related to time in service for the piping systems, design in accordance with USAS B31.1 rules is considered a TLAA.

A review of non-Class 1 piping systems was performed to determine whether any systems or components would exceed the number of thermal expansion stress cycles assumed in the design. The review concluded that, with the exception of the reactor coolant hot leg sample line, all non-Class 1 piping systems remained within the design cycle limit for 60 years of operation. The reactor coolant hot leg sample line was re-analyzed and found to be acceptable for 60 years with the application of the appropriate stress range reduction factor to account for the increased number of thermal expansion cycles.

Conclusion

Therefore, the non-Class 1 (except for the reactor coolant hot leg sample line) piping systems TLAA is acceptable for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i). The reactor coolant hot leg sample line TLAA is acceptable for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii).

4.3.2.2 AUXILIARY HEAT EXCHANGERS

Description

Heat exchangers in auxiliary systems were designed in accordance with ASME Code, Section III Class C and/or Section VIII rules, which do not require an explicit fatigue analysis. However, the equipment specification for the residual heat removal, letdown, regenerative, excess letdown, and primary sample heat exchangers included thermal and pressure transient conditions as an input to the component design. The specified transient occurrences are considered a TLAA and have been evaluated for the extended plant operating period.

The transient occurrences specified for the design of these auxiliary heat exchangers are either conservatively large when compared to actual operating conditions, or are bounded by the transient occurrences monitored by the Metal Fatigue of Reactor Coolant Pressure Boundary program, with the exception of the primary sample heat exchanger in the reactor coolant hot leg sample stream. Based on current sampling practice, it is anticipated that the number of specified transient occurrences for the reactor coolant hot leg primary sample heat exchanger will be exceeded prior to the end of the period of extended operation.

Conclusion

Therefore, the auxiliary heat exchangers TLAA, with the exception of the primary sample heat exchanger, will remain valid during the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

The primary sample heat exchanger transient cycles will be tracked in accordance with the Metal Fatigue of Reactor Coolant Pressure Boundary program and corrective actions (including re-analysis, replacement, or repair) will be initiated prior to exceeding the specified number of transient occurrences. Therefore, the effects of transient cycles on the function of the sample heat exchanger will be managed in accordance with 10 CFR 54.21(c)(1)(iii).

Table 4.3-1 Reactor Coolant System Operating Transients

Transient	Allowable Cycles	Cumulative Cycles to 7/10/2006	Projected Cycles at 60 Years	Percent of Allowable	Monitored Transient ?
RCS Heatup	200	55	110	55.0%	YES
RCS Cooldown	200	54	108	54.0%	YES
Plant Loading 5%/min	18300	107	214	1.2%	YES
Plant Unloading 5%/min	18300	75	150	0.8%	YES
Step Load Increase 10%	2000	10	20	1.0%	YES
Step Load Decrease 10%	2000	12	24	1.2%	YES
Large Step Load Decrease	200	7	14	7.0%	YES
Loss of Load	80	0	0	0.0%	YES
Loss of Power	40	2	4	10.0%	YES
Loss of Flow (one RC pump)	80	0	0	0.0%	YES
Reactor Trip	400	57	114	28.5%	YES
Turbine Roll Test	10	1	2	20.0%	YES
Primary Side Hydrostatic Test	5	1	2	40.0%	YES
Secondary Side Hydrostatic Test	5	0	0	0.0%	YES
Primary Side Leak Test	50	24	48	96.0%	YES
Reactor Coolant Pipe Break	1	0	Note b	-	NO
Steam Pipe Break	1	0	Note b	-	NO
Steam Generator Tube Rupture	Note a	0	-	-	NO
Steady State Fluctuations	Infinite	Not Counted (Note c)	-	-	NO

a. This transient is no more severe than a reactor trip transient and is enveloped by counting reactor trip transients.

b. This accident condition is not expected to occur during the plant lifetime and is not a tracked or projected transient as part of the Metal Fatigue of Reactor Coolant Pressure Boundary program.

c. Steady state fluctuation transients have been analyzed for an infinite number of occurrences due to insignificant fatigue usage and, therefore, are not required to be monitored.

Table 4.3-2 Environmentally Assisted Fatigue Evaluation Results

NUREG/CR-6260 Location	Material	Fen	60-Year CUF	60-Year U_{EAF}
Reactor Vessel Shell and Lower Head	Low Alloy Steel	2.455	0.204	0.501
Reactor Vessel Inlet Nozzle	Low Alloy Steel	2.455	0.0331	0.0813
Reactor Vessel Outlet Nozzle	Low Alloy Steel	2.455	0.126	0.309
Surge Line Hot Leg Nozzle	Stainless Steel	15.35	0.00108	0.0166
Charging Line Nozzle	Stainless Steel	15.35	0.0368	0.565
Safety Injection Cold Leg Nozzle	Stainless Steel	15.35	0.0306	0.470
RHR Tee at Safety Injection Accumulator Line	Stainless Steel	2.55	0.0364	0.0928

4.4 ENVIRONMENTAL QUALIFICATION OF ELECTRIC EQUIPMENT

Description

10 CFR Part 50 requires that certain categories of systems, structures and components be designed to accommodate the effects of both normal and accident environmental conditions, and that design control measures be employed to ensure the adequacy of these designs. Specific requirements pertaining to the environmental qualification of these categories of electrical equipment are embodied within 10 CFR 50.49, Environmental Qualification of Electrical Equipment Important to Safety for Nuclear Power Plants. The categories include safety related (Class 1E) electrical equipment, non-safety related electrical equipment whose failure could prevent satisfactory accomplishment of a safety function by safety-related equipment, and certain post-accident monitoring equipment.

The qualification of electrical equipment in accordance with 10 CFR 50.49 involves the use of time-limited assumptions such as thermal life, total radiation dose, and component cycling. These assessments also meet the requirements of 10 CFR 54.3 and, as such, represent time-limited aging analyses. All electrical equipment within the scope of the Kewaunee EQ program is included in the EQ TLAA evaluation.

10 CFR 50.49 specifies that electrical equipment that is important to safety and is located in a harsh environment must be qualified for the lifetime of the plant such that the equipment is capable of performing its safety function in the event of a design basis accident. As required by 10 CFR 50.49, electrical equipment not qualified for the current license term is to be refurbished, replaced or have their qualification extended prior to reaching the aging limits established in the evaluation. Continued implementation of the Environmental Qualification (EQ) of Electric Components aging management program (described in Section B3.1) for the period of extended operation ensures that the requirements of 10 CFR 50.49 will continue to be met. A discussion of the EQ component re-analysis attributes is included in the description of the Environmental Qualification (EQ) of Electric Components program.

Conclusion

Consistent with 10 CFR 54.21(c)(1)(iii), aging effects that affect the environmental qualification of electrical equipment will be adequately managed by the Environmental Qualification (EQ) of Electric Components program for the period of extended operation.

4.5 CONCRETE CONTAINMENT TENDON PRESTRESS

Description

The Reactor Containment Vessel is a metal containment designed without the use of prestressed concrete containment tendons. Therefore, the concrete containment tendon prestress analysis is not an applicable TLAA.

4.6 CONTAINMENT LINER PLATE, METAL CONTAINMENTS, AND PENETRATIONS FATIGUE ANALYSIS

Description

The Reactor Containment Vessel is a freestanding metal containment and, therefore, containment liner plate fatigue is not applicable.

The Reactor Containment Vessel is a cylindrical steel pressure vessel with hemispherical dome and ellipsoidal bottom head. The vessel is completely enclosed by the reinforced concrete Shield Building with an annulus air space between the two structures. The Reactor Containment Vessel, including the penetration nozzles, is designed as a Class B vessel in accordance with the requirements of the ASME Boiler and Pressure Vessel Code, Section III - 1965 through Winter ’67 addenda. The Reactor Containment Vessel is code-stamped for pressures of both 46 psig and 41.4 psig in accordance with Paragraph N-1500, ASME Boiler and Pressure Vessel Code, Section III. The Winter 1967 Addenda of the ASME Code, Section III, Subsection B, N-1314(e) requires that a fatigue evaluation be performed for portions of the vessel that do not satisfy the provisions of Subsection A, N-415.1, "Vessels Not Requiring Analysis for Cyclic Operation." The Reactor Containment Vessel stress report includes a review for cyclic operation in accordance with paragraph N-415.1 as required by paragraph N-1314 of the Code. This review was based on a 40-year vessel life and concluded that a fatigue analysis was not required. The fatigue exemption basis is considered a TLAA and must be evaluated for 60-years of operation.

The design specification for the Reactor Containment Vessel and penetrations specifies 40 pressurization cycles from atmospheric pressure to operating pressure, and 200 temperature variations between 50F and 120F. The vessel stress report provided an evaluation of the criteria from paragraph N-415.1 using these specified transients as input.

The Reactor Containment Vessel operates at essentially atmospheric pressure, and the vessel would only experience a pressurization cycle during integrated leak rate testing (that is currently scheduled at 10-year intervals) or under accident conditions. Therefore, the 40 pressurization cycles specified is considered conservative, and will remain bounding for 60 years of operation.

The operating temperature of the vessel remains relatively constant during normal plant operation since the surrounding Shield Building effectively isolates the Reactor Containment Vessel from outdoor weather conditions. Significant vessel temperature variations are only expected when the plant is shutdown and restarted due to reactor heat generation. The 200 temperature variations of the Reactor Containment Vessel can be correlated to plant heat-up and cooldown cycles, which are shown to be less than 200 for 60 years of plant operation in Section 4.3.1.1, Component Design Transient Cycles.

Based on this evaluation the transient inputs to the stress analysis are not affected by extending the plant operating period and the conclusion that a fatigue analysis of the Reactor Containment Vessel and penetration nozzles is not required by the Code remains valid for 60 years of operation.

Process lines traverse the boundary between the inside of the Reactor Containment Vessel and the outside of the Shield Building by means of piping penetration assemblies made up of several elements. Two general types of piping penetration assemblies are provided: those that are not required to accommodate thermal movement (designated as cold penetrations) and those that are required to accommodate thermal movement (hot penetrations). Penetration assemblies fabricated from stainless steel include dissimilar metal welds to the carbon steel Reactor Containment Vessel.

Both hot and cold piping penetration assemblies consist of a containment penetration nozzle, a process pipe, a Shield Building penetration sleeve and a Shield Building flexible seal. In the case of a cold penetration, the Reactor Containment Vessel penetration nozzle is an integral part of the process pipe. For hot penetrations, a multiple-flued head becomes an integral part of the process pipe, and is used to attach a guard pipe and an expansion joint bellows. The expansion joint bellows is welded to the Reactor Containment Vessel penetration nozzle.

The penetration assemblies, including the bellows, were designed in accordance with USAS B31.1.0 Power Piping Code. No fatigue analyses or specified cyclic loading limits were identified for the penetration assemblies. The associated piping system cyclic loading TLAA is evaluated in Section 4.3.2.1, Non-Class 1 Piping.

Conclusion

The original exemption from the requirements of a fatigue evaluation remains valid for the Reactor Containment Vessel and penetration nozzles throughout 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 CRANE LOAD CYCLE LIMIT

Description

Overhead cranes were originally designed to Specification 61 of the Electric Overhead Crane Institute. EOCI-61 did not require a specific fatigue or load-cycle analysis. However, cranes subject to the requirements of NUREG-0612 "Control of Heavy Loads at Nuclear Power Plants" were subsequently evaluated to the guidelines of Specification 70 of the Crane Manufacturers Association of America (CMAA-70), "Specifications for Electric Overhead Traveling Cranes," which includes an evaluation of load cycles. The load cycle evaluation is considered a TLAA and has been evaluated for 60 years of operation.

Three cranes are within the scope of NUREG-0612 and have been evaluated to CMAA-70:

- 230 ton polar crane
- 125 ton turbine building crane
- 125 ton auxiliary building crane

These cranes are Class A service cranes per CMAA-70. Cranes designated Class A service level are designed for 20,000 to 100,000 cycles. For the NUREG-0612 evaluation, a conservative estimate of crane usage was determined to be less than

800 significant lifts (lifts greater than 25% of rated capacity) for each crane, over a 40-year period, corresponding to a rate of 20 lifts per year. Since the expected number of lifts was significantly less than 20,000, it was determined that these cranes are not governed by the fatigue consideration in Table 3.3.3.1.3-1 of CMAA-70. Similarly, the expected number of significant lifts for a 60-year period will also be considerably less than the 20,000 lift threshold, and these cranes continue to be exempt from fatigue consideration for the period of extended operation.

The 125 ton auxiliary building crane was recently upgraded and incorporated the specifications of CMAA-70 and ASME NOG-1, "Rules for Construction of Overhead and Gantry Cranes (Top Running Bridge, Multiple Girder)" in the new design. ASME NOG-1 states that for cranes expected to have less than 20,000 full-load cycles over the life of the crane, allowable stresses need not be reduced due to fatigue. Since the auxiliary building crane is expected to have considerably less than 20,000 full-load cycles, no reduction in allowable stresses were required.

Conclusion

The cumulative number of lift cycles for these cranes is expected to remain much less than the limiting 20,000 cycles through the period of extended operation. Therefore, the crane load cycle TLAA remains acceptable in accordance with 10 CFR 54.21(c)(1)(i).

4.7.2 REACTOR COOLANT PUMP FLYWHEEL

Description

The potential for crack propagation in the reactor coolant pump motor flywheel was evaluated due to the potential for flywheel failure that could inhibit pump coastdown or result in missile generation. WCAP-14535 updated the original flywheel crack growth analysis to credit the leak-before-break analysis that results in a limited postulated break size and lower reactor coolant pump overspeed conditions, and to account for a 60-year operating life of the motor flywheel. The evaluation established a basis for the elimination of the 40-month inservice inspection requirements for the flywheel. WCAP-14535 was reviewed and approved by the NRC and reissued as WCAP-14535-A (Reference 4.8-12), which includes the NRC SER and response to NRC requests for additional information. In the SER, the NRC continued to require a flywheel inspection to be performed on a reduced frequency of 10-years.

Subsequently, WCAP-15666 was developed to provide a technical basis and risk assessment for extending the flywheel inspection interval to 20 years in order to coincide with the typical 10- to 15-year reactor coolant pump motor refurbishment schedule. The evaluation was reviewed and approved by the NRC (Reference 4.8-13) and re-issued as WCAP-15666-1A (Reference 4.8-14).

Conclusion

The reactor coolant pump motor flywheels are inspected on a 20-year frequency through the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program. The potential aging effect of cracking will be managed with the application of an aging management program for the period of extended operation such that the reactor coolant pump motor flywheel crack growth TLAA is resolved in accordance with 10 CFR 54.21(c)(1)(iii).

4.7.3 LEAK-BEFORE-BREAK

Description

10 CFR 50, Appendix A, Criterion 4 allows for the use of LBB methodology for excluding the dynamic effects of postulated ruptures in Reactor Coolant System piping. Guidance and procedures for the application of the LBB methodology is provided in NUREG-1031, Volume 3 and NUREG-0800, Section 3.6.3. The fundamental premise of the LBB methodology is that the materials used in nuclear power plant piping are sufficiently tough that even a large through-wall crack would remain stable and would not result in a double-ended pipe rupture. Application of the LBB methodology is limited to those high-energy fluid systems not considered to be overly susceptible to failure from such mechanisms as corrosion, water hammer, fatigue, thermal aging; or indirectly from such causes as missile damage or the failure of nearby components.

This methodology has been applied to the following:

- Section 4.7.3.1, LBB - Reactor Coolant Loop Piping
- Section 4.7.3.2, LBB - Pressurizer Surge Line Piping
- Section 4.7.3.3, LBB - Reactor Coolant Loop Branch Piping (portions of the Safety Injection and Residual Heat Removal Systems)

The time-based inputs to a LBB analysis consist of the effect of thermal aging of cast austenitic stainless steel materials and the thermal and mechanical cycling assumptions for the fatigue crack growth predictions. These factors are typically based on a 40-year plant lifetime and, as such, could be TLAAs that must be evaluated for the period of extended operation.

4.7.3.1 LBB - REACTOR COOLANT LOOP PIPING

Westinghouse initially performed LBB analyses for the primary loop piping in 1987. The results of these analyses were documented in WCAP-11411 (Reference 4.8-15) and WCAP-11619 (Reference 4.8-16), which were approved by the NRC in a letter dated February 16, 1988 (Reference 4.8-17). Westinghouse updated the LBB analysis to support the steam generator replacement project in WCAP-15311 (Reference 4.8-18) and the power uprate program in WCAP-16040-P (Reference 4.8-19). A review of these documents identified that the fracture toughness values for the CASS loop piping were based on a 40-year plant service life. Additionally, the crack growth predictions were based on the design basis operational transients for the NSSS. These time-based inputs must be evaluated for the period of extended operation.

Westinghouse re-evaluated the LBB analysis for the period of extended operation in WCAP-16738 (Reference 4.8-20). The report documents the plant specific geometry, operating parameters, loading, and material properties used in the fracture mechanics evaluation. Mechanical properties were determined at operating temperatures. Cast stainless steel loop piping and elbows fracture toughness considering thermal aging was determined for each heat of material for the fully aged condition.

Enveloping critical locations were determined based on loading, pipe geometry, and fracture toughness considerations. Leak-before-break crack stability evaluations were performed at these locations. Through-wall flaw sizes were found which would cause a leak at a rate of ten (10) times the leakage detection system capability of the plant. Large margins against flaw instability were demonstrated for such flaw sizes.

The fatigue crack growth conclusions of the previous analyses are unaffected by the extended plant service life since the original design set of plant transients have been shown to be bounding for the period of extended operation in Section 4.3.1.1, Component Design Transient Cycles.

A review for plant changes that could affect the applicability of the LBB methodology due to increased probability of failure from such mechanisms as corrosion, water hammer, fatigue, or thermal aging, or indirectly from such causes as missile damage or the failure of nearby components, has been performed. No changes affecting applicability of LBB to the loop piping were identified and it is concluded that previous LBB evaluation conclusions remain valid.

Therefore, based on the use of fully-aged fracture toughness values in the updated evaluation, the loop piping LBB analysis has been re-evaluated for 60 years of plant operation.

4.7.3.2 LBB - PRESSURIZER SURGE LINE PIPING

Westinghouse performed the LBB analysis for the pressurizer surge line piping applicable for a 40 year service life. The results of this analysis are documented in WCAP-12875 (Reference 4.8-21) and were approved by the NRC in a letter dated January 3, 1992 (Reference 4.8-22). A review of WCAP-12875 identified that, since the surge line does not include any cast stainless steel piping or fittings, loss of fracture toughness due to thermal aging is not evaluated in the LBB analysis. The crack growth predictions were based on the design basis operational transients for the NSSS, including the effects of thermal stratification. Fatigue crack growth conclusions are unaffected by the extended plant service life since the original design set of plant transients have been shown to be bounding for the period of extended operation in Section 4.3.1.1, Component Design Transient Cycles.

A review for plant changes that could affect the applicability of the LBB methodology due to increased probability of failure from such mechanisms as corrosion, water hammer, fatigue, thermal aging; or indirectly from such causes as missile damage or the failure of nearby components has been performed. No changes affecting applicability of LBB to the surge line piping were identified and it is concluded that previous LBB evaluation conclusions remain valid.

Therefore, the pressurizer surge line piping LBB analysis TLAA remains valid for 60 years of operation.

4.7.3.3 LBB - REACTOR COOLANT LOOP BRANCH PIPING

Structural Integrity Associates performed the LBB analysis for primary loop branch line piping applicable for a 40 year service life. The results of this analysis are documented in report SIR-00-045 (Reference 4.8-23). This report was reviewed and approved by the NRC in a letter dated September 5, 2002 (Reference 4.8-24). The evaluation included ASME Class 1 portions of the SI and RHR Systems.

There is no CASS piping material in the scope of this LBB evaluation. However, the evaluation was based on the stainless steel welds as the limiting locations for crack growth, and the welds were evaluated at saturation toughness properties, i.e., the material was considered fully aged. Therefore, the material properties used in the analysis are not affected by extending the piping service life.

The crack growth evaluations utilized the NSSS design basis operational transients as well as additional transients (high-head safety injection actuation, RHR initiation, and refueling flood-up) defined specifically for the analysis of the branch piping since there is no fatigue evaluation of record for these lines. The occurrences assumed for the additional transients are based on the design basis operational transients.

The fatigue crack growth evaluation for the 8" RHR lines and the 12" SI accumulator lines concluded that only a limited number of RHR initiation transients could be tolerated when an 11% through-wall initial crack size (ASME B&PV Code, Section XI detection limit) was assumed. The analysis concluded that growth of a postulated crack would remain well within critical crack size limits for a period of 10 years given the historical rate of occurrence of the RHR thermal transients. It was further concluded that the ASME B&PV Code, Section XI - required inspections every 10 years would effectively manage cracking in this piping such that a crack greater in size than that postulated would not be present at the start of the ten year interval. Since the time-based input for the crack growth analysis for these lines is less than 40 years, the crack growth analysis associated with these branch lines does not constitute a TLAA per 10CFR54.3(a)(3).

The LBB crack growth analysis for the 6" SI lines was found to be acceptable for the 40-year plant life, and therefore is a TLAA that must be evaluated for license renewal. The fatigue crack growth conclusions are not affected by the extended plant service life since the original design basis transients have been shown to be bounding for the period of extended operation in Section 4.3.1.1, Component Design Transient Cycles. The number of high head SI transients assumed in this LBB analysis has also been determined to be bounding for the period of extended operation.

A review for plant changes that could affect the applicability of the LBB methodology due to increased probability of failure from such mechanisms as corrosion, water hammer, fatigue, or thermal aging, or indirectly from such causes as missile damage or the failure of nearby components, has been performed. No changes affecting applicability of LBB to the loop branch piping were identified and it is concluded that previous LBB evaluation conclusions remain valid.

Therefore, the primary loop piping branch lines LBB analysis TLAA remains valid for 60 years of operation.

Conclusion

The leak-before-break evaluations of record for the reactor coolant loop piping, pressurizer surge line, and loop piping branch lines have been reviewed to evaluate the time-limited inputs and assumptions for validity through the period of extended operation. Plant changes have also been reviewed to ensure that the applicability of LBB methodology for these components is not affected.

It is concluded that the LBB evaluation TLAA for the reactor coolant loop piping has been projected to the end of the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii), and the LBB evaluation TLAA for the pressurizer surge line piping and reactor coolant loop piping branch lines remain valid to the end of the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

4.7.4 REACTOR VESSEL UNDERCLAD CRACKING

Description

The issue of reactor vessel underclad cracking (cracks in the low-alloy steel vessel wall at the interface with the cladding caused by the weld deposition of the stainless steel cladding material) was addressed for the current licensing basis and for license renewal, and reviewed and approved by the NRC, in topical report WCAP-15338-1A (Reference 4.8-25). The evaluation concluded that underclad cracks are of no concern relative to structural integrity of the reactor vessel for a period of 60 years.

The NRC SER for WCAP-15338 included Applicant Action Item 4.1 (1) that requires confirmation that the transient cycles used in the evaluation bound the plant design transient cycles for 60-years of operation. The set of transients used as input to the evaluation in WCAP-15338 is documented in letter WOG-01-096 (Reference 4.8-26).

Conclusion

The transient list in the WOG letter has been compared to the NSSS operational transients list in USAR Table 4.1-8 and it was determined that the WOG transient set is bounding for the Kewaunee reactor vessel. The transients listed in USAR Table 4.1-8 have been shown to be bounding for the period of extended operation in Section 4.3.1.1, Component Design Transient Cycles. Thus the WCAP-15338 conclusions related to underclad cracking are determined to be applicable to the Kewaunee reactor vessel. Therefore, the reactor vessel underclad cracking TLAA remains valid for the period of extended operation in accordance with 10CFR54.21(c)(1)(i).

4.7.5 REACTOR COOLANT LOOP PIPING FLAW TOLERANCE EVALUATION

Description

NUREG-1801 identifies that CASS Reactor Coolant System components may be susceptible to reduced fracture toughness in a high temperature environment due to the effects of thermal aging embrittlement of the steel. Reactor coolant loop piping, valves, and pumps are constructed from CASS material. An evaluation of the susceptibility of the loop piping to thermal aging and the potential for flaw growth in the piping due to reduced fracture toughness has been performed consistent with the recommendations of NUREG-1801, Section XI.M12 "Thermal Embrittlement of Cast Austenitic Stainless Steel (CASS)."

In accordance with a NRC assessment documented in a May 19, 2000 letter (Reference 4.8-27), thermally aged CASS valve bodies and pump casings are resistant to failure, and management of the effects of thermal embrittlement is adequately accomplished through ASME B&PV Code, Section XI inspection requirements. Therefore, these components were not included in the evaluation.

The approach for evaluation of the reactor coolant loop piping consisted of (1) screening the CASS material properties for susceptibility to thermal aging embrittlement and, (2) for susceptible materials, performing a plant-specific flaw tolerance evaluation. The screening and flaw tolerance methodology is consistent with NUREG-1801 and the NRC letter (Reference 4.8-27).

The susceptibility screening identified that the material of construction for the loop piping is ASME SA-351 Grade CF8M with high molybdenum (2 - 3%) content. Certified material test reports traceable to the material heat numbers for the piping components were available for the evaluation. The loop piping consists of centrifugally-cast piping segments and statically-cast elbows. The screening concluded that there are four statically-cast elbows and one centrifugally-cast pipe section that are potentially susceptible to the adverse effects of thermal embrittlement based on calculated delta-ferrite content (>14% and >20%, respectively). It was also determined that no materials exceeded 25% delta-ferrite content such that the flaw evaluation could be performed in accordance with ASME B&PV Code, Section XI, IWB-3640 procedures for submerged arc welds per the NRC letter (Reference 4.8-27).

The flaw tolerance evaluation was performed for the susceptible CASS piping locations by using plant-specific bounding material properties, geometry, and stresses in each leg (i.e., hot leg, cold leg, and cross-over leg) of the reactor coolant loop piping. Flaw tolerance curves were developed for both longitudinal and circumferential flaws of varying aspect ratio for 10, 20, and 30 years of additional service. The curves represented the maximum acceptable initial flaw depth for the service life indicated. The limiting initial flaw depth for an aspect ratio of 6 is in the crossover leg; 28.2% through-wall. The flaw tolerance evaluation concludes that a flaw of this initial size would not grow to critical size, i.e., a size that could result in piping failure at design basis loading conditions, during an additional 30 years of service.

Thus, the flaw tolerance evaluation shows that, even with thermal aging embrittlement of CASS loop piping materials to the fully-aged condition, these susceptible piping locations are tolerant of large flaws. The large postulated initial flaw sizes remain acceptable for a 30-year remaining service life, which envelopes the remaining plant life considering the period of extended operation.

Conclusion

The reactor coolant loop CASS piping materials have been screened for susceptibility to thermal aging embrittlement, and a flaw tolerance evaluation has been performed for those susceptible materials consistent with the recommendations of NUREG-1801, Section XI.M12. The evaluation concluded that the CASS reactor coolant loop piping has adequate fracture toughness for a minimum remaining service life of 30 years, which envelopes the period of extended operation. Therefore, there is no requirement to manage the effects of thermal aging embrittlement of CASS reactor coolant loop piping for the period of extended operation.

4.8 REFERENCES

4.8-1 NEI-95-10, Industry Guideline for Implementing the Requirements of 10 CFR 54 - The License Renewal Rule, Revision 6, Nuclear Energy Institute, June 2005.

4.8-2 NUREG-1800, Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants, U.S. Nuclear Regulatory Commission, September 2005.

4.8-3 Letter from NRC to M. Reddemann, NMC, Kewaunee Nuclear Power Plant - Exemption from the Requirements of 10 CFR Part 50, Appendix G, Appendix H, and Section 50.61 (TAC No. MA8585), dated May 1, 2001

4.8-4 WCAP-16641, Revision 0, Analysis of Capsule T from Dominion Energy Kewaunee Power Station Reactor Vessel Radiation Surveillance Program, Westinghouse Electric Company, LLC, October, 2006.

4.8-5 WCAP-16642, Revision 0, Evaluation of Pressurized Thermal Shock for Kewaunee Power Station, Westinghouse Electric Company, LLC, December, 2006.

4.8-6 Letter, J. G. Lamb, NRC to M. Reddemann, NMC; Kewaunee Nuclear Power Plant Exemption form the Requirements of 10 CFR Part 50, Appendix G, Appendix H, and Section 50.61, dated May 1, 2001.

4.8-7 WCAP-16609, Revision 0, Master Curve Assessment of Kewaunee Power Station Reactor Vessel Weld Metal, Westinghouse Electric Company, LLC, October, 2006.

4.8-8 Letter, W. O. Long, NRC to M. L. Marchi, WPSC; Amendment No. 144 to Facility Operating License No. DPR-43, Kewaunee Nuclear Power Plant, dated April 1, 1999.

4.8-9 WCAP-16643, Revision 0, Kewaunee Power Station Heatup and Cooldown Limit Curves for Normal Operation, Westinghouse Electric Company, LLC, February, 2008.

4.8-10 WCAP-14574-A, License Renewal Evaluation: Aging Management Evaluation for Pressurizers, Westinghouse Electric Company, LLC, December, 2000.

4.8-11 Memorandum, A. C. Thadani, NRC to W. D. Travers, NRC; Closeout of Generic Safety Issue 190 "Fatigue Evaluation of Metal Components for 60-Year Plant Life," dated December 26, 1999.

4.8-12 WCAP-14535-A, Topical Report on Reactor Coolant Pump Flywheel Inspection Elimination, November, 1996.

4.8-13 Letter from H.N. Berkow, NRC to R.H. Bryan, WOG, Safety Evaluation Of Topical Report WCAP-15666, “Extension Of Reactor Coolant Pump Motor Flywheel Examination' (TAC NO. MB2819), dated May 5, 2003

4.8-14 WCAP-15666-1A, Extension of Reactor Coolant Pump Motor Flywheel Examination, October, 2003

4.8-15 WCAP-14111, Revision 1, Technical Bases for Eliminating Large Primary Loop Pipe Rupture as the Structural Design Basis for Kewaunee, April 1987, Westinghouse Electric Company

4.8-16 WCAP-11619, Revision 0, Additional Technical Bases for Eliminating Large Primary Loop Pipe Rupture as the Structural Design Basis for Kewaunee, October 1987, Westinghouse Electric Company

4.8-17 Letter K-88-032, K.E. Perkins, USNRC to D.C. Hintz, WPSC; Application of Leak-Before-Break Technology as a Basis for Kewaunee Nuclear Power Plant Steam Generator Snubber Reduction, dated February 16, 1988

4.8-18 WCAP-15311, Revision 0, Technical Justifications for Eliminating Large Primary Loop Pipe Rupture as the Structural Design Basis for Kewaunee Nuclear Power Plant After SG Replacement, June 2000, Westinghouse Electric Company

4.8-19 WCAP-16040-P, Revision 0, Power Uprate Project Kewaunee Nuclear Power Plant, NSSS and BOP Licensing Report, February 2003, Westinghouse Electric Company

4.8-20 WCAP-16738-P, Revision 0, Technical Bases for Eliminating Large Primary Loop Pipe Rupture as the Structural Design Basis for the Kewaunee Power Station for the License Renewal Program, March 2007, Westinghouse Electric Company

4.8-21 WCAP-12875, Revision 0, Technical Justification for Eliminating Pressurizer Surge Line Rupture as the Structural Design Basis for Kewaunee Nuclear Power Plant, June 1991, Westinghouse Electric Company

4.8-22 Letter K-92-005, A.G. Hansen, USNRC to C.A. Schrock, WPSC; Kewaunee Nuclear Power Plant: Leak-Before-Break Evaluation of the Pressurizer Surge Line (TAC No. M72140), dated January 3, 1992

4.8-23 Calculation SIR-00-045, Revision 2, Leak-Before-Break Evaluation 6-inch to 12-inch Safety Injection and Residual Heat Removal Piping Attached to the RCS (Kewaunee Nuclear Power Plant), January 2003, Structural Integrity Associates

4.8-24 Letter K-02-080, J.G. Lamb, USNRC to T. Coutu, NMC; Kewaunee Nuclear Power Plant - Review of Leak-Before-Break Evaluation for the Residual Heat Removal, Accumulator Injection Line, and Safety Injection System (TAC No. MB1301), dated September 5, 2002

4.8-25 WCAP-15338 Revision 1-A, Evaluation of Cracking Associated with Weld Deposited Cladding in PWR Vessels, October, 2002

4.8-26 Letter WOG-01-096, Transmittal of LR Phase 2 Program Generic Issues 1 - 7, Approved Responses (MUHP-6130), dated April 16, 2001

4.8-27 Letter, C.I. Grimes, NRC to D.J. Walters, NEI, License Renewal Issue No. 98-0030, "Thermal Aging Embrittlement of Cast Austenitic Stainless Steel Components", dated May 19, 2000

Kewaunee Power Station

Appendix A

USAR Supplement

Appendix A USAR Supplement

Contents

Contents

A1.0 INTRODUCTION

The application for a renewed operating license is required by 10 CFR 54.21(d) to include a USAR Supplement. This appendix, which includes the following sections, comprises the USAR supplement:

- Section A1.0 contains a listing of the aging management programs and the status of the program at the time the License Renewal Application was submitted.
- Section A2.0 contains a description of the programs for managing the effects of aging.
- Section A3.0 contains the evaluation of Time-limited Aging Analyses (TLAAs) for the period of extended operation.
- Section A4.0 contains a summarized description of the programs that support the TLAAs.
- Section A5.0 contains a summarized description of the plant-specific exemptions.
- Section A6.0 contains the license renewal commitments.

The integrated plant assessment for license renewal identified new and existing aging management programs necessary to provide reasonable assurance that components within the scope of license renewal will continue to perform their intended functions consistent with the Current Licensing Basis (CLB) for the period of extended operation. The period of extended operation is defined as 20 years from the unit’s current operating license expiration date.

A listing of the abbreviations used in this appendix is provided in Section 1.4.

Quality Assurance Program and Administrative Controls

The Quality Assurance Program is described in Topical Report DOM-QA-1, "Dominion Nuclear Facility Quality Assurance Program Description" and implements the requirements of 10 CFR 50, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants." The Quality Assurance Program is consistent with the summary in Appendix A.2 of NUREG-1800. The program includes the elements of corrective action, confirmation process, and administrative controls, which are applicable to the safety-related and non-safety-related systems, structures, and components that are subject to aging management review. In many cases, existing programs were found to be adequate for managing aging effects during the period of extended operation. Generically the three elements are applicable as follows:

Corrective Actions

The Corrective Action Program is implemented in accordance with the requirements of 10 CFR 50, Appendix B and Topical Report DOM-QA-1. A single corrective actions process is applied regardless of the safety classification of the structure or component. Corrective actions are implemented through the initiation of a condition report in accordance with Fleet and plant procedures for actual or potential problems, including unexpected plant equipment degradation, damage, failure, malfunction or loss. Site documents that implement aging management programs for license renewal will direct that a condition report be prepared in accordance with those procedures whenever non-conforming conditions are found (i.e., the acceptance criteria are not met).

Equipment deficiencies are corrected through the initiation of a work order in accordance with plant procedures. Plant procedures require that a condition report also be initiated when equipment deficiencies or the need for corrective maintenance is identified.

Confirmation Process

The focus of the confirmation process is on the follow-up actions that must be taken to verify effective implementation of corrective actions. The measure of effectiveness is in terms of correcting the adverse condition and precluding repetition of significant conditions adverse to quality. 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, to ensure effective corrective actions are taken. The corrective action process is also monitored for potentially adverse trends. The existence of an adverse trend due to recurring or repetitive adverse conditions will result in the initiation of a condition report. The aging management programs required for license renewal would also uncover any unsatisfactory condition due to ineffective corrective action.

Since the same 10 CFR 50, Appendix B corrective actions and confirmation process is applied for nonconforming safety-related and non-safety-related structures and components subject to aging management review for license renewal, the Corrective Action Program is consistent with the NUREG-1801 elements.

Administrative Controls

Administrative controls procedures provide a formal review and approval process on procedures and other forms of administrative control documents, as well as guidance on classifying documents into the proper document type.

Operating Experience

Plant-specific and industry operating experience, including past corrective actions resulting in process enhancements, was considered in development of the aging management programs. This information provides objective evidence that the effects of aging have been, and will continue to be, adequately managed. The implementing procedures for the review of operating experience provides for incorporating additional plant-specific and industry operating experience into the aging management programs to ensure continued program effectiveness.

A1.1 AGING MANAGEMENT PROGRAMS

The aging management programs for Kewaunee Power Station are described in the sections listed below. The list identifies the implementation status of the programs at the time of the License Renewal Application (LRA) submittal.

Existing programs were either fully or partially implemented at the time the LRA was submitted. Partially implemented programs require enhancement for full implementation. Programs that are not existing programs need to be developed before being implemented. The implementation status of the listed programs will change as new programs are developed and enhancements to existing programs are completed.

1. Alloy 600 Inspections [Section A2.1.1] [Existing]
2. ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD [Section A2.1.2] [Existing - Requires Enhancement]
3. ASME Section XI, Subsection IWE [Section A2.1.3] [Existing]
4. ASME Section XI, Subsection IWF [Section A2.1.4] [Existing]

5. Bolting Integrity [Section A2.1.5] [Existing - Requires Enhancement]
6. Boric Acid Corrosion [Section A2.1.6] [Existing]
7. Buried Piping and Tanks Inspection [Section A2.1.7] [Existing - Requires Enhancement]
8. Closed-Cycle Cooling Water System [Section A2.1.8] [Existing]
9. Compressed Air Monitoring [Section A2.1.9] [Existing - Requires Enhancement]
10. External Surfaces Monitoring [Section A2.1.10] [Existing - Requires Enhancement]
11. Fire Protection [Section A2.1.11] [Existing - Requires Enhancement]
12. Flow-Accelerated Corrosion [Section A2.1.12] [Existing]
13. Flux Thimble Tube Inspection [Section A2.1.13] [Existing]
14. Fuel Oil Chemistry [Section A2.1.14] [Existing]
15. Fuel Oil Tank Inspections [Section A2.1.15] [Existing - Requires Enhancement]
16. Inspection of Overhead Heavy Load and Refueling Handling Systems [Section A2.1.16] [Existing - Requires Enhancement]
17. Lubricating Oil Analysis [Section A2.1.17] [Existing]
18. Metal Enclosed Bus [Section A2.1.18] [Existing - Requires Enhancement]
19. Non-EQ Electrical Cables and Connections [Section A2.1.19] [To Be Developed]
20. Non-EQ Electrical Cable Connections [Section A2.1.20] [To Be Developed]
21. Non-EQ Inaccessible Medium-Voltage Cables [Section A2.1.21] [To Be Developed]
22. Non-EQ Instrumentation Circuits Subject to Sensitive, High-Voltage, Low-Level Signals [Section A2.1.22] [To Be Developed]
23. Open-Cycle Cooling Water System [Section A2.1.23] [Existing - Requires Enhancement]
24. Primary Water Chemistry [Section A2.1.24] [Existing]
25. Reactor Containment Leakage Testing 10 CFR 50, Appendix J [Section A2.1.25] [Existing]
26. Reactor Head Closure Studs [Section A2.1.26] [Existing]

27. Reactor Vessel Surveillance [Section A2.1.27] [Existing - Requires Enhancement]
28. Secondary Water Chemistry [Section A2.1.28] [Existing]
29. Selective Leaching of Materials [Section A2.1.29] [To Be Developed]
30. Steam Generator Tube Integrity [Section A2.1.30] [Existing]
31. Structures Monitoring Program [Section A2.1.31] [Existing - Requires Enhancement]
32. Work Control Process [Section A2.1.32] [Existing - Requires Enhancement]

A1.2 TIME LIMITED AGING ANALYSES AGING MANAGEMENT PROGRAMS:

1. Environmental Qualification (EQ) of Electric Components [Section A4.1] [Existing]
2. Metal Fatigue of Reactor Coolant Pressure Boundary [Section A4.2] [Existing]

A2.0 PROGRAMS THAT MANAGE THE EFFECTS OF AGING

This section provides summaries of the programs credited for managing the effects of aging.

The Quality Assurance Program implements the requirements of 10 CFR 50, Appendix B, and is consistent with the summary in NUREG-1800, Section A.2. The Quality Assurance program includes the elements of corrective action, confirmation process, and administrative controls and is applicable to the safety-related and non-safety-related systems, structures, and components that are within the scope of license renewal.

A2.1 AGING MANAGEMENT PROGRAMS

A2.1.1 ALLOY 600 INSPECTIONS

Program Description

The *Alloy 600 Inspections* program is a plant-specific program that consists of the applicable ten elements as described in Appendix A of NUREG-1800, "Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants." The program meets the NUREG-1801 expectation to have a plant-specific program for managing nickel alloy materials to comply with the applicable NRC publications and industry guidelines.

The *Alloy 600 Inspections* program manages the aging effects of primary water stress corrosion cracking in Alloy 600 base metal and Alloy 82/182 dissimilar metal welds and Alloy 690 base metal and Alloy 52/152 dissimilar metal welds. The program performs visual/bare metal, liquid penetrant, eddy current, and ultrasonic examinations to detect cracking of the in-scope components in accordance with the *ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD* program.

The *Alloy 600 Inspections* program implements the applicable requirements of the NRC First Revised Order EA-03-009, "Issuance Of First Revised NRC Order (EA-03-009) Establishing Interim Inspection Requirements For Reactor Pressure Vessel Heads At Pressurized Water Reactors" and NRC Bulletin 2003-02, "Leakage From Reactor Pressure Vessel Lower Head Penetrations And Reactor Coolant Pressure Boundary Integrity."

A2.1.2 ASME SECTION XI INSERVICE INSPECTION, SUBSECTIONS IWB, IWC, AND IWD

Program Description

The *ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD* program is an existing program that corresponds to NUREG-1801, Section XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD."

The *ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD* program manages the aging effects of change in dimensions, cracking, loss of fracture toughness, loss of material, and loss of preload for the ASME Class 1, 2, and 3 piping, including piping less than four inches nominal pipe size, and components fabricated of nickel alloys, stainless steel, and steel. In addition, the program manages the aging effect of cracking for the steel reactor coolant pump motor flywheels.

The *ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD* program performs visual, surface, ultrasonic, and eddy current examinations based on the inspection extent, schedule, and techniques specified in Tables IWB-2500-1, IWC-2500-1, and IWD-2500-1, respectively, for Class 1, 2, and 3 components.

Commitments

- Aging Management of Reactor Vessel Internals

  The *ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD* program will be enhanced to (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, submit an inspection plan for reactor internals to the NRC for review and approval to augment the current inspections.

  This commitment is identified in Appendix A, Table A6.0-1 License Renewal Commitments, Item 1.

- Aging Management of Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel

  The *ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD* program will be enhanced to include identification of the limiting susceptible cast austenitic stainless steel reactor vessel internals components from the standpoint of thermal aging susceptibility, neutron fluence, and cracking. For each identified component, a plan will be developed, which accomplishes aging management through either a supplemental examination or a component-specific evaluation. The plan will be submitted for NRC review and approval not less than 24 months before entering the period of extended operation.

  This commitment is identified in Appendix A, Table A6.0-1 License Renewal Commitments, Item 2.

A2.1.3 ASME SECTION XI, SUBSECTION IWE

Program Description

The *ASME Section XI, Subsection IWE* program is an existing program that corresponds to NUREG-1801, Section XI.S1, "ASME Section XI, Subsection IWE."

The *ASME Section XI, Subsection IWE* program manages aging effects in Class MC metal Reactor Containment Vessel, including loss of material, cracking and loss of sealing for steel, stainless steel and elastomers.

The *ASME Section XI, Subsection IWE* program consists of condition monitoring examinations of metal pressure boundary surfaces and welds, penetrations, integral attachments and their welds, moisture barriers, and pressure-retaining bolted connections. The program requirements include scope, schedule, examination methods, and acceptance standards for components. The *ASME Section XI, Subsection IWE* program requires periodic visual examination (general visual and VT-3) of all pressure-retaining components and augmented examinations of surfaces likely to experience accelerated degradation and aging. Augmented examinations include a VT-1 visual exam and possible ultrasonic thickness measurements.

The *ASME Section XI, Subsection IWE* program inspections have been effective in maintaining the integrity of the Reactor Containment Vessel pressure boundary and structural integrity and ensuring that aging effects are discovered and repaired before the loss of structure or component intended functions.

A2.1.4 ASME SECTION XI, SUBSECTION IWF

Program Description

The *ASME Section XI, Subsection IWF* program is an existing program that corresponds to NUREG-1801, Section XI.S3 "ASME Section XI, Subsection IWF."

The *ASME Section XI, Subsection IWF* program manages the aging effects of loss of material and loss of mechanical function for the in-scope steel supports and hangers.

The *ASME Section XI, Subsection IWF* program performs visual examinations of Class 1, Class 2, and Class 3 component supports. The program support and hanger inspections fulfill the requirements specified by 10 CFR 50.55a(g). Removal, repair, monitoring, or analytical evaluation are identified as acceptable corrective action options.

A2.1.5 BOLTING INTEGRITY

Program Description

The *Bolting Integrity* program is an existing program that corresponds to NUREG-1801, Section XI.M18, "Bolting Integrity."

The *Bolting Integrity* program manages the aging effects of cracking, loss of material, and loss of preload for bolting/fasteners.

The *Bolting Integrity* program relies on recommendations for a comprehensive bolting integrity program as delineated in NUREG-1339, "Resolution of Generic Safety Issue 29: Bolting Degradation or Failure in Nuclear Power Plants," and industry recommendations as delineated in the Electric Power Research Institute (EPRI) NP-5769, "Degradation and Failure of Bolting in Nuclear Power Plants," with the exceptions noted in NUREG-1339. The *Bolting Integrity* program addresses three subject areas: proper assembly of bolted joints through instructions/procedures; the procurement, receipt and storage of bolting materials; and the training of plant personnel with respect to bolting issues. The program addresses bolting associated with pressure boundary, mechanical, and high strength bolting for component supports. Maintenance procedures provide detailed instructions for removal and installation of bolted pressure boundary closures, and provide generic guidance on proper bolting practices.

Commitments

- Bolting Program Improvements

  The *Bolting Integrity* program will be enhanced to further incorporate applicable EPRI and industry bolting guidance. Topic enhancements will include proper joint assembly, torque values, gasket types, use of lubricants, and other bolting fundamentals.

  This commitment is identified in Appendix A, Table A6.0-1 License Renewal Commitments, Item 3.

A2.1.6 BORIC ACID CORROSION

Program Description

The *Boric Acid Corrosion* program is an existing program that corresponds to NUREG-1801, Section XI.M10, "Boric Acid Corrosion."

The *Boric Acid Corrosion* program manages the aging effect of loss of material for the aluminum, copper alloys, electrical conductor material, and steel for the in-scope systems, structures, and components that are subject to borated water leakage. The program performs visual inspections to identify boric acid leakage. The scope of the program includes those systems and components, which are potential sources of borated water leakage and potential targets of borated water leakage.

Generic Letter 88-05, "Boric Acid Corrosion of Carbon Steel Reactor Pressure Boundary Components in PWR Plants" and industry guidance are used as reference documents for providing guidance for evaluating the severity of boric acid leakage and for determining the appropriate corrective actions.

The *Boric Acid Corrosion* program is supported by the inspection opportunities afforded by other programs, including inspections performed during plant operator rounds, system engineer walkdowns, inservice inspection pressure tests and inspections, and Reactor Containment Vessel inspections performed during power operation and immediately following a unit shutdown.

A2.1.7 BURIED PIPING AND TANKS INSPECTION

Program Description

The *Buried Piping and Tanks Inspection* program is an existing program that corresponds to NUREG-1801, Section XI.M34, "Buried Piping and Tanks Inspection."

The *Buried Piping and Tanks Inspection* program manages the aging effect of loss of material for the buried steel (including cast iron) and stainless steel components such as piping, valves, and tanks in the in-scope buried portions of the Circulating Water System, Emergency Diesel Generators fuel oil system, Technical Support Center Diesel Generator fuel oil system, and Fire Protection System.

The program includes the use of preventive measures, such as coatings and wrappings and performs opportunistic and deliberate visual inspections of the external surface of a representative sample of the material/protective measures combinations of the in-scope buried piping and components. The program inspections inspect for evidence of damaged wrapping; coating defects, such as coating perforation, holidays, or other damage; and evidence of loss of material on the external surface of the piping or component.

Commitments

- Program Inspection Implementation

  The *Buried Piping and Tanks Inspection* program will be enhanced to perform the opportunistic and deliberate inspections of a representative sample of the in-scope buried material/protective measure combinations.

  This commitment is identified in Appendix A, Table A6.0-1 License Renewal Commitments, Item 4.

A2.1.8 CLOSED-CYCLE COOLING WATER SYSTEM

Program Description

The *Closed-Cycle Cooling Water System* program is an existing program that corresponds to NUREG-1801, Section XI.M21, "Closed-Cycle Cooling Water System."

The *Closed-Cycle Cooling Water System* program manages the aging effects of cracking, loss of material, and reduction of heat transfer for the steel, stainless steel, and copper alloys in the piping, heat exchangers, and other components in the Component Cooling System, Emergency Diesel Generator cooling water subsystems, and Control Room Air Conditioning System. The Component Cooling System provides cooling water to a number of heat exchangers and other equipment in other systems that are included in the scope of the program. The *Closed-Cycle Cooling Water System* program manages the in-scope systems with corrosion control strategies and chemistry specifications, including the use of inhibitors; and performance monitoring, including system operation monitoring, system testing, heat exchanger thermal performance testing, heat exchanger tube eddy current testing, and pump performance testing monitoring.

A2.1.9 COMPRESSED AIR MONITORING

Program Description

The *Compressed Air Monitoring* program is an existing program that corresponds to NUREG-1801, Section XI.M24, "Compressed Air Monitoring."

The *Compressed Air Monitoring* program manages the aging effect of loss of material for the steel, stainless steel, and copper alloy components in the Station and Instrument Air System and the air start subsystems for the Emergency Diesel Generators.

The *Compressed Air Monitoring* program performs air quality sampling, visual inspections, and periodic testing to verify the adequacy of the air quality and to detect air leakage. The program addresses the requirements of NRC Generic Letter 88-14 "Instrument Air Supply System Problems Affecting Safety-Related Equipment."

Commitments

- Implementation of Industry Guidelines

  The *Compressed Air Monitoring* program will be enhanced to incorporate the compressed air system testing and maintenance recommendations from ASME OM-S/G-1998, Part 17 and EPRI TR-108147 and to identify these documents as part of the program basis.

  This commitment is identified in Appendix A, Table A6.0-1 License Renewal Commitments, Item 5.

A2.1.10 EXTERNAL SURFACES MONITORING

Program Description

The *External Surfaces Monitoring* program is an existing program that corresponds to NUREG-1801, Section XI.M36, "External Surfaces Monitoring."

The *External Surfaces Monitoring* program manages the aging effects of change in material properties, cracking, delamination, loss of material, and hardening and loss of strength by visually inspecting the external surfaces of in-scope components, piping, supports, structural members, and structural commodities, whether they are constructed of metal or elastomers.

The program credits the activities of Operations, Engineering and Health Physics to perform the external surface visual inspections. Nuclear Auxiliary Operators perform rounds each shift in accessible plant areas and perform general inspections, which include specific inspection details related to monitoring equipment aging. System Engineers perform comprehensive visual inspections during walkdowns of plant systems and components during both normal operation and refueling outages. The guidance for System Engineer walkdowns provides a walkdown checklist of attributes to be observed, which includes inspection criteria related to aging management. Health Physics technicians routinely perform radiological surveys in the radiologically controlled areas of the plant and look for any evidence of boron precipitation and active radioactive system leaks observed while performing these surveys.

The *External Surfaces Monitoring* program includes the inspection of areas of the plant containing in-scope equipment or structural commodities requiring aging management that are infrequently accessed because there is no operational need for plant personnel to access the area or the stay times in the area are limited.

Commitments

- Infrequently Accessed Areas Inspections

  The *External Surfaces Monitoring* program will be enhanced to inspect the accessible external surfaces of in-scope components, piping, supports, structural members, and structural commodities, in the infrequently accessed areas, consistent with the criteria used in other plant areas.

This commitment is identified in Appendix A, Table A6.0-1 License Renewal Commitments, Item 6.

- Inspections and Walkdowns Training

  The *External Surfaces Monitoring* program will be enhanced to provide training for Operations, Engineering, and Health Physics personnel performing the program inspections and walkdowns. The training will address the requirements of the *External Surfaces Monitoring* program for license renewal, the need to document the identified conditions with sufficient detail to support monitoring and trending the aging effects, and the aging effects monitored by the program and how to identify them.

  This commitment is identified in Appendix A, Table A6.0-1 License Renewal Commitments, Item 7.

A2.1.11 FIRE PROTECTION

Program Description

The *Fire Protection* program is an existing program that corresponds to NUREG-1801, Sections XI.M26, "Fire Protection" and XI.M27, "Fire Water System."

The *Fire Protection* program manages the aging effects of change in material properties, cracking, delamination, increased hardness, loss of material, loss of sealing, loss of strength, shrinkage, and spalling for the fire protection components and features.

The *Fire Protection* program performs chemical treatment and periodic flushing of the water-based fire suppression system and periodic inspection and testing of the water-based, CO_2, and halon fire suppression systems. The program also performs visual inspections of fire barriers, fire barrier penetrations and seals, fire barrier expansion joints, doors, fire wraps, and the reactor coolant pump oil collection system.

Commitments

- Inspect or Replace Fire Sprinklers

  The *Fire Protection* program will be enhanced to test a representative sample of sprinkler heads or to replace all affected sprinkler heads in accordance with the requirements of NFPA 25.

This commitment is identified in Appendix A, Table A6.0-1 License Renewal Commitments, Item 8.

- Shield Building Penetration Inspections

  The *Fire Protection* program fire barrier penetration seal inspections will be revised to include the elastomer Shield Building fire boots.

  This commitment is identified in Appendix A, Table A6.0-1 License Renewal Commitments, Item 9.

- Reactor Coolant Pump Oil Collection System Inspections

  The *Fire Protection* program inspections of the reactor coolant pump oil collection system will be revised to include additional inspection criteria for the visual inspection of the system and to perform a one-time inspection of the internal surfaces of the reactor coolant pump oil collection tank.

  This commitment is identified in Appendix A, Table A6.0-1 License Renewal Commitments, Item 10.

A2.1.12 FLOW-ACCELERATED CORROSION

Program Description

The *Flow-Accelerated Corrosion* program is an existing program that corresponds to NUREG-1801, Section XI.M17, "Flow-Accelerated Corrosion."

The *Flow-Accelerated Corrosion* program manages the aging effect of wall thinning, thus assuring that the structural integrity of all steel (carbon or low-alloy) piping and components containing high-energy fluids (two phase as well as single phase) is maintained. The program applies to both safety-related and non-safety-related components.

The *Flow-Accelerated Corrosion* program is based on EPRI 1011838, "Recommendations for an Effective Flow-Accelerated Corrosion Program (NSAC-202L-R3)," and predicts, detects, and monitors FAC in plant piping and other pressure retaining components. The program (a) conducts an analysis to determine critical locations (CHECWORKS), (b) performs limited baseline inspections to determine the extent of wall thinning at those locations, and (c) performs follow-up inspections to confirm the predictions, or repairing or replacement of piping and components as necessary. CHECWORKS is a predictive computer program that uses past inspection data to predict wear rates.

A2.1.13 FLUX THIMBLE TUBE INSPECTION

Program Description

The *Flux Thimble Tube Inspection* program is an existing program that corresponds to NUREG-1801, Section XI.M37, "Flux Thimble Tube Inspection."

The *Flux Thimble Tube Inspection* program manages the aging effect of loss of material of the flux thimble tube wall.

The flux thimble tubes provide a path for the incore neutron flux monitoring system detectors and form part of the RCS pressure boundary. Flux thimble tubes are subject to loss of material (primarily at the fuel assembly lower nozzle) where flow-induced fretting causes wear at discontinuities in the path from the reactor vessel instrument nozzle to the fuel assembly instrument guide tube. The eddy current testing (ECT) inspection method is used to monitor for loss of material primarily due to wear of the flux thimble tubes. Program requirements have been established, including inspection methodology, tube wear acceptance criterion, prediction of future wall loss rates, inspection frequency, corrective actions, and maintenance of program documents and test results.

A2.1.14 FUEL OIL CHEMISTRY

Program Description

The *Fuel Oil Chemistry* program is an existing program that corresponds to NUREG-1801, Section XI.M30, "Fuel Oil Chemistry."

The *Fuel Oil Chemistry* program manages the aging effect of loss of material on piping and components in the systems that supply fuel oil from the storage tanks to the Emergency Diesel Generators and the Technical Support Center Diesel Generator by providing reasonable assurance that potentially harmful contaminants are maintained at low concentrations.

The *Fuel Oil Chemistry* program samples the fuel oil for the existence of contaminants such as water and microbiological organisms, and verifies the quality of new oil before its introduction into the diesel generator fuel oil storage tanks. The program defines specific acceptance criteria for contaminant concentrations, which reflect ASTM guidelines for parameters that maintain contaminant concentrations below unacceptable levels. Should unacceptable indications be observed, the condition is documented and evaluated using the Corrective Action Program.

A2.1.15 FUEL OIL TANK INSPECTIONS

Program Description

The *Fuel Oil Tank Inspections* program is an existing program that corresponds to NUREG-1801, Section XI.M30, "Fuel Oil Chemistry."

The *Fuel Oil Tank Inspections* program manages the aging effect of loss of material internal to the underground diesel generator fuel oil storage tanks. The program periodically drains, cleans, and inspects (both visual inspections and nondestructive examinations) the internal surfaces of the fuel oil storage tanks to ensure that there is no loss of intended function. The program's schedule for cleaning and inspection is aligned with the recommendations of Regulatory Guide 1.137, "Fuel-Oil Systems for Standby Diesel Generators," Revision 1.

Commitments

- Fuel Oil Storage Tanks Inspection and Cleaning

  The *Fuel Oil Tank Inspections* program will be enhanced to provide guidance for the periodic draining, cleaning and inspection activities.

  This commitment is identified in Appendix A, Table A6.0-1 License Renewal Commitments, Item 11.

A2.1.16 INSPECTION OF OVERHEAD HEAVY LOAD AND REFUELING HANDLING SYSTEMS

Program Description

The *Inspection of Overhead Heavy Load and Refueling Handling Systems* program is an existing program that corresponds to NUREG-1801, Section XI.M23, "Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems."

The *Inspection of Overhead Heavy Load and Refueling Handling Systems* program manages the aging effect of loss of material due to general corrosion and rail wear for the in-scope steel cranes, trolleys, bridges and rails. The program is implemented through periodic visual inspections of the crane, trolley, bridge and rail structural members.

Commitments

- Inspection Criteria

  The *Inspection of Overhead Heavy Load and Refueling Handling Systems* program will be enhanced to clarify the requirements of visual inspection of structural members, including structural bolting, of the in-scope heavy load and refueling handling cranes and associated equipment.

  This commitment is identified in Appendix A, Table A6.0-1 License Renewal Commitments, Item 12.

A2.1.17 LUBRICATING OIL ANALYSIS

Program Description

The *Lubricating Oil Analysis* program is an existing program that corresponds to NUREG-1801, Section XI.M39, "Lubricating Oil Analysis Program."

The *Lubricating Oil Analysis* program manages the aging effects of loss of material and reduction of heat transfer for aluminum, copper alloys, stainless steel, and steel mechanical system components within the scope of license renewal.

The *Lubricating Oil Analysis* program maintains oil systems contaminants (primarily water and particulates) within acceptable limits, thereby preserving an environment that is not conducive to loss of material or reduction of heat transfer. Lubricating oil testing activities include sampling and analysis of lubricating oil for detrimental contaminants, such as water, particulates, and metals.

A2.1.18 METAL ENCLOSED BUS

Program Description

The *Metal Enclosed Bus* program is an existing program that corresponds to NUREG-1800, Section XI.E4, "Metal Enclosed Bus."

The *Metal Enclosed Bus* program manages the aging effects of reduced insulation resistance, electrical failure and loosening of bolted connections for non-segregated metal enclosed bus (MEB) and internal components within the scope of license renewal.

The program uses a sampling methodology whereby sections of the in-scope MEB are visually inspected for cracks, corrosion, foreign debris, excessive dust buildup, evidence of water intrusion, and visual inspection of component insulation for surface anomalies, such as discoloration, cracking, chipping or surface contamination. These samples represent, with reasonable assurance, other areas of the MEB.

The inspection of the MEB will be completed prior to the period of extended operation and will be repeated every five years thereafter.

Commitments

- Additional Visual Inspections and Corrective Actions

  The *Metal Enclosed Bus* program will be enhanced to include augmented periodical visual inspections of the MEB internal surfaces, bus supports, bus insulation, taped joints and boots for signs of degradation or aging.

  This commitment is identified in Appendix A, Table A6.0-1 License Renewal Commitments, Item 13.

A2.1.19 NON-EQ ELECTRICAL CABLES AND CONNECTIONS

Program Description

The *Non-EQ Electrical Cables and Connections* program is a new program that will correspond to NUREG-1801, Section XI.E1, "Electrical Cable and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements".

The *Non-EQ Electrical Cables and Connections* program will manage the aging effects of reduced insulation resistance and electrical failure of accessible non-EQ electrical cables and connections within the scope of license renewal that are subject to an adverse localized environment.

The program will perform a plant walkdown to visually inspect for accessible electrical cables and connections installed in an adverse localized environment. Should an adverse localized environment be observed, a representative sample of electrical cables and connections installed within that environment will be visually inspected for the aging mechanisms associated with jacket surface anomalies, such as embrittlement, discoloration, cracking, or surface contamination.

The first inspection will be completed prior to the period of extended operation, and will be repeated every ten years thereafter.

Commitments

- Program Implementation

  The *Non-EQ Electrical Cables and Connections* program will be established.

  This commitment is identified in Appendix A, Table A6.0-1 License Renewal Commitments, Item 14.

A2.1.20 NON-EQ ELECTRICAL CABLE CONNECTIONS

Program Description

The *Non-EQ Electrical Cable Connections* program is a new program that will correspond to NUREG-1801, Section XI. E6, "Electrical Cable Connections Not Subject To 10 CFR 50.49 Environmental Qualification Requirements (Revised)."

The *Non-EQ Electrical Cable Connections* program will manage the aging effect of loosening of bolted connections for non-EQ electrical cable connections within the scope of license renewal.

The program will perform a one-time inspection, on a sampling basis, to confirm the absence of loosening of bolted connections due to thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion and oxidation.

A representative sample of non-EQ electrical cable connections (metallic parts) associated with cables within the scope of license renewal will be tested at least once prior to the period of extended operation to provide an indication of the integrity of the cables connections.

Commitments

- Program Implementation

  The *Non-EQ Electrical Cable Connections* program will be established.

  This commitment is identified in Appendix A, Table A6.0-1 License Renewal Commitments, Item 15.

A2.1.21 NON-EQ INACCESSIBLE MEDIUM-VOLTAGE CABLES

Program Description

The *Non-EQ Inaccessible Medium-Voltage Cables* program is a new program that will correspond to NUREG-1801, Section XI.E3, "Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements."

The *Non-EQ Inaccessible Medium-Voltage Cables* program will manage the aging effects of localized damage and breakdown of insulation leading to electrical failure for non-EQ, inaccessible, medium-voltage cables within the scope of license renewal that are subject to an adverse localized environment caused by exposure to significant moisture simultaneously with significant voltage.

Significant moisture is defined as periodic exposures to moisture that last more than a few days (e.g., cable in standing water). Periodic exposures to moisture that last less than a few days (i.e., normal rain and drain) are not significant. Significant voltage exposure is defined as being subjected to system voltage for more than twenty-five percent of the time. An adverse localized environment is a condition in a limited plant area that is significantly more severe than the specified service environment for the cables (power, control, and instrumentation) and connections. An adverse localized environment is significant if it could appreciably increase the rate of aging of a component, or has an immediate adverse effect on operability.

The program will inspect the in-scope manhole east of the tertiary auxiliary transformer for water collection that could cause the in-scope cables to be exposed to significant moisture and will remove water, if required. The program will perform a test on the in-scope non-EQ inaccessible medium-voltage cables to provide an indication of the condition of the conductor insulation.

Inspection of the in-scope manhole east of the tertiary auxiliary transformer for water collection will be performed prior to the period of extended operation, and the inspection will be repeated every two years thereafter.

Testing of the in-scope inaccessible medium-voltage cables exposed to significant moisture and significant voltage will be performed prior to the period of extended operation, and the tests will be repeated every ten years thereafter.

Commitments

- Program Implementation

  The *Non-EQ Inaccessible Medium-Voltage Cables* program will be established.

  This commitment is identified in Appendix A, Table A6.0-1 License Renewal Commitments, Item 16.

A2.1.22 NON-EQ INSTRUMENTATION CIRCUITS SUBJECT TO SENSITIVE, HIGH-VOLTAGE, LOW-LEVEL SIGNALS

Program Description

The *Non-EQ Instrumentation Circuits Subject to Sensitive, High-Voltage, Low-Level Signals* program is a new program that will correspond to NUREG-1801, Section XI.E2, "Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements."

The *Non-EQ Instrumentation Circuits Subject to Sensitive, High-Voltage, Low-Level Signals* program will manage the aging effects of reduced insulation resistance and electrical failure for electrical cables and connections subject to sensitive, high-voltage, low-level signals installed in nuclear instrumentation and radiation monitoring circuits within the scope of license renewal that are subject to an adverse localized environment.

The program will perform a proven cable system test for detecting deterioration of the insulation system (such as insulation resistance tests, time domain reflectometry tests, or other testing judged to be effective in determining cable insulation condition) for those electrical cables and connections disconnected during calibration, or will review the results and findings of calibrations for those electrical cables that remain connected during the calibration process.

The first tests and calibration reviews will be completed prior to the period of extended operation and will be repeated every ten years thereafter.

Commitments

- Program Implementation

  The *Non-EQ Instrumentation Circuits Subject to Sensitive, High-Voltage, Low-Level Signals* program will be established.

This commitment is identified in Appendix A, Table A6.0-1 License Renewal Commitments, Item 17.

A2.1.23 OPEN-CYCLE COOLING WATER SYSTEM

Program Description

The *Open-Cycle Cooling Water System* program is an existing program that corresponds to NUREG-1801, Section XI.M20, "Open-Cycle Cooling Water System."

The *Open-Cycle Cooling Water System* program manages the aging effects of loss of material and reduction in heat transfer of open-cycle cooling water systems components. The scope of the program includes the components fabricated of copper alloys, stainless steel, and steel in the Service Water System and the portions of the Circulating Water System, which interface with and support the operation of the Service Water System.

The *Open-Cycle Cooling Water System* program performs chemical treatment, visual inspections, nondestructive examinations, heat exchanger thermal performance testing, and maintenance, which includes flushing and cleaning, to manage aging of the open-cycle cooling water systems.

Commitments

- Additional Circulating Water System Inspection Criteria

  The *Open-Cycle Cooling Water System* program will be enhanced to add the applicable aging effects as inspection criteria for the Circulating Water System underwater visual inspections.

  This commitment is identified in Appendix A, Table A6.0-1 License Renewal Commitments, Item 18.

A2.1.24 PRIMARY WATER CHEMISTRY

Program Description

The *Primary Water Chemistry* program is an existing program that corresponds to NUREG-1801, Section XI.M2, "Water Chemistry."

The *Primary Water Chemistry* program manages the aging effects of cracking, loss of material, and reduction of heat transfer for nickel alloys, stainless steel and steel components.

The intent of the *Primary Water Chemistry* program is to minimize corrosion in order to maintain the primary system pressure boundary integrity.

The *Primary Water Chemistry* program relies on the periodic monitoring and control of known detrimental contaminants such as chloride, fluoride, dissolved oxygen and sulfate concentrations below the levels known to result in cracking, loss of material, and reduction of heat transfer. Primary water chemistry control is based on the industry guidelines for primary water chemistry.

A2.1.25 REACTOR CONTAINMENT LEAKAGE TESTING 10 CFR 50, APPENDIX J

Program Description

The *Reactor Containment Leakage Testing 10 CFR 50, Appendix J* program is an existing program that corresponds to NUREG-1801, Section XI.S4, "10 CFR Part 50, Appendix J."

The *Reactor Containment Leakage Testing 10 CFR 50, Appendix J* program manages the aging effects of cracking, loss of leak tightness, loss of material, loss of sealing and leakage through the Reactor Containment Vessel, including the systems penetrating the Reactor Containment Vessel, penetrations, isolation valves, fittings and access openings made of elastomers, stainless steel, and steel to detect degradation of the pressure boundary.

The *Reactor Containment Leakage Testing 10 CFR 50, Appendix J* program is implemented using Option B. The regulatory basis for the program includes NRC Regulatory Guide 1.163, "Performance-Based Containment Leak-Test Program," and NEI 94-01, "Industry Guideline for Implementing Performance-Based Option of 10 CFR 50, Appendix J."

A2.1.26 REACTOR HEAD CLOSURE STUDS

Program Description

The *Reactor Head Closure Studs* program is an existing program that corresponds to NUREG-1801, Section XI.M3, "Reactor Head Closure Studs."

The *Reactor Head Closure Studs* program manages the aging effects of cracking and loss of material for the reactor head closure stud assembly including nuts and washers and for the threads in the reactor vessel flange. The program includes preventive measures to mitigate cracking and loss of material and visual or volumetric examinations to monitor this degradation. The preventive measures implemented by the program are consistent with the measures identified in NRC Regulatory Guide 1.65, "Material and Inspection for Reactor Vessel Closure Studs," October 1973. The *Reactor Head Closure Studs* program visual and volumetric examinations are performed in accordance with the ASME Section XI 1998 Code Edition through the 2000 Addenda, Examination Category B-G-1.

A2.1.27 REACTOR VESSEL SURVEILLANCE

Program Description

The *Reactor Vessel Surveillance* program is an existing program that corresponds to NUREG-1801, Section XI.M31, "Reactor Vessel Surveillance."

The *Reactor Vessel Surveillance* program manages the aging effects of loss of fracture toughness due to irradiation embrittlement of the reactor pressure vessel low alloy steel material.

Monitoring methods are in accordance with 10 CFR 50, Appendix H. This program includes surveillance capsule removal and specimen mechanical testing/evaluation, radiation analysis, development of pressure-temperature limits, and determination of low-temperature overpressure protection (LTOP) set points. The program ensures the reactor vessel materials meet the fracture toughness requirements of 10 CFR 50, Appendix G, and meet the requirements of Pressurized Thermal Shock (PTS) and upper shelf energy in 10 CFR 50.60 and 10 CFR 50.61, as modified by the exemption granted to utilize Master Curve methodology.

Commitments

- Operating Restrictions

  The *Reactor Vessel Surveillance* program will be enhanced to include the applicable limitations on operating conditions to which the surveillance capsules were exposed (e.g. neutron flux, spectrum, irradiation temperature, etc.).

  This commitment is identified in Appendix A, Table A6.0-1 License Renewal Commitments, Item 19.

- Storage of Pulled and Tested Surveillance Capsules

  The *Reactor Vessel Surveillance* program will be enhanced to include requirements for storing, and possible recovery, of tested and untested capsules (removed from the Reactor Vessel after August 31, 2000).

  This commitment is identified in Appendix A, Table A6.0-1 License Renewal Commitments, Item 20.

A2.1.28 SECONDARY WATER CHEMISTRY

Program Description

The *Secondary Water Chemistry* program is an existing program that corresponds to NUREG-1801, Section XI.M2, "Water Chemistry."

The *Secondary Water Chemistry* program manages the aging effects of cracking, loss of material, and reduction of heat transfer for copper alloys, nickel alloys, stainless steel and steel components.

The intent of the *Secondary Water Chemistry* program is to minimize the corrosion of secondary-side components to attain their maximum useful life and minimize the fouling of heat transfer surfaces to achieve maximum plant efficiency.

The *Secondary Water Chemistry* program relies on periodic monitoring and control of known detrimental contaminants such as chloride, dissolved oxygen and sulfate, to ensure the concentrations are below the levels known to result in cracking, loss of material, or reduction of heat transfer. Secondary water chemistry control is based on the industry guidelines for secondary water chemistry.

A2.1.29 SELECTIVE LEACHING OF MATERIALS

Program Description

The *Selective Leaching of Materials* program is a new program that will correspond to NUREG-1801, XI.M33, "Selective Leaching of Materials."

The *Selective Leaching of Materials* program will manage the aging effects of loss of material on internal and external surfaces of in-scope components such as piping, pumps, valves, and heat exchanger components made of steel (cast iron), and copper alloys (brass, bronze, or aluminum-bronze).

The program will perform a one-time visual inspection, and hardness measurement or qualitative examination such as resonance when struck by another object, scraping, or chipping, as appropriate, of selected components within the scope of license renewal for loss of material due to selective leaching.

The inspection, and hardness measurement or qualitative examination, as appropriate, will be performed prior to the period of extended operation.

Commitments

- Program Implementation

  The *Selective Leaching of Materials* program will be established.

  The commitment is identified in Appendix A, Table A6.0-1 License Renewal Commitments, Item 21.

A2.1.30 STEAM GENERATOR TUBE INTEGRITY

Program Description

The *Steam Generator Tube Integrity* program is an existing program that corresponds to NUREG-1801, Section XI.M19, "Steam Generator Tube Integrity."

The *Steam Generator Tube Integrity* program manages the aging effects of cracking and loss of material for the primary and secondary-side steam generator components fabricated of nickel alloys, stainless steel, and steel. The program is based on Technical Specification requirements, meets the intent of NEI 97-06, "Steam Generator Program Guidelines," and is credited for aging management of the tubes, tube plugs, tube sleeves, tube supports, and secondary-side components whose failure could prevent the steam generator from fulfilling its intended safety function.

Acceptance criteria for inspections performed in accordance with the *Steam Generator Tube Integrity* program are based on applicable regulations and standards. Corrective actions for conditions that are adverse to quality are performed in accordance with the Corrective Action Program as a part of the Quality Assurance Program.

A2.1.31 STRUCTURES MONITORING PROGRAM

Program Description

The *Structures Monitoring Program* is an existing program that corresponds to NUREG-1801, Sections XI.S5, "Masonry Wall Program," XI.S6, "Structures Monitoring Program," and XI.S7, "RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants."

The *Structures Monitoring Program* manages the aging effects of: (1) cracking, loss of bond, loss of material (spalling, scaling), cracks and distortion, increase in porosity and permeability, loss of strength, and reduction in concrete anchor capacity due to local concrete degradation for concrete, (2) loss of material and loss of mechanical function for steel, (3) loss of material for stainless steel and aluminum, and (4) change in material properties, cracking, increased hardness, shrinkage and loss of strength, loss of sealing, and reduction or loss of isolation function for elastomers.

The program relies on periodic visual inspections to monitor the condition of structures, structural elements (including component supports), miscellaneous structural commodities, and masonry walls.

Commitments

- Define In-Scope Structural Elements

  The *Structures Monitoring Program* will be enhanced to clearly define structures, structural elements, and miscellaneous structural commodities that are in scope.

  This commitment is identified in Appendix A, Table A6.0-1 License Renewal Commitments, Item 22.

- Groundwater Monitoring

  The *Structures Monitoring Program* will be enhanced to monitor groundwater quality and verify that it remains non-aggressive to below-grade concrete.

  This commitment is identified in Appendix A, Table A6.0-1 License Renewal Commitments, Item 23.

- Underwater Inspections

  The *Structures Monitoring Program* will be enhanced to improve criteria for detection of aging effects for the underwater visual inspections of the in-scope structures.

This commitment is identified in Appendix A, Table A6.0-1 License Renewal Commitments, Item 24.

A2.1.32 WORK CONTROL PROCESS

Program Description

The *Work Control Process* program is an existing plant-specific program. The program manages the aging effects of change in material properties, cracking, hardening and loss of strength, loss of material, loss of sealing, loss of strength, and reduction of heat transfer for various component types and structural elements fabricated of aluminum, copper alloys, elastomers, non-metallics, stainless steel, and steel, as applicable.

The *Work Control Process* program inspections are implemented in accordance with the work management process. The work management process includes all surveillance procedures, preventive and corrective maintenance procedures, or other routinely scheduled tasks. Due to the comprehensive scope of the work management process, the process provides the opportunity to visually inspect the internal surfaces of components constructed of typical system materials and exposed to typical system environments, including stagnant locations, on an ongoing basis.

Personnel performing maintenance activities on a component inspect the internal surfaces of the component and adjacent components and piping to identify component and commodity aging. The program requires that these "As Found" conditions be documented. The "As Found" descriptions detail the inspection extent and results even when no signs of aging degradation are found in order to allow meaningful trending of aging effects.

Commitments

- Documenting “As Found” Equipment Condition

  The *Work Control Process* program will be enhanced to provide additional guidance for documenting the "As Found" equipment conditions with sufficient detail to support monitoring and trending of aging effects.

  This commitment is identified in Appendix A, Table A6.0-1 License Renewal Commitments, Item 25.

- Supplemental Work Control Process Inspections

  The *Work Control Process* program will be enhanced to perform visual inspections to assess the aging of the items that require supplemental inspections.

  This commitment is identified in Appendix A, Table A6.0-1 License Renewal Commitments, Item 26.

- Additional Training for Inspection Personnel

  The *Work Control Process* program will be enhanced to provide additional focused training for the personnel performing the program inspections. The training will address the program requirements; the need to document "As Found" equipment conditions with sufficient detail to support monitoring and trending the aging effects; and the aging effects monitored by the program and how to identify them.

  This commitment is identified in Appendix A, Table A6.0-1 License Renewal Commitments, Item 27.

A3.0 TIME-LIMITED AGING ANALYSIS

As part of the application for a renewed license, 10 CFR 54.21(c) requires that an evaluation of Time-limited Aging Analyses (TLAAs) for the period of extended operation be provided. The following TLAAs have been identified and evaluated to meet this requirement.

A3.1 REACTOR VESSEL NEUTRON EMBRITTLEMENT

A3.1.1 UPPER SHELF ENERGY

10 CFR 50, Appendix G contains screening criteria that establish limits on how far the upper shelf energy (USE) values for a reactor pressure vessel material may be allowed to decrease due to neutron irradiation exposure. The regulation requires the initial USE value to be greater than 75 ft-lbs in the unirradiated condition and that the value be greater than 50 ft-lbs in the fully irradiated condition as determined by Charpy V-notch specimen testing throughout the licensed life of the plant.

Acceptable USE values have been calculated in accordance with Regulatory Guide 1.99, Revision 2 to the end of the period of extended operation (52.1 EFPY). Calculated USE values for the most limiting reactor pressure vessel forging and weld materials remain greater than 50 ft-lbs.

A3.1.2 PRESSURIZED THERMAL SHOCK

Reactor pressure vessel beltline fluence is one of the factors used in determining the margin of acceptability of the reactor pressure vessel to pressurized thermal shock as a result of radiation embrittlement. The margin is the difference between the maximum nil ductility reference temperature in the limiting beltline material and the screening criteria established in accordance with 10 CFR 50.61(b)(2). The screening criteria for the limiting reactor vessel materials are 270°F for beltline plates, forging, and axial weld materials, and 300°F for beltline circumferential weld materials.

The materials in the reactor vessel extended beltline region have been evaluated using the 10 CFR 50.61 procedure to define RT_{PTS}. None of the materials in the extended beltline were determined to be controlling.

For the circumferential weld metal (heat 1P3571), an exemption to 10 CFR 50.61 was granted (Reference A3.6-1) based upon use of the Master Curve method as defined in ASME Code Case N-629, coupled with measured fracture toughness data using pre-cracked Charpy specimens. WCAP-16609 (Reference A3.6-2) re-evaluated RT_{PTS} for the circumferential weld metal using fracture toughness data determined from Capsule T specimens, and applying the methodology defined in the NRC Safety Evaluation for the exemption.

The RT_{To} for a fluence corresponding to EOLR (52.1 EFPY) was determined by making direct measurement of irradiated 1P3571 weld metal fracture toughness using fatigue pre-cracked Charpy surveillance specimens.

The screening criteria of 10 CFR 50.61(b)(2) are met for all beltline and extended beltline materials for a fluence value corresponding to the end of the period of extended operation (52.1 EFPY).

A3.1.3 PRESSURE-TEMPERATURE LIMITS

10 CFR Part 50 Appendix G requires that heatup and cooldown of the reactor vessel be accomplished within established pressure-temperature limits. These limits identify the maximum allowable pressure as a function of reactor coolant temperature. As the reactor vessel becomes irradiated and its fracture toughness is reduced, the allowable pressure at low temperatures is reduced. Therefore, in order to heatup and cooldown the vessel, the reactor coolant temperature and pressure must be maintained within the limits of Appendix G as defined by the evaluation of reactor vessel neutron irradiation embrittlement.

Heatup and cooldown limit curves have been calculated using the adjusted RT_{NDT} corresponding to the limiting beltline material of the reactor vessel for the current period of licensed operation. In accordance with 10 CFR 50, Appendix G, updated pressure-temperature limits for the period of extended operation have been developed and will be implemented by the Reactor Vessel Surveillance program prior to the period of extended operation.

A3.2 METAL FATIGUE

A3.2.1 FATIGUE OF ASME CLASS 1 COMPONENTS

A3.2.1.1 Component Design Transient Cycles

Operating experience at the plant and other Westinghouse NSSS units has demonstrated that the analyzed numbers of design basis transients are generally conservative for a 40 year life. The Metal Fatigue of Reactor Coolant Pressure

Boundary program monitors transients and components to assure that actual plant operation remains bounded by the assumptions used in the design analyses. This program tracks cycles of design basis transient events and evaluates the number of occurrences against the design basis.

The number of occurrences of transient cycles monitored by the Metal Fatigue of Reactor Coolant Pressure Boundary program have been projected to the end of the period of extended operation based on past trends throughout the operating history of the plant. The projection provides an estimate of transient occurrences for a 60-year plant lifetime, and provides reasonable assurance that the design basis number of transients will not be exceeded during the period of extended operation. These transients will continue to be tracked in accordance with the Metal Fatigue of Reactor Coolant Pressure Boundary program for the remaining plant life.

A3.2.1.2 ASME Class 1 Vessels and Surge Line Piping

The reactor vessel (including the control rod drive mechanism pressure housings), steam generators, pressurizer, reactor coolant pumps, and the pressurizer surge line, were analyzed for fatigue usage for the original 40-year life of the plant in accordance with ASME Code, Section III, requirements for Class 1 components using transient conditions that are representative of those expected to occur during plant operation and that are sufficiently severe or frequent to be of possible significance to component cyclic behavior. An assumed number of occurrences of each of the design transients during the plant lifetime were used as input to the design basis fatigue calculations. Evaluations have shown that the assumed number of occurrences are conservatively large and are not expected to be exceeded during the period of extended operation.

Therefore, based on these transient cycle projections, that are confirmed by continued cycle counting through the Metal Fatigue of Reactor Coolant Pressure Boundary program, the design fatigue analyses will remain valid for 60 years of plant operation.

A3.2.1.3 Reactor Coolant Loop Piping

The reactor coolant loop piping was designed to the requirements of USAS B31.1.0-1967. Piping systems designed to this Code were evaluated for thermal expansion cycles, and a thermal expansion stress range reduction factor was to be applied if cycling was determined to be excessive. The Code allows 7000 full temperature thermal expansion cycles without penalty.

The design transients defined for the ASME Class 1 vessels are also applicable to the reactor coolant loop piping. An evaluation of these transients concluded that thermal cycling of the reactor coolant loop piping will remain well below the 7000 thermal expansion cycles allowed by USAS B31.1.0.

A3.2.1.4 Pressurizer Lower Head and Surge Line

The NRC staff has indicated, through Renewal Applicant Action Item 3.3.1.1-1 contained in WCAP-14574-A (Reference A3.6-3) safety evaluation report, that insurge/outsurge fatigue effects on the pressurizer lower head and the surge line must be evaluated for license renewal. These effects have been evaluated as part of the Metal Fatigue of Reactor Coolant Pressure Boundary program for critical locations in the pressurizer lower head and in the surge line, including the pressurizer and hot leg nozzles. The highest projected 60-year CUF for these locations, at a pressurizer heater penetration, is less than the design limit.

A3.2.1.5 Effects of Reactor Coolant Environment on Fatigue Life of ASME Class 1 Piping and Components

GSI-190 addressed fatigue life of metal components and was closed by the NRC in December 1999 (Reference A3.6-4). In the closure letter, however, the NRC concluded that licensees should address the effects of the reactor coolant environment on the fatigue life of selected components as aging management programs are formulated in support of license renewal. Environmentally-assisted fatigue (EAF) effects for the following plant-specific locations, as identified in NUREG/CR-6260 for the older vintage Westinghouse plant, have been evaluated.

- Reactor Vessel Outlet Nozzle
- Reactor Vessel Inlet Nozzle
- Reactor Vessel Shell and Lower Head
- Surge Line Hot Leg Nozzle*
- Safety Injection Cold Leg Nozzle*
- Residual Heat Removal System Tee at Safety Injection Accumulator Line*

- Charging Line Nozzle*

* Since the original design did not include the requirement for fatigue analysis of piping locations, the four piping locations required the development of specific fatigue evaluations, which have been performed based on the guidance of ASME B&PV Code, Section III 1989 edition with 1989 addenda.

The evaluation of the effects of the reactor coolant environment on fatigue usage at the NUREG/CR-6260 locations concluded that fatigue limits continue to be met for 60 years, based on projected plant operation. In addition, the Metal Fatigue of Reactor Coolant Pressure Boundary program confirms the assumptions for projected plant operation and manages fatigue for these locations through the period of extended operation.

A3.2.2 FATIGUE OF NON-ASME CLASS 1 COMPONENTS

A3.2.2.1 Non-Class 1 Piping

Non-Class 1 piping systems were designed and constructed to the requirements of USAS B31.1.0-1967. There is no general requirement in this Code for an explicit fatigue analysis. However, piping systems are required to be evaluated for thermal expansion cycles, and a thermal expansion stress range reduction factor is to be applied if cycling is excessive. The Code allows 7000 full temperature thermal expansion cycles without penalty.

With the exception of the reactor coolant hot leg sample line, all non-Class 1 piping systems remained within the design cycle limit for 60 years of operation. The reactor coolant hot leg sample line was re-analyzed and found to be acceptable for 60 years with the application of the appropriate stress range reduction factor to account for the increased number of thermal expansion cycles.

A3.2.2.2 Auxiliary Heat Exchangers

Heat exchangers in auxiliary systems were designed in accordance with ASME Code, Section III Class C and/or Section VIII rules, which do not require an explicit fatigue analysis. However, the equipment specification for the residual heat removal, letdown, regenerative, excess letdown, and primary sample heat exchangers included thermal and pressure transient conditions as an input to the component design.

The transient occurrences specified for the design of these auxiliary heat exchangers are either conservatively large when compared to actual operating conditions, are bounded by the transient occurrences monitored, or are directly monitored by the Metal Fatigue of Reactor Coolant Pressure Boundary program.

A3.3 ENVIRONMENTAL QUALIFICATION OF ELECTRIC EQUIPMENT

10 CFR Part 50 requires that certain categories of systems, structures and components be designed to accommodate the effects of both normal and accident environmental conditions, and that design control measures be employed to ensure the adequacy of these designs. 10 CFR 50.49 specifies that electrical equipment that is important to safety and is located in a harsh environment must be qualified for the lifetime of the plant such that the equipment is capable of performing its safety function in the event of a design basis accident.

The qualification of electrical equipment in accordance with 10 CFR 50.49 involves the use of time-limited assumptions such as thermal life, total radiation dose, and component cycling.

As required by 10 CFR 50.49, electrical equipment not qualified for the current license term is to be refurbished, replaced or have their qualification extended prior to reaching the aging limits established in the evaluation. Continued implementation of the Environmental Qualification (EQ) of Electric Components aging management program for the period of extended operation ensures that the requirements of 10 CFR 50.49 will continue to be met.

A3.4 CONTAINMENT FATIGUE ANALYSIS

The design specification for the Reactor Containment Vessel provided design input for the number of temperature variations and pressurization cycles during the life of the vessel, which was assumed to be 200 temperature variations, and 40 pressurization cycles. The operating temperature of the vessel stays relatively constant during normal plant operation as the Shield Building effectively isolates the Reactor Containment Vessel from outdoor weather, and temperature variations are only expected during plant shutdown periods. The temperature variations of the Reactor Containment Vessel can be correlated to plant heat-up and cooldown cycles, which are shown to be limited to 200 over 60 years. Therefore, this assumption will remain valid through the period of extended operation. The Reactor Containment Vessel operates at essentially atmospheric pressure, and the vessel would experience a pressurization cycle during integrated leak rate testing (that is currently scheduled at 10-year intervals) or under accident conditions. Therefore, the 40 pressurization cycles specified will remain bounding for 60 years of operation.

Using these assumptions as inputs, a review of paragraph N-415.1 of Subsection B, ASME Section III-1965 W67, determined that a cyclic or fatigue analysis was not required. The number of design cycles used to demonstrate exemption from fatigue in accordance with Articles N-415 (a)-(f) will not be exceeded during the period of extended operation. Therefore, the original evaluation for exemption from fatigue for the Reactor Containment Vessel will remain valid for an additional 20 years of operation.

The penetration assemblies, including the bellows, were designed in accordance with USAS B31.1.0 Power Piping Code. No fatigue analyses or specified cyclic loading limits were identified for the penetration assemblies.

A3.5 OTHER PLANT-SPECIFIC TIME-LIMITED AGING ANALYSES

A3.5.1 CRANE LOAD CYCLE LIMIT

Overhead cranes were originally designed to Specification 61 of the Electric Overhead Crane Institute (EOCI). EOCI-61 did not require a specific fatigue or load-cycle analysis. However, cranes subject to the requirements of NUREG-0612 "Control of Heavy Loads at Nuclear Power Plants" were subsequently evaluated to the guidelines of Specification 70 of the Crane Manufacturers Association of America (CMAA-70), "Specifications for Electric Overhead Traveling Cranes," which includes an evaluation of load cycles. Cranes designated as Class A service cranes per CMAA-70, are designed for 20,000 to 100,000 cycles.

Since the expected number of lifts is significantly less than 20,000 through the period of extended operation, it was determined that these cranes are not governed by the fatigue consideration in Table 3.3.3.1.3-1 of CMAA-70.

A3.5.2 REACTOR COOLANT PUMP FLYWHEEL

The potential for crack propagation in the reactor coolant pump motor flywheel was evaluated due to the potential for flywheel failure that could inhibit pump coastdown or result in missile generation. The original flywheel crack growth analysis was updated to credit the leak-before-break analysis that results in a limited postulated break size and lower reactor coolant pump overspeed conditions, and to account for a 60-year operating life of the motor flywheel. Following that evaluation, flywheel inspections were required every 10 years.

Subsequently, an additional evaluation provided a technical basis and risk assessment for extending the flywheel inspection interval to 20 years in order to coincide with the typical 10- to 15-year reactor coolant pump motor refurbishment schedule. The reactor coolant pump motor flywheels are currently inspected on a 20-year interval through the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program.

A3.5.3 LEAK-BEFORE-BREAK

10 CFR 50, Appendix A, Criterion 4 allows for the use of leak-before-break (LBB) methodology for excluding the dynamic effects of postulated ruptures in reactor coolant system piping. The fundamental premise of the LBB methodology is that the materials used in nuclear power plant piping are sufficiently tough that even a large through-wall crack would remain stable and would not result in a double-ended pipe rupture.

The current licensing basis LBB analyses are discussed in USAR Section 4.1.3.4. The analyses were reviewed to determine whether the conclusions were affected by extending the operating life of the plant to 60 years. It was determined that, since the cyclic transient assumptions used as input to the analyses are bounding for the period of extended operation, only thermal aging embrittlement effects on cast austenitic stainless steel (CASS) components needed to be re-evaluated. Additionally, the only CASS components considered in the LBB analyses are the reactor coolant loop piping and elbows. The reactor coolant loop piping LBB analysis was re-evaluated assuming fully-aged (saturated) material properties for the CASS material and found to remain acceptable.

A3.5.4 REACTOR VESSEL UNDERCLAD CRACKING

The issue of reactor vessel underclad cracking (cracks in the low-alloy steel vessel wall at the interface with the cladding caused by the weld deposition of the stainless steel cladding material) was addressed for the current licensing basis and for license renewal, and reviewed and approved by the NRC, in topical report WCAP-15338-1A (Reference A3.6-5). The evaluation concluded that underclad cracks are of no concern relative to structural integrity of the reactor vessel for a period of 60 years.

A3.5.5 REACTOR COOLANT LOOP PIPING FLAW TOLERANCE EVALUATION

NUREG-1801 identifies that CASS reactor coolant system components may be susceptible to reduced fracture toughness in a high temperature environment due to the effects of thermal aging embrittlement of the steel. Reactor coolant loop piping, valves, and pumps are constructed from CASS material. Thermal aging embrittlement of pumps and valves is managed by the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program. An evaluation of the susceptibility of loop piping to thermal aging and the potential for flaw growth in the piping due to reduced fracture toughness has been performed consistent with the recommendations of NUREG-1801, Section XI.M12 "Thermal Embrittlement of Cast Austenitic Stainless Steel (CASS)."

The evaluation concluded that the CASS reactor coolant loop piping has adequate fracture toughness for a minimum remaining service life of 30 years, which envelopes the period of extended operation. Therefore, there is no requirement to manage the effects of thermal aging embrittlement of CASS reactor coolant loop piping for the period of extended operation.

A3.6 REFERENCES

1. Letter from NRC to M. Reddemann, NMC, Kewaunee Nuclear Power Plant - Exemption from the Requirements of 10 CFR Part 50, Appendix G, Appendix H, and Section 50.61 (TAC No. MA8585), dated May 1, 2001.
2. WCAP-16609, Revision 0, Master Curve Assessment of Kewaunee Power Station Reactor Vessel Weld Metal, Westinghouse Electric Company, LLC, October, 2006.
3. WCAP-14574-A, License Renewal Evaluation: Aging Management Evaluation for Pressurizers, Westinghouse Electric Company, LLC, December, 2000.
4. Memorandum, A. C. Thadani, NRC to W. D. Travers, NRC; Closeout of Generic Safety Issue 190 "Fatigue Evaluation of Metal Components for 60-Year Plant Life," dated December 26, 1999.
5. WCAP-15338 Revision 1-A, Evaluation of Cracking Associated with Weld Deposited Cladding in PWR Vessels, October, 2002.

A4.0 TLAA SUPPORT PROGRAMS

A4.1 ENVIRONMENTAL QUALIFICATION (EQ) OF ELECTRIC COMPONENTS

Program Description

The *Environmental Qualification (EQ) of Electric Components* program is an existing program that corresponds to NUREG-1801, Section X.E1, "Environmental Qualification (EQ) of Electric Components."

The 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 for license renewal.

For the period of extended operation, the necessary qualified life for equipment is an additional 20 years at the maximum normal plant service conditions to which the equipment will be exposed. However, the component lifespan necessary to reach the end of the period of extended operation (or the current operating term) may not always be achieved due to aging limitations and the variations in degradation rates of the materials used in equipment construction. In these cases, it is acceptable to determine a qualified life of less than the length necessary to envelop the period of extended operation, as long as the equipment is replaced, refurbished, or requalified prior to end of that qualified life. Re-analysis of aging evaluations to extend the qualifications of components is performed on a routine basis as part of the program. Important attributes for the re-analysis of aging evaluations include analytical methods, data collection and reduction methods, underlying assumptions, acceptance criteria and corrective actions (if acceptance criteria are not met).

A4.2 METAL FATIGUE OF REACTOR COOLANT PRESSURE BOUNDARY

Program Description

The *Metal Fatigue of Reactor Coolant Pressure Boundary* program is an existing program that corresponds to NUREG-1801, Section X.M1, "Metal Fatigue of the Reactor Coolant Pressure Boundary."

The *Metal Fatigue of Reactor Coolant Pressure Boundary* program manages the effects of fatigue for ASME Code Class 1 components. The program monitors and tracks the critical thermal and pressure transients listed in USAR Table 4.1-8 to ensure that cycle occurrence limits are not exceeded such that the ASME Class 1 vessels and pressurizer surge line fatigue analyses assumptions are maintained. Maintaining cycle limits assumed in the analyses provides assurance that the probability of fatigue cracking of ASME Class 1 components is minimized.

As part of the program, the effects of the reactor coolant environment on component fatigue life have been addressed by assessing the impact of the environment on a sample of critical components as identified in NUREG/CR-6260 for an older vintage Westinghouse plant. Management of the fatigue effects is required, when environmental life correction factors are applied, for the hot leg surge line nozzle and the charging nozzle locations. The *Metal Fatigue of Reactor Coolant Pressure Boundary* program provides fatigue monitoring for these locations to ensure adequate margin against fatigue cracking due to anticipated cyclic strains and the effects of the reactor coolant environment.

In addition, the program monitors thermal cycles associated with selected auxiliary heat exchangers in order to ensure that original equipment specification cycle limits are not exceeded.

The program utilizes fatigue monitoring software (EPRI FatiguePro™) to monitor plant transient cycles (in addition to using plant surveillance procedures) and to monitor fatigue usage for selected ASME Class 1 components. The fatigue monitoring software includes three different modules: cycle counting, cycle-based fatigue (CBF) monitoring, and stress-based fatigue (SBF) monitoring.

Cycle Counting - The cycle counting module counts and tracks the number of selected operating transients that have occurred. Counting these cycles and demonstrating that current and projected cycles are less than were assumed in design fatigue calculations, demonstrates that those calculations are still valid and therefore the fatigue usage can be expected to remain below the ASME Section III design limit.

Cycle-Based Fatigue (CBF) Monitoring - The CBF monitoring module computes fatigue usage on a per event basis for each event that actually occurs using the maximum severity for each event specific to the monitored location.

Stress-Based Fatigue (SBF) Monitoring - The SBF monitoring module is the most precise means of the three modules for monitoring fatigue usage. This module uses the actual temperature, pressure, and flow measurement data to calculate stress ranges and the resulting fatigue usage at a given location.

For locations monitored using the CBF or SBF methods, current and projected fatigue usage is calculated to demonstrate that the fatigue usage remains below the design limit.

The program uses a combination of cycle counting, cycle-based fatigue monitoring, and stress-based fatigue monitoring to monitor and track fatigue usage. The software counts cycles and calculates fatigue usage for selected high usage components. The fatigue monitoring software counts most of the transient cycles that are required to be tracked by monitoring changes in plant instrument readings. Cycles that cannot be counted based on installed instrumentation are counted manually and then incorporated into the fatigue monitoring software database.

The *Metal Fatigue of Reactor Coolant Pressure Boundary* program provides for corrective actions in response to approaching an “Action Limit” on cycle counts or fatigue usage. When monitored transients or fatigue usage exceeds 80 percent of the design limit, the condition is evaluated and appropriate corrective action is initiated to ensure the design limit is not exceeded. Limits are established based on equipment specifications or fatigue evaluation assumptions for cycle counts, ASME Code CUF limit of 1.0, or the CUF limit considering environmental effects, whichever is limiting.

Commitments

- Routine Update of Cycle Count and Fatigue Usage Status

  The *Metal Fatigue of Reactor Coolant Pressure Boundary* program will be enhanced to include a routine assessment of the transient cycle count totals and fatigue usage status for monitored locations, including an action limit for the initiation of corrective action.

  This commitment is identified in Appendix A, Table A6.0-1 License Renewal Commitments, Item 28.

A5.0 EXEMPTIONS

The requirements of 10 CFR 54.21(c) stipulate that the application for a renewed license should include a list of plant-specific exemptions granted pursuant to 10 CFR 50.12 and that are based on time-limited aging analyses, as defined in 10 CFR 54.3.

An exemption from the requirements of 10 CFR 50.61 and 10 CFR 50 Appendices G and H was granted in a May, 2001 letter from NRC (Reference A3.6-1). The exemption remains in effect and is based on a time-limited aging analysis. Specifically, the NRC issued an exemption to: (1) establish the use of a new methodology to meet the requirements of Appendix G to 10 CFR 50; (2) establish the use of a new methodology to meet the requirements of 10 CFR 50.61; and (3) modify the basis for the Kewaunee reactor pressure vessel surveillance program (required by Appendix H to 10 CFR 50) to incorporate the acquisition of fracture toughness data. The new methodology for assessing the RPV circumferential beltline weld is based on the use of the 1997 Edition of ASTM Standard Test Method E-1921 and ASME Code Case N-629. The exemption was necessary for the reactor vessel beltline weld to meet the pressurized thermal shock criterion of 10 CFR 50.61.

A6.0 LICENSE RENEWAL COMMITMENTS

Table A6.0-1 License Renewal Commitments

Item	Commitment	Source	Schedule[a]
1	The *ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD* program will be enhanced to (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, submit an inspection plan for reactor internals to the NRC for review and approval to augment the current inspections.	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	At least 2 years prior to entering the period of extended operation.
2	The *ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD* program will be enhanced to include identification of the limiting susceptible cast austenitic stainless steel reactor vessel internals components from the standpoint of thermal aging susceptibility, neutron fluence, and cracking. For each identified component, a plan will be developed, which accomplishes aging management through either a supplemental examination or a component-specific evaluation. The plan will be submitted for NRC review and approval not less than 24 months before entering the period of extended operation.	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	At least 2 years prior to entering the period of extended operation.

Table A6.0-1 License Renewal Commitments

Item	Commitment	Source	Schedule[a]
3	The *Bolting Integrity* program will be enhanced to further incorporate applicable EPRI and industry bolting guidance. Topic enhancements will include proper joint assembly, torque values, gasket types, use of lubricants, and other bolting fundamentals.	Bolting Integrity	Prior to the Period of Extended Operation
4	The *Buried Piping and Tanks Inspection* program will be enhanced to perform the opportunistic and deliberate inspections of a representative sample of the in-scope buried material/ protective measure combinations.	Buried Piping and Tanks Inspection	Prior to the Period of Extended Operation
5	The *Compressed Air Monitoring* program will be enhanced to incorporate the compressed air system testing and maintenance recommendations from ASME OM-S/G-1998, Part 17 and EPRI TR-108147 and to identify these documents as part of the program basis.	Compressed Air Monitoring	Prior to the Period of Extended Operation
6	The *External Surfaces Monitoring* program will be enhanced to inspect the accessible external surfaces of in-scope components, piping, supports, structural members, and structural commodities, in the infrequently accessed areas, consistent with the criteria used in other plant areas.	External Surfaces Monitoring	Prior to the Period of Extended Operation

Table A6.0-1 License Renewal Commitments

Item	Commitment	Source	Schedule[a]
7	The *External Surfaces Monitoring* program will be enhanced to provide training for Operations, Engineering, and Health Physics personnel performing the program inspections and walkdowns. The training will address the requirements of the *External Surfaces Monitoring* program for license renewal, the need to document the identified conditions with sufficient detail to support monitoring and trending the aging effects, and the aging effects monitored by the program and how to identify them.	External Surfaces Monitoring	Prior to the Period of Extended Operation
8	The *Fire Protection* program will be enhanced to test a representative sample of sprinkler heads or to replace all affected sprinkler heads in accordance with the requirements of NFPA 25.	Fire Protection	Prior to the sprinkler heads achieving 50 years of service life.
9	The *Fire Protection* program fire barrier penetration seal inspections will be revised to include the elastomer Shield Building fire boots.	Fire Protection	Prior to the Period of Extended Operation
10	The *Fire Protection* program inspections of the reactor coolant pump oil collection system will be revised to include additional inspection criteria for the visual inspection of the system and to perform a one-time inspection of the internal surfaces of the reactor coolant pump oil collection tank.	Fire Protection	Prior to the Period of Extended Operation

Table A6.0-1 License Renewal Commitments

Item	Commitment	Source	Schedule[a]
11	The *Fuel Oil Tank Inspections* program will be enhanced to provide guidance for the periodic draining, cleaning and inspection activities.	Fuel Oil Tank Inspections	Prior to the Period of Extended Operation
12	The *Inspection of Overhead Heavy Load and Refueling Handling Systems* program will be enhanced to clarify the requirements of visual inspection of structural members, including structural bolting, of the in-scope heavy load and refueling handling cranes and associated equipment.	Inspection of Overhead Heavy Load and Refueling Handling Systems	Prior to the Period of Extended Operation
13	The *Metal Enclosed Bus* program will be enhanced to include augmented periodical visual inspections of the MEB internal surfaces, bus supports, bus insulation, taped joints and boots for signs of degradation or aging.	Metal Enclosed Bus	Prior to the Period of Extended Operation Thereafter, the inspections will not exceed a 5-year interval.
14	The *Non-EQ Electrical Cables and Connections* program will be established. The program will periodically visually inspect for accessible electrical cables and connections installed in an adverse localized equipment environment. Should an adverse localized environment be observed, a representative sample of electrical cables and connections installed within that environment will be visually inspected for jacket surface anomalies.	Non-EQ Electrical Cables and Connections	Prior to the Period of Extended Operation Thereafter, the inspections will not exceed a 10-year interval.

Table A6.0-1 License Renewal Commitments

Item	Commitment	Source	Schedule[a]
15	The *Non-EQ Electrical Cable Connections* program will be established. The program will perform a one-time inspection, on a sampling basis, to confirm the absence of loosening of bolted connections.	Non-EQ Electrical Cable Connections	Prior to the Period of Extended Operation
16	The *Non-EQ Inaccessible Medium-Voltage Cables* program will be established. The program will periodically inspect the in-scope manhole for water collection and will remove water, if required. The program will periodically perform a test on the in-scope cables to provide an indication of the condition of the conductor insulation.	Non-EQ Inaccessible Medium-Voltage Cables	Prior to the Period of Extended Operation Thereafter, the manhole inspections will not exceed a 2-year interval. Thereafter, the cable testing will not exceed a 10-year interval.
17	The *Non-EQ Instrumentation Circuits Subject to Sensitive, High-Voltage, Low-Level Signals* program will be established. The program will periodically perform a proven cable system test for detecting deterioration of the insulation system for those electrical cables and connections disconnected during calibration, or will periodically review the results and findings of calibrations for those electrical cables that remain connected during the calibration process.	Non-EQ Instrumentation Circuits Subject to Sensitive, High-Voltage, Low-Level Signals	Prior to the Period of Extended Operation Thereafter, the cable testing and calibration reviews will not exceed a 10-year interval.

Table A6.0-1 License Renewal Commitments

Item	Commitment	Source	Schedule[a]
18	The *Open-Cycle Cooling Water System* program will be enhanced to add the applicable aging effects as inspection criteria for the Circulating Water System underwater visual inspections.	Open-Cycle Cooling Water System	Prior to the Period of Extended Operation
19	The *Reactor Vessel Surveillance* program will be enhanced to include the applicable limitations on operating conditions to which the surveillance capsules were exposed (e.g. neutron flux, spectrum, irradiation temperature, etc.).	Reactor Vessel Surveillance	Prior to the Period of Extended Operation
20	The *Reactor Vessel Surveillance* program will be enhanced to include requirements for storing, and possible recovery, of tested and untested capsules (removed from the Reactor Vessel after August 31, 2000).	Reactor Vessel Surveillance	Prior to the Period of Extended Operation
21	The *Selective Leaching of Materials* program will be established. The program will perform a one-time visual inspection, and hardness measurement or qualitative examination of selected components within the scope of license renewal for selective leaching.	Selective Leaching of Materials	Prior to the Period of Extended Operation

Table A6.0-1 License Renewal Commitments

Item	Commitment	Source	Schedule[a]
22	The *Structures Monitoring Program* will be enhanced to clearly define structures, structural elements, and miscellaneous structural commodities that are in scope.	Structures Monitoring Program	Prior to the Period of Extended Operation
23	The *Structures Monitoring Program* will be enhanced to monitor groundwater quality and verify that it remains non-aggressive to below-grade concrete.	Structures Monitoring Program	Prior to the Period of Extended Operation
24	The *Structures Monitoring Program* will be enhanced to improve criteria for detection of aging effects for the underwater visual inspections of the in-scope structures.	Structures Monitoring Program	Prior to the Period of Extended Operation
25	The *Work Control Process* program will be enhanced to provide additional guidance for documenting the "As Found" equipment conditions with sufficient detail to support monitoring and trending of aging effects.	Work Control Process	Prior to the Period of Extended Operation
26	The *Work Control Process* program will be enhanced to perform visual inspections to assess the aging of the items that require supplemental inspections.	Work Control Process	Prior to the Period of Extended Operation

Table A6.0-1 License Renewal Commitments

Item	Commitment	Source	Schedule[a]
27	The *Work Control Process* program will be enhanced to provide additional focused training for the personnel performing the program inspections. The training will address the program requirements; the need to document "As Found" equipment conditions with sufficient detail to support monitoring and trending the aging effects; and the aging effects monitored by the program and how to identify them.	Work Control Process	Prior to the Period of Extended Operation
28	The *Metal Fatigue of Reactor Coolant Pressure Boundary* program will be enhanced to include a routine assessment of the transient cycle count totals and fatigue usage status for monitored locations, including an action limit for the initiation of corrective action.	Metal Fatigue of Reactor Coolant Pressure Boundary	Prior to the Period of Extended Operation

a The Period of Extended operation is the period of 20 years beyond the expiration date of the unit's current operating license.

Kewaunee Power Station

Appendix B

Aging Management Programs

Appendix B Aging Management Programs

Contents

B1.0 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 of the aging management programs described in this section has ten elements which are consistent with the definitions described in Section A.1, “Aging Management Review - Generic,” Table A.1-1, “Elements of an Aging Management Program for License Renewal,” of NUREG 1800, “Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants,” Revision 1. The ten element detail is not provided when the program is deemed to be consistent with the assumptions made in NUREG-1801, “Generic Aging Lessons Learned (GALL),” Revision 1.

The ten 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 are provided. 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.

For those programs that are plant-specific, the above form is generally followed with the additional discussion of each of the ten elements.

B1.3 QUALITY ASSURANCE PROGRAM AND ADMINISTRATIVE CONTROLS

The Quality Assurance Program is described in Topical Report DOM-QA-1, "Dominion Nuclear Facility Quality Assurance Program Description" and implements the requirements of 10 CFR 50, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants." The Quality Assurance Program is consistent with the summary in Appendix A.2 of NUREG-1800. The program includes the elements of corrective action, confirmation process, and administrative controls, which are applicable to the safety-related and non-safety-related systems, structures, and components that are subject to aging management review. In many cases, existing programs were found to be adequate for managing aging effects during the period of extended operation. Generically the three elements are applicable as follows:

Corrective Actions:

The Corrective Action Program is implemented in accordance with the requirements of 10 CFR 50, Appendix B and Topical Report DOM-QA-1. A single corrective actions process is applied regardless of the safety classification of the structure or component. Corrective actions are implemented through the initiation of a condition report in accordance with Fleet and plant procedures for actual or potential problems, including unexpected plant equipment degradation, damage, failure, malfunction or loss. Site documents that implement aging management programs for license renewal will direct that a condition report be prepared in accordance with those procedures whenever non-conforming conditions are found (i.e., the acceptance criteria are not met).

Equipment deficiencies are corrected through the initiation of a work order in accordance with plant procedures. Plant procedures require that a condition report also be initiated when equipment deficiencies or the need for corrective maintenance is identified.

Confirmation Process:

The focus of the confirmation process is on the follow-up actions that must be taken to verify effective implementation of corrective actions. The measure of effectiveness is in terms of correcting the adverse condition and precluding repetition of significant conditions adverse to quality. 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, to ensure effective corrective actions are taken. The corrective action process is also monitored for potentially adverse trends. The existence of an adverse trend due to recurring or repetitive adverse conditions will result in the initiation of a condition report. The aging management programs required for license renewal would also uncover any unsatisfactory condition due to ineffective corrective action.

Since the same 10 CFR 50, Appendix B corrective actions and confirmation process is applied for nonconforming safety-related and non-safety-related structures and components subject to aging management review for license renewal, the Corrective Action Program is consistent with the NUREG-1801 elements.

Administrative Controls:

Administrative controls procedures provide information on procedures and other forms of administrative control documents, as well as guidance on classifying documents into the proper document type.

B1.4 OPERATING EXPERIENCE

Industry operating experience was incorporated into the license renewal process through a review of industry documents to identify aging effects and mechanisms that could challenge the intended function of systems and structures within the scope of license renewal. Review of plant-specific operating experience was performed to identify aging effects experienced. The review of plant-specific operating experience involved electronic database searches of plant information. In addition, discussions with plant personnel were conducted.

Plant-specific and industry operating experience, including past corrective actions resulting in process enhancements, was considered in development of the aging management programs. This information provides objective evidence that the effects of aging have been, and will continue to be, adequately managed. The implementing procedures for the review of operating experience provide for incorporating additional plant-specific and industry operating experience into the aging management programs to ensure continued program effectiveness.

B1.5 AGING MANAGEMENT PROGRAMS

The aging management programs for Kewaunee Power Station are described in the sections listed below. Programs that are fully or partially implemented are identified as existing programs. Programs that need to be developed are identified as new programs.

1. Alloy 600 Inspections [Section B2.1.1] [Existing]
2. ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD [Section B2.1.2] [Existing]
3. ASME Section XI, Subsection IWE [Section B2.1.3] [Existing]
4. ASME Section XI, Subsection IWF [Section B2.1.4] [Existing]
5. Bolting Integrity [Section B2.1.5] [Existing]
6. Boric Acid Corrosion [Section B2.1.6] [Existing]
7. Buried Piping and Tanks Inspection [Section B2.1.7] [Existing]
8. Closed-Cycle Cooling Water System [Section B2.1.8] [Existing]
9. Compressed Air Monitoring [Section B2.1.9] [Existing]
10. External Surfaces Monitoring [Section B2.1.10] [Existing]
11. Fire Protection [Section B2.1.11] [Existing]
12. Flow-Accelerated Corrosion [Section B2.1.12] [Existing]
13. Flux Thimble Tube Inspection [Section B2.1.13] [Existing]
14. Fuel Oil Chemistry [Section B2.1.14] [Existing]

15. Fuel Oil Tank Inspections [Section B2.1.15] [Existing]
16. Inspection of Overhead Heavy Load and Refueling Handling Systems [Section B2.1.16] [Existing]
17. Lubricating Oil Analysis [Section B2.1.17] [Existing]
18. Metal Enclosed Bus [Section B2.1.18] [Existing]
19. Non-EQ Electrical Cables and Connections [Section B2.1.19] [New]
20. Non-EQ Electrical Cable Connections [Section B2.1.20] [New]
21. Non-EQ Inaccessible Medium-Voltage Cables [Section B2.1.21] [New]
22. Non-EQ Instrumentation Circuits Subject to Sensitive, High-Voltage, Low-Level Signals [Section B2.1.22] [New]
23. Open-Cycle Cooling Water System [Section B2.1.23] [Existing]
24. Primary Water Chemistry [Section B2.1.24] [Existing]
25. Reactor Containment Leakage Testing 10 CFR 50, Appendix J [Section B2.1.25] [Existing]
26. Reactor Head Closure Studs [Section B2.1.26] [Existing]
27. Reactor Vessel Surveillance [Section B2.1.27] [Existing]
28. Secondary Water Chemistry [Section B2.1.28] [Existing]
29. Selective Leaching of Materials [Section B2.1.29] [New]
30. Steam Generator Tube Integrity [Section B2.1.30] [Existing]
31. Structures Monitoring Program [Section B2.1.31] [Existing]
32. Work Control Process [Section B2.1.32] [Existing]

B1.6 TIME LIMITED AGING ANALYSES AGING MANAGEMENT PROGRAMS:

1. Environmental Qualification (EQ) of Electric Components [Section B3.1] [Existing]
2. Metal Fatigue of Reactor Coolant Pressure Boundary [Section B3.2] [Existing]

B2.0 AGING MANAGEMENT PROGRAM

The correlation between the NUREG-1801 (Generic Aging Lessons Learned (GALL)) programs and the Kewaunee Aging Management Programs are shown below. Links to the sections describing the Kewaunee programs are provided.

NUREG-1801 ID Number	NUREG-1801 Aging Management Program	Kewaunee Aging Management Program	Comparison to NUREG-1801 Program
XI.M1	ASME Section XI Inservice Inspection, Subsections IWB, IWC, & IWD	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD [Section B2.1.2]	Existing program consistent with NUREG-1801 with exceptions.
XI.M2	Water Chemistry	Primary Water Chemistry [Section B2.1.24] Secondary Water Chemistry [Section B2.1.28]	Existing program consistent with NUREG-1801. Existing program consistent with NUREG-1801.
XI.M3	Reactor Head Closure Studs	Reactor Head Closure Studs [Section B2.1.26]	Existing program consistent with NUREG-1801 with exception.
XI.M4	BWR Vessel ID Attachment Welds	Kewaunee Unit is a PWR.	Not Applicable.
XI.M5	BWR Feedwater Nozzle	Kewaunee Unit is a PWR.	Not Applicable.
XI.M6	BWR Control Rod Drive Return Line Nozzle	Kewaunee Unit is a PWR.	Not Applicable.
XI.M7	BWR Stress Corrosion Cracking	Kewaunee Unit is a PWR.	Not Applicable.
XI.M8	BWR Penetrations	Kewaunee Unit is a PWR.	Not Applicable.
XI.M9	BWR Vessel Internals	Kewaunee Unit is a PWR.	Not Applicable.
XI.M10	Boric Acid Corrosion	Boric Acid Corrosion [Section B2.1.6]	Existing program consistent with NUREG-1801.

NUREG-1801 ID Number	NUREG-1801 Aging Management Program	Kewaunee Aging Management Program	Comparison to NUREG-1801 Program
XI.M11	Nickel-Alloy Nozzles and Penetrations	The aging management reviews did not identify the need for this aging management program.	Not Applicable.
XI.M11A	Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactors	The aging management reviews did not identify the need for this aging management program.	Not Applicable.
XI.M12	Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)	The aging management reviews did not identify the need for this aging management program. (See Section 4.7.5, Reactor Coolant Loop Piping Flaw Tolerance Evaluation)	Not Applicable.
XI.M13	Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS)	An enhancement to ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD [Section B2.1.2] will include the recommendations of XI.M13.	Not Applicable.
XI.M14	Loose Part Monitoring	The aging management reviews did not identify the need for this aging management program.	Not Applicable.
XI.M15	Neutron Noise Monitoring	The aging management reviews did not identify the need for this aging management program.I	Not Applicable.

NUREG-1801 ID Number	NUREG-1801 Aging Management Program	Kewaunee Aging Management Program	Comparison to NUREG-1801 Program
XI.M16	PWR Vessel Internals	An enhancement to ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD [Section B2.1.2] will include the recommendations of XI.M16.	Not Applicable.
XI.M17	Flow-Accelerated Corrosion	Flow-Accelerated Corrosion [Section B2.1.12]	Existing program consistent with NUREG-1801 with exception.
XI.M18	Bolting Integrity	Bolting Integrity [Section B2.1.5]	Existing program consistent with NUREG-1801.
XI.M19	Steam Generator Tube Integrity	Steam Generator Tube Integrity [Section B2.1.30]	Existing program consistent with NUREG-1801 with exception.
XI.M20	Open-Cycle Cooling Water System	Open-Cycle Cooling Water System [Section B2.1.23]	Existing program consistent with NUREG-1801 with exception.
XI.M21	Closed-Cycle Cooling Water System	Closed-Cycle Cooling Water System [Section B2.1.8]	Existing program consistent with NUREG-1801 with exceptions.
XI.M22	Boraflex Monitoring	The aging management reviews did not identify the need for this aging management program.	Not Applicable.

NUREG-1801 ID Number	NUREG-1801 Aging Management Program	Kewaunee Aging Management Program	Comparison to NUREG-1801 Program
XI.M23	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems	Inspection of Overhead Heavy Load and Refueling Handling Systems [Section B2.1.16]	Existing program consistent with NUREG-1801.
XI.M24	Compressed Air Monitoring	Compressed Air Monitoring [Section B2.1.9]	Existing program consistent with NUREG-1801 with exception.
XI.M25	BWR Reactor Water Cleanup System	Kewaunee Unit is a PWR.	Not Applicable.
XI.M26	Fire Protection	Fire Protection [Section B2.1.11]	Existing program consistent with NUREG-1801 with exception.
XI.M27	Fire Water System	Fire Protection [Section B2.1.11]	Existing program consistent with NUREG-1801.
XI.M28	Buried Piping and Tanks Surveillance	The aging management reviews did not identify the need for this aging management program.	Not Applicable.
XI.M29	Aboveground Steel Tanks	The aging management reviews did not identify the need for this aging management program.	Not Applicable.
XI.M30	Fuel Oil Chemistry	Fuel Oil Chemistry [Section B2.1.14] Fuel Oil Tank Inspections [Section B2.1.15]	Existing program consistent with NUREG-1801 with exceptions. Existing program consistent with NUREG-1801.

NUREG-1801 ID Number	NUREG-1801 Aging Management Program	Kewaunee Aging Management Program	Comparison to NUREG-1801 Program
XI.M31	Reactor Vessel Surveillance	Reactor Vessel Surveillance [Section B2.1.27]	Existing program consistent with NUREG-1801 with exception.
XI.M32	One-Time Inspection	The aging management reviews did not identify the need for this aging management program.	Not Applicable.
XI.M33	Selective Leaching of Materials	Selective Leaching of Materials [Section B2.1.29]	New program to be consistent with NUREG-1801.
XI.M34	Buried Piping and Tanks Inspection	Buried Piping and Tanks Inspection [Section B2.1.7]	Existing program consistent with NUREG-1801.
XI.M35	One-time Inspection of ASME Code Class 1 Small Bore-Piping	The aging management reviews did not identify the need for this aging management program.	Not Applicable.
XI.M36	External Surfaces Monitoring	External Surfaces Monitoring [Section B2.1.10]	Existing program consistent with NUREG-1801.
XI.M37	Flux Thimble Tube Inspection	Flux Thimble Tube Inspection [Section B2.1.13]	Existing program consistent with NUREG-1801.
XI.M38	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	The aging management reviews did not identify the need for this aging management program.	Not Applicable.
XI.M39	Lubricating Oil Analysis	Lubricating Oil Analysis [Section B2.1.17]	Existing program consistent with NUREG-1801.
XI.S1	ASME Section XI, Subsection IWE	ASME Section XI, Subsection IWE [Section B2.1.3]	Existing program consistent with NUREG-1801.

NUREG-1801 ID Number	NUREG-1801 Aging Management Program	Kewaunee Aging Management Program	Comparison to NUREG-1801 Program
XI.S2	ASME Section XI, Subsection IWL	Kewaunee Power Station has a metal Reactor Containment Vessel.	Not Applicable.
XI.S3	ASME Section XI, Subsection IWF	ASME Section XI, Subsection IWF [Section B2.1.4]	Existing program consistent with NUREG-1801 with exception.
XI.S4	10 CFR 50, Appendix J	Reactor Containment Leakage Testing 10 CFR 50, Appendix J [Section B2.1.25]	Existing program consistent with NUREG-1801.
XI.S5	Masonry Wall Program	Structures Monitoring Program [Section B2.1.31]	Existing program consistent with NUREG-1801.
XI.S6	Structures Monitoring Program	Structures Monitoring Program [Section B2.1.31]	Existing program consistent with NUREG-1801.
XI.S7	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants	Structures Monitoring Program [Section B2.1.31]	Existing program consistent with NUREG-1801.
XI.S8	Protective Coating Monitoring and Maintenance Program	Kewaunee Power Station does not rely on coatings to manage the affects of aging.	Not Applicable.
XI.E1	Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	Non-EQ Electrical Cables and Connections [Section B2.1.19]	New program to be consistent with NUREG-1801.

NUREG-1801 ID Number	NUREG-1801 Aging Management Program	Kewaunee Aging Management Program	Comparison to NUREG-1801 Program
XI.E2	Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits	Non-EQ Instrumentation Circuits Subject to Sensitive, High-Voltage, Low-Level Signals [Section B2.1.22]	New program to be consistent with NUREG-1801.
XI.E3	Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	Non-EQ Inaccessible Medium-Voltage Cables [Section B2.1.21]	New program to be consistent with NUREG-1801.
XI.E4	Metal-Enclosed Bus	Metal Enclosed Bus [Section B2.1.18]	Existing program consistent with NUREG-1801.
XI.E5	Fuse Holders	The aging management reviews did not identify the need for this aging management program.	Not Applicable.
XI.E6	Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	Non-EQ Electrical Cable Connections [Section B2.1.20]	New program to be consistent with NUREG-1801.

NUREG-1801 ID Number	NUREG-1801 Aging Management Program	Kewaunee Aging Management Program	Comparison to NUREG-1801 Program
X.M1	Metal Fatigue of Reactor Coolant Pressure Boundary	Metal Fatigue of Reactor Coolant Pressure Boundary [Section B3.2]	Existing program consistent with NUREG-1801.
X.E1	Environmental Qualification (EQ) of Electric Components	Environmental Qualification (EQ) of Electric Components [Section B3.1]	Existing program consistent with NUREG-1801.
X.S1	Concrete Containment Tendon Prestress	Kewaunee Power Station has a metal Reactor Containment Vessel.	Not Applicable.
NA	Plant-Specific	Alloy 600 Inspections [Section B2.1.1]	Not Applicable.
NA	Plant-Specific	Work Control Process [Section B2.1.32]	Not Applicable.

B2.1 AGING MANAGEMENT PROGRAMS

B2.1.1 ALLOY 600 INSPECTIONS

Program Description

The *Alloy 600 Inspections* program is a plant-specific program that manages the aging effects of primary water stress corrosion cracking in Alloy 600 base metal and Alloy 82/182 dissimilar metal welds and Alloy 690 base metal and Alloy 52/152 dissimilar metal welds. The program meets the NUREG-1801 expectation to have a plant-specific program for managing nickel alloy materials to comply with the applicable NRC publications and industry guidelines.

The *Alloy 600 Inspections* program performs visual/bare metal, liquid penetrant, eddy current, and ultrasonic examinations to detect cracking of the in-scope components. The program implementing procedures define the requirements and scope of the program. The procedures identify the specific base metal and dissimilar metal weld locations included in the program and the susceptibility of each location to primary water stress corrosion cracking.

The program proactively addressed the industry operating experience for primary water stress corrosion cracking of the Alloy 600 and dissimilar metal welds. Based on the industry experience, the reactor vessel head was replaced during the Fall 2004 refueling outage.

The *Alloy 600 Inspections* program activities for the pressure boundary base metal and dissimilar metal weld locations are performed in accordance with the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program.

The *Alloy 600 Inspections* program implements the applicable requirements of NRC First Revised Order EA-03-009, "Issuance Of First Revised NRC Order (EA-03-009) Establishing Interim Inspection Requirements For Reactor Pressure Vessel Heads At Pressurized Water Reactors" and NRC Bulletin 2003-02, "Leakage From Reactor Pressure Vessel Lower Head Penetrations And Reactor Coolant Pressure Boundary Integrity."

The *Alloy 600 Inspections* program provides verification that the Primary Water Chemistry program has been effective in mitigating primary water stress corrosion cracking and supports the Boric Acid Corrosion program.

<u>Aging Management Program Elements</u>

A comparison of the *Alloy 600 Inspections* program to ten elements described in Appendix A of NUREG-1800 is provided below.

- **Element 1: Scope of Program**

  The *Alloy 600 Inspections* program implementing procedures define the requirements and scope of the program. The procedures identify the specific base metal and dissimilar metal weld locations included in the program and the susceptibility of each location to primary water stress corrosion cracking, including the following locations:

  - Reactor Vessel closure head penetrations (control rod drive mechanisms, reactor vessel level instrument system, and head vent) and associated J-groove welds
  - Reactor Vessel bottom head instrument tube penetrations and associated J-groove welds
  - Reactor Vessel safety injection nozzles buttering weld
  - Reactor Vessel core support guide lug/weld

- Steam Generator primary nozzles safe end/buttering

The *Alloy 600 Inspections* program implements the applicable requirements of NRC First Revised Order EA-03-009, "Issuance Of First Revised NRC Order (EA-03-009) Establishing Interim Inspection Requirements For Reactor Pressure Vessel Heads At Pressurized Water Reactors" and NRC Bulletin 2003-02, "Leakage From Reactor Pressure Vessel Lower Head Penetrations And Reactor Coolant Pressure Boundary Integrity."

- **Element 2: Preventive Actions**

The *Alloy 600 Inspections* program does not include preventive actions.

The *Alloy 600 Inspections* program provides verification that *Primary Water Chemistry* program has been effective in mitigating primary water stress corrosion cracking.

- **Element 3: Parameters Monitored or Inspected**

The *Alloy 600 Inspections* program monitors cracking due to primary water stress corrosion cracking.

- **Element 4: Detection of Aging Effects**

The *Alloy 600 Inspections* program performs visual/bare metal, liquid penetrant, eddy current, and ultrasonic examinations to detect cracking of the in-scope components. An inspection plan has been developed for each of the Alloy 600 or dissimilar metal weld locations, which have been determined to be susceptible to primary water stress corrosion cracking. The inspection plans are based on the industry guidance provided in EPRI 1009561, "Materials Reliability Program: Generic Guidance for Alloy 600 Management (MRP-126)."

The *Alloy 600 Inspections* program inspections are performed in accordance with the *ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD* program.

The *Alloy 600 Inspections* program includes the augmented inservice inspections that comply with the requirements of the NRC First Revised Order EA-03-009 for replaced reactor vessel head inspections.

- **Element 5: Monitoring and Trending**

The *Alloy 600 Inspections* program relies on periodic inspections of susceptible locations to detect and address progressive, time-dependent degradation prior to loss of function. The inspection results are reviewed, dispositioned, and trended in accordance with the *ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD* program.

- **Element 6: Acceptance Criteria**

  The *Alloy 600 Inspections* program is implemented in accordance with the *ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD* program that includes the inspection procedures, the acceptance criteria for each examination technique, and the process for evaluating unsatisfactory inspection results.

- **Element 7: Corrective Actions**

  The *Alloy 600 Inspections* program is implemented in accordance with the *ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD* program that includes the inspection procedures, the acceptance criteria for each examination technique, and the process for evaluating unsatisfactory inspection results.

  The Corrective Action Program is discussed in Section B1.3.

- **Element 8: Confirmation Process**

  The *Alloy 600 Inspections* program is implemented in accordance with the *ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD* program that includes the inspection procedures, the acceptance criteria for each examination technique, and the process for evaluating unsatisfactory inspection results.

  The Confirmation Process is discussed in Section B1.3.

- **Element 9: Administrative Controls**

  The Administrative Controls are discussed in Section B1.3.

- **Element 10: Operating Experience**

  The *Alloy 600 Inspections* program has not identified cracking due to primary water stress corrosion cracking for the components in the scope of the program. However, industry operating experience indicates that the inspection methodologies employed by the program have been effective in identifying cracking due to primary water stress corrosion cracking. If the program identifies cracking of the in-scope components, the program provides for evaluating the degradation and implementing corrective actions to ensure that the intended functions of the affected components are maintained.

  The following provides the internal operating experience for Kewaunee:

Reactor Vessel Head Inspections

Prior to the issuance of NRC Bulletin 2001-01, "Circumferential Cracking of Reactor Pressure Vessel Head Penetration Nozzles," inspections and examinations of the reactor vessel head were performed as required by Section XI of the American Society of Mechanical Engineers (ASME) Code. When industry issues warranted, additional conservative examinations were conducted. These inspection activities continued and were expanded following the issuance of the Bulletin and included:

- Visual examination of accessible portions of control rod drive mechanisms
- Visual examination of the bare metal exterior surface of the reactor vessel head
- Dye penetrant examination of 10 percent of the full penetration butt welds on peripheral control rod drive mechanisms on a ten-year frequency
- Visual examination of carbon steel conoseal bolting on the thermocouple columns.

A visual examination of the bare metal exterior surface of the reactor vessel head was performed during both the 1989 and 2001 refueling outages. During the 2001 refueling outage, a visual examination of 100 percent of the exterior surface area of the reactor vessel head hemisphere (including all reactor vessel head penetrations) was performed in accordance with NRC Bulletin 2001-01. In addition, visual examinations were performed during the Class 1 system pressure test of the reactor vessel head, which focused on detection of leakage at the reactor vessel flange and control rod drive mechanism mechanical joints.

During the 2001 refueling outage, the shroud on the reactor vessel head was modified to include visual inspection ports. These inspection ports enhanced the ability to examine the reactor vessel head.

In response to Order EA-03-009[1], "Issuance Of Order Establishing Interim Inspection Requirements For Reactor Pressure Vessel Heads At Pressurized Water Reactors," the reactor pressure vessel head and head penetration nozzles

1. These inspections encompassed the inspections required by NRC Bulletin 2002-01, "Reactor Pressure Vessel Head Degradation and Reactor Coolant Pressure Boundary Integrity" and NRC Bulletin 2002-02, "Reactor Pressure Vessel Head and Vessel Head Penetration Nozzle Inspection Programs."

were inspected during the Spring 2003 refueling outage using VT-1 and VT-3 visual examinations in accordance with the requirements of ASME Boiler and Pressure Vessel Code, Section XI, 1989 Edition. The inspections included a 360-degree visual inspection around each reactor pressure vessel head penetration nozzle. The results of the examinations showed no recordable indications for the reactor pressure vessel head, penetrations or the pressure retaining components above the head. Additionally, the reactor pressure vessel head and pressure retaining components above the head were free of any evidence of corrosion, boric acid residue, or leakage.

The required inspections over the time period from 2001 through 2004 were performed in accordance with industry guidance and regulatory requirements and identified no indications of through wall leakage or loss of structural integrity.

As a conservative measure, during the Fall 2004 refueling outage, the reactor vessel head was replaced even though no signs of degradation had been observed. The replacement head utilizes design features and materials to reduce the probability of primary water stress corrosion cracking and boric acid leakage.

Reactor Vessel Bottom Head Instrument Tube Penetrations Inspections

The Reactor Vessel bottom head instrument tube penetrations examinations have historically consisted of system pressure testing performed in accordance with Table IWB-2500-1 of the ASME Boiler and Pressure Vessel Code, Section XI, 1989 Edition and Section XI, 1998 Edition, 2000 Addenda, as applicable during each refueling outage. The examination was a visual examination for evidence of leakage by a VT-2 qualified inspector with the system at normal operating pressure and with the insulation in place as allowed per IWA-5242. The system pressure tests did not identify any bottom mounted instrument leakage.

During the Spring 2003 refueling outage, a boroscope inspection was performed of the area between the reactor pressure vessel and the insulation at several locations. No boric acid crystals were observed. Visual VT-3 examinations were performed on the 36 bottom head instrument tube penetrations. Liquid penetrant examinations were performed at two locations.

During the Fall 2004 refueling outage, a direct VT-1 and VT-3 visual examination of the Reactor Vessel bottom head instrument tube penetrations area with the insulation removed was performed. These inspections addressed NRC Bulletin

2003-02, "Leakage From Reactor Pressure Vessel Lower Head Penetrations And Reactor Coolant Pressure Boundary Integrity."

In addition, during this outage removable insulation was installed to facilitate future inspections.

During the Fall 2006 refueling outage, a direct VT-3 visual inspection of the Reactor Vessel bottom head instrument tube penetrations area with the insulation removed was performed.

The purpose of the examinations discussed above was to assess the condition of the reactor vessel bottom head bare-metal located around the 36 bottom head instrument tube penetrations, and specifically to look for Reactor Coolant System pressure boundary leakage. No evidence of Reactor Coolant System pressure boundary leakage was observed. No indications of cracking were observed in the liquid penetrant examinations.

Steam Generator Nozzle Safe-end Inspections

The steam generator nozzle inspections have historically consisted of ultrasonic and dye penetrant examinations and system pressure testing performed in accordance with Table IWB-2500-1 of the ASME Boiler and Pressure Vessel Code, Section XI, 1989 Edition and Section XI, 1998 Edition, 2000 Addenda, as applicable during each refueling outage.

During the Fall 2001 refueling outage, the steam generators were replaced due to degradation of the Alloy 600 tubes. There were no indications of any other Reactor Coolant System pressure boundary degradation, including the steam generator nozzles.

The inner diameter wetted surfaces of the new steam generator nozzle to safe-end welds are Alloy 52/152 to reduce the potential for primary water stress corrosion cracking.

Conclusion

The *Alloy 600 Inspections* program ensures that the effects of aging associated with the in-scope components will be adequately managed so that there is reasonable assurance that their intended functions will be maintained consistent with the current licensing basis throughout the period of extended operation.

B2.1.2 ASME SECTION XI INSERVICE INSPECTION, SUBSECTIONS IWB, IWC, AND IWD

Program Description

The *ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD* program manages the aging effects of change in dimensions, cracking, loss of fracture toughness, loss of material, and loss of preload for the ASME Class 1, 2, and 3 piping, including piping less than four inches nominal pipe size, and components fabricated of nickel alloys, stainless steel, and steel. In addition, the program manages the aging effect of cracking for the steel reactor coolant pump motor flywheels.

The *ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD* program performs visual, surface, ultrasonic, and eddy current examinations based on the inspection extent, schedule, and techniques specified in Tables IWB-2500-1, IWC-2500-1, and IWD-2500-1.

The *ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD* program performs examinations of the reactor coolant pump motor flywheels as augmented examinations. These augmented examinations are regulatory commitments outside the scope of the requirements of ASME Boiler and Pressure Vessel Code Section XI.

The inspections performed by the *ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD* program provide verification of the effectiveness of the Primary Water Chemistry and Secondary Water Chemistry programs; and support the Alloy 600 Inspections, Bolting Integrity, Boric Acid Corrosion, and Reactor Head Closure Studs programs.

NUREG-1801 Consistency

The *ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD* program is an existing program that is consistent with the recommendations of NUREG-1801, Section XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," with the exception described below.

Exceptions to NUREG-1801

Exception 1: Use of a Different ASME Section XI Code Edition

The *ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD* program is based on the ASME Section XI 1998 Code Edition through 2000 Addenda. This is a different Code Edition and Addenda than recommended in NUREG 1801 Section XI.M1, which specifies the use of ASME Section XI 2001 Code Edition through the 2003 Addenda.

Justification

Use of the ASME Section XI 1998 Code Edition through 2000 Addenda is based on the provisions in 10 CFR 50.55a to use the ASME Section XI Code in effect 12 months prior to the start of the inspection interval.

The existing *ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD* program is consistent with the requirements of the ASME Section XI 2001 Code Edition through the 2003 Addenda, which are referenced by NUREG-1801, Section XI.M1. A comparison of the two Code Edition/Addenda combinations indicates that there were no changes in scope of components included in the program and that the changes made in the later Code Edition/Addenda involve making the requirements generally less restrictive and providing clarifications and additional options for completing code requirements.

The use of the ASME Section XI 1998 Code Edition through 2000 Addenda is consistent with the intent of the NUREG-1801, Section XI.M1, program.

Program Elements Affected

- **Element 1: Scope of Program**

  The components included in the scope of the program are consistent between the ASME Section XI 1998 Code Edition through 2000 Addenda and the ASME Section XI 2001 Code Edition through the 2003 Addenda. The use of the ASME Section XI 1998 Code Edition through 2000 Addenda is consistent with the intent of the NUREG-1801, Section XI.M1, program.

- **Element 3: Parameters Monitored or Inspected**

  The parameters monitored by the program are consistent between the ASME Section XI 1998 Code Edition through 2000 Addenda and the ASME Section XI 2001 Code Edition through the 2003 Addenda. The use of the ASME Section XI

1998 Code Edition through 2000 Addenda is consistent with the intent of the NUREG-1801, Section XI.M1, program.

- **Element 4: Detection of Aging Effects**

  The changes from the ASME Section XI 1998 Code Edition through 2000 Addenda to the ASME Section XI 2001 Code Edition through the 2003 Addenda involve making requirements generally less restrictive and provide clarifications and additional options for completing code requirements. The use of the ASME Section XI 1998 Code Edition through 2000 Addenda is consistent with the intent of the NUREG-1801, Section XI.M1, program.

- **Element 5: Monitoring and Trending**

  The changes from the ASME Section XI 1998 Code Edition through 2000 Addenda to the ASME Section XI 2001 Code Edition through the 2003 Addenda involve making requirements generally less restrictive and provide clarifications and additional options for completing code requirements. The use of the ASME Section XI 1998 Code Edition through 2000 Addenda is consistent with the intent of the NUREG-1801, Section XI.M1, program.

- **Element 6: Acceptance Criteria**

  The changes from the ASME Section XI 1998 Code Edition through 2000 Addenda to the ASME Section XI 2001 Code Edition through the 2003 Addenda involve making requirements generally less restrictive and provide clarifications and additional options for completing code requirements. The use of the ASME Section XI 1998 Code Edition through 2000 Addenda is consistent with the intent of the NUREG-1801, Section XI.M1, program.

Enhancements

Enhancement 1: Aging Management of Reactor Vessel Internals

The *ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD* program will be enhanced to (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, submit an inspection plan for reactor internals to the NRC for review and approval to augment the current inspections.

This commitment is identified in Appendix A, Table A6.0-1 License Renewal Commitments, Item 1.

Program Elements Affected

- **Element 4: Detection of Aging Effects**

  The enhancement will ensure that the inspections for the detection of aging effects on the reactor vessel internals will implement the best industry practices.

Enhancement 2: Aging Management of Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel

The *ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD* program will be enhanced to include identification of the limiting susceptible cast austenitic stainless steel reactor vessel internals components from the standpoint of thermal aging susceptibility, neutron fluence, and cracking. For each identified component, a plan will be developed, which accomplishes aging management through either a supplemental examination or a component-specific evaluation. The plan will be submitted for NRC review and approval not less than 24 months before entering the period of extended operation.

This commitment is identified in Appendix A, Table A6.0-1 License Renewal Commitments, Item 2.

Program Elements Affected

- **Element 4: Detection of Aging Effects**

  The enhancement will ensure that the inspections for the detection of aging effects on the cast austenitic stainless steel reactor vessel internals components will implement the best industry practices.

Operating Experience

Operating experience indicates that the *ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD* program is effective in identifying degradation of Class 1, 2, or 3 pressure-retaining components and their integral attachments, evaluating the degradation, and implementing corrective actions. When degradation has been identified, corrective actions have been implemented to ensure that the intended functions of the affected Class 1, 2, or 3 components are maintained.

In November 2006, in NRC Integrated Inspection Report 05000305/2006004, the NRC documented the evaluation of the implementation of the *ASME Section XI Inservice Inspection, Subsections IWB, IWC and IWD* program for monitoring degradation of the Reactor Coolant System boundary and risk significant piping system boundaries. The NRC also evaluated the visual inspection of the reactor pressure vessel head penetrations and the bare metal visual examination of the reactor pressure vessel head to verify quality and to ensure minimum examination coverage. No findings of significance were identified.

The following representative examples of internal operating experience are based on a review of Corrective Action Program items and NRC Inspection Reports, and were considered in evaluating the effectiveness of the program:

In May 2000, during the ultrasonic and radiography examinations of the Class 2 feedwater nozzle to pipe welds, recordable indications were recorded. The examinations were performed as reexamination of indications previously noted in 1995, 1996, 1997, and 1998. The indications were accepted through analytical evaluation as permitted by ASME Section XI 1989 Edition, Paragraphs IWB-3142.4, IWB-3600 and IWC-3600. The replacement of the steam generators in 2001 resolved these issues.

In October 2001, during a liquid penetrant examination of a 6-inch pipe weld in the Internal Containment Spray System, a rounded linear indication was recorded. The evaluation of the indication determined that it was acceptable in accordance with ASME Section XI 1989 Edition, Table IWB-3514-2 because the indication was smaller than the allowable indication provided in ASME B&PV Code Section III 1989 Edition, Section NC-5352.

In April 2003, during a liquid penetrant examination of a 2-inch socket weld in the Reactor Coolant System, a linear indication was recorded that was unacceptable in accordance with ASME Section XI 1989 Edition, Table IWB-3514-2. The evaluation of the condition determined that it was a fabrication indication. The weld was repaired by light filing.

In September 2006, during the inservice inspection of a Residual Heat Removal valve, the NDE examiner identified a moderate amount of dry white boric acid on the valve body to bonnet interface. The boric acid was in contact with the valve bonnet studs and there was a light dry white boric acid on the valve stem packing. The valve was repaired to address the white boric acid on the valve body to bonnet interface and returned to service.

Conclusion

The *ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD* program ensures that the effects of aging associated with the in-scope components will be adequately managed so that there is reasonable assurance that their intended functions will be maintained consistent with the current licensing basis throughout the period of extended operation.

B2.1.3 ASME SECTION XI, SUBSECTION IWE

Program Description

The *ASME Section XI, Subsection IWE* program manages the aging effects of loss of material, cracking and loss of sealing for steel, stainless steel and elastomers. The program is required by Technical Specifications and 10 CFR 50.55a(g) to manage the effects of aging for ASME Class MC metal Reactor Containment Vessel structures and components. The program is in accordance with ASME Boiler and Pressure Vessel Code, Section XI, Subsection IWE, 2001 Edition through 2003 Addenda.

The *ASME Section XI, Subsection IWE* program consists of condition monitoring activities that include periodic visual examinations (general visual and VT-3) of metal pressure boundary surfaces and welds, penetrations, integral attachments and their welds, moisture barriers, and pressure retaining bolted connections. In addition, surface areas likely to experience accelerated degradation require augmented examinations, i.e., a detailed visual VT-1 examination and ultrasonic thickness measurements, if required. These components, parts, and appurtenances are fully identified in the *ASME Section XI, Subsection IWE* program and are derived from ASME Section XI, Table IWE-2500-1 requirements.

The program requirements include scope, schedule, examination methods, and acceptance standards for Class MC components. The program provides measures for inspection to detect aging effects prior to loss of intended function and for engineering evaluation, corrective measures, or repair/replacement of components with aging effects that do not meet the acceptance standards. The *ASME Section XI, Subsection IWE* program also provides for reexamination during subsequent inspection periods of flaws and areas of degradation that have been evaluated and found acceptable for continued service.

The program credits and utilizes the Corrective Action Program if any flaws or areas of degradation exceeding ASME Section XI, Subsection IWE acceptance standards are identified. The Corrective Action Program will document and trend the cause and extent of condition and the ultimate disposition of the flaw or area of degradation.

The Reactor Containment Leakage Testing 10 CFR 50, Appendix J program is supported by the *ASME Section XI, Subsection IWE* program by performing a general visual inspection of the accessible interior and exterior surfaces of the primary Reactor Containment Vessel. The general visual examination is performed every inspection period, which fulfills 10 CFR 50, Appendix J requirements.

The *ASME Section XI, Subsection IWE* program meets ASME Section XI, Subsection IWE requirements and manages aging such as loss of material, structural integrity or leak tightness degradation, pressure-retaining bolted connections, excessive wear from abrasion or erosion, and moisture barrier degradation. The *ASME Section XI, Subsection IWE* program inspections have been effective in maintaining the integrity of the Reactor Containment Vessel pressure boundary and structural integrity and ensuring that aging effects are discovered and repaired before the loss of structure or component intended functions.

NUREG-1801 Consistency

The *ASME Section XI, Subsection IWE* program is an existing program that is consistent with the recommendations of NUREG-1801, Sections XI.S1, "ASME Section XI, Subsection IWE."

Exceptions to NUREG-1801

The *ASME Section XI, Subsection IWE* program takes no exceptions to the recommendations of NUREG-1801, Section XI.S1, "ASME Section XI, Subsection IWE."

Enhancements

The *ASME Section XI, Subsection IWE* program does not require enhancement to be consistent with the recommendations of NUREG-1801, Section XI.S1, "ASME Section XI, Subsection IWE."

Operating Experience

Operating experience indicates that the *ASME Section XI, Subsection IWE* program is effective in identifying degradation that may affect either the metal Reactor Containment Vessel structural integrity or leak tightness, evaluating the degradation, and implementing corrective actions. When degradation has been identified, corrective actions have been implemented to ensure that the intended functions of the affected Reactor Containment Vessel, penetrations, equipment hatch and air locks are maintained.

The following representative examples of internal operating experience are based on a review of Corrective Action Program items and were considered in evaluating the effectiveness of the program:

In April 2003, during performance of structure walkdowns, surface rust was noted on the exterior face of the Reactor Containment Vessel, primarily at the vessel, concrete foundation interface. The condition was evaluated and assessed in accordance with the requirements of the *ASME Section XI, Subsection IWE* program. The condition was corrected and the surface coating was restored via the work management system.

In August 2003, a focused self-assessment of ISI activities, including *ASME Section XI, Subsection IWE* program, identified a number of improvements and recommendations. One area for improvement dealt with engineering evaluations, which were noted to lack rigor. Action was taken to provide training to appropriate plant personnel and to provide additional oversight in this area. In addition, procedure changes were made to better capture requirements contained in 10 CFR 50.55a(b)(2)(ix) with respect to acceptability of inaccessible areas when aging in accessible areas may indicate potential problems.

In October 2004, due to mechanical damage to the Reactor Containment Vessel and equipment hatch, an IWE visual examination was performed on the areas of concern. The exam noted moderate surface rust but no physical damage to the structure and no recordable indications. Surface rust was corrected via the work management system.

In October 2004, during performance of IWE inspections, two recordable indications were noted: caulk degradation at the joint between the personnel airlock and the concrete floor, and a scab-type indication on the metal Reactor Containment Vessel surface. The caulking issue was determined not to affect Reactor Containment

Vessel operability and the joint was subsequently repaired/restored to its design condition. The engineering evaluation for the scab-type indication determined that it was a manufacturing blemish and not an inservice induced degradation. Engineering evaluation determined that the condition was acceptable for service without removal or repair. As a conservative measure, reexamination was performed during the next inspection opportunity, which confirmed there was no change to the indication.

Conclusion

The *ASME Section XI, Subsection IWE* program ensures that the effects of aging associated with the in-scope structures will be adequately managed so that there is reasonable assurance that their intended functions will be maintained consistent with the current licensing basis throughout the period of extended operation.

B2.1.4 ASME SECTION XI, SUBSECTION IWF

Program Description

The *ASME Section XI, Subsection IWF* program manages the aging effects of loss of material and loss of mechanical function for the in-scope steel supports and hangers.

The *ASME Section XI, Subsection IWF* program performs visual examinations of Class 1, Class 2, and Class 3 component supports consistent with the examinations of "Support Types Examined" in Table IWF-2500-1. The program support and hanger inspections fulfill the requirements specified by 10 CFR 50.55a(g). The program identifies the in-scope systems, number of nonexempt supports in the system boundary, and the required inspection percentage.

The *ASME Section XI, Subsection IWF* program is based on the ASME Section XI 1998 Code Edition through 2000 Addenda.

The appropriate corrective action is determined for indications that exceed the acceptance criteria. Removal, repair, monitoring, or analytical evaluation are identified as acceptable corrective action options.

The inspections of supports and hangers performed by the *ASME Section XI, Subsection IWF* program support the Bolting Integrity program to monitor cracking and loss of preload.

NUREG-1801 Consistency

The *ASME Section XI, Subsection IWF* program is an existing program that is consistent with NUREG-1801, Section XI.S3 "ASME Section XI, Subsection IWF," with the exception described below.

Exceptions to NUREG-1801

Exception 1: Use of a Different ASME Section XI Code Edition

The *ASME Section XI, Subsection IWF* program is based on ASME Section XI 1998 Code Edition through 2000 Addenda. This Code edition is different than the Code edition identified in NUREG-1801, Section XI.S3, which specifies the use of ASME Section XI 2001 Code edition through the 2003 Addenda.

Justification

Use of the ASME Section XI 1998 Code Edition through 2000 Addenda is consistent with provisions in 10 CFR 50.55a to use the ASME Section XI Code in effect 12 months prior to the start of the inspection interval.

ASME Code, Section XI, Subsection IWF, 2001 Edition through 2003 Addenda and the 1998 Edition through 2000 Addenda have been compared and no technical differences were identified. Therefore, the *ASME Section XI, Subsection IWF* program is consistent with the intent of the NUREG-1801, Section XI.S3, recommendations.

Program Elements Affected

- **Element 1: Scope of Program**

  ASME Code, Section XI, Subsection IWF, 2001 Edition through 2003 Addenda and the 1998 Edition through 2000 Addenda have been compared and no technical differences were identified. Therefore, the *ASME Section XI, Subsection IWF* program is consistent with the intent of the NUREG-1801, Section XI.S3, recommendations.

Enhancements

The *ASME Section XI, Subsection IWF* program does not require enhancement to be consistent with the recommendations of NUREG-1801, Section XI.S3, "ASME Section XI, Subsection IWF."

Operating Experience

Operating experience indicates that the *ASME Section XI, Subsection IWF* program is effective in identifying support and hanger degradation, evaluating the degradation, and implementing corrective actions. When degradation has been identified, corrective actions have been implemented to ensure that the intended functions of the affected supports and hangers are maintained.

The following representative examples of internal operating experience are based on a review of Corrective Action Program items and were considered in evaluating the effectiveness of the program:

In April 2003, a VT-3 examination of a support for a component cooling heat exchanger identified one support stud nut that was not flush to the base plate. The condition was considered unacceptable per the VT examination criteria. A structural engineering evaluation of the condition determined that the installation was acceptable during the refueling outage, but recommended that a beveled washer be installed prior to the plant exceeding 200 degrees F. A design change was made and implemented to add the beveled washer to this support, which restored the support design.

In May 2005, a VT-3 examination of the U-bolts on two service water pipe hangers identified "Unsatisfactory" inspection results. The U-bolts for both hangers were found degraded during disassembly, with the U-bolt for one of the hangers being broken. It was determined that the U-bolts had failed due to normal wear. Both U-bolts were discarded and replaced. A VT-3 examination was performed on both replacement U-bolts. They were found acceptable, with no indications.

In September 2006, it was identified that a main steam pipe hanger did not meet the drawing specifications. The drawing showed a 2-inch minimum dimension to the centerline of the pipe. A visual examination found the dimension to be approximately 1.75 inch. The support was a new support that had been recently installed by a design change. A mode restraint was imposed to prevent unit heat up until the discrepancy was resolved. The support was reworked to bring it into compliance with the design, as shown on the drawing.

In October 2006, a VT-3 inspection, performed following maintenance of a hanger on the suction piping to a residual heat removal pump near the removable spool piece, found the spring can "as found" setting in excess of the limits displayed on the design drawing. The condition evaluation in accordance with the Corrective Action Program determined it did not pose a significant impact to the piping stress analysis. The spring can was reset back to its design load.

Conclusion

The *ASME Section XI, Subsection IWF* program ensures that the effects of aging associated with the in-scope components will be adequately managed so that there is reasonable assurance that their intended functions will be maintained consistent with the current licensing basis throughout the period of extended operation.

B2.1.5 BOLTING INTEGRITY

Program Description

The *Bolting Integrity* program manages the aging effects of cracking, loss of material, and loss of preload for bolting/fasteners.

The *Bolting Integrity* program relies on recommendations for a comprehensive bolting integrity program as delineated in NUREG-1339, "Resolution of Generic Safety Issue 29: Bolting Degradation or Failure in Nuclear Power Plants," and industry recommendations as delineated in the EPRI NP-5769, "Degradation and Failure of Bolting in Nuclear Power Plants," with the exceptions noted in NUREG-1339. The program addresses three subject areas: (1) proper assembly of bolted joints through instructions/procedures, (2) the procurement, receipt and storage of bolting materials, and (3) the training of plant personnel with respect to bolting issues. The program addresses bolting associated with pressure boundary, mechanical, and high strength bolting for component supports. Maintenance procedures provide detailed instructions for removal and installation of bolted pressure boundary closures, and provide generic guidance on proper bolting practices.

Proper preload and its attainment, principally through torque, are critical for nearly all bolted joints. Procurement issues include specification, certification, identification, receipt inspection, and handling. Maintenance and engineering personnel are exposed to industry operating experience, procurement issues, and assembly methods, which facilitates dependable, leak free, bolted joints throughout the plant.

Additional inspections of installed bolting within the scope of the *Bolting Integrity* program are performed by other aging management programs, including ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD; Boric Acid

Corrosion; External Surfaces Monitoring; Work Control Process; and ASME Section XI, Subsection IWF.

The aging management of the reactor head closure studs is addressed by the *Reactor Head Closure Studs* program and is not included in this program. Structural bolts and fasteners are inspected by the *Structures Monitoring Program*.

NUREG-1801 Consistency

The *Bolting Integrity* program is an existing program that is consistent with the recommendations of NUREG-1801, Section XI.M18, "Bolting Integrity."

Exceptions to NUREG-1801

The *Bolting Integrity* program takes no exceptions to the recommendations of NUREG-1801, Section XI.M18, "Bolting Integrity."

Enhancements

Enhancement 1: Bolting Program Improvements

The *Bolting Integrity* program will be enhanced to further incorporate applicable EPRI and industry bolting guidance. Topic enhancements will include proper joint assembly, torque values, gasket types, use of lubricants, and other bolting fundamentals.

This commitment is identified in Appendix A, Table A6.0-1 License Renewal Commitments, Item 3.

<u>Program Elements Affected</u>

- **Element 2: Preventive Actions**

  This enhancement will expand the depth and breadth of coverage and incorporate the latest comprehensive information and instructions on bolting.

Operating Experience

Operating experience indicates that the *Bolting Integrity* program is effective in identifying bolting degradation, evaluating the degradation, and implementing corrective actions. When degradation has been identified, corrective actions have been implemented to ensure that the intended functions of the affected bolting are maintained.

The following representative examples of internal operating experience are based on a review of Corrective Action Program items and were considered in evaluating the effectiveness of the program:

In February 2006, leaking water from a service water strainer was identified as the cause of corrosion discovered on the anchor bolts and base plate of a Service Water System pump. An inspection of the corrosion determined that it was moderate surface rust and that the nuts, bolts, and base plate would function adequately. The Service Water strainer packing leak was repaired and the surface of the base plate was cleaned and inspected.

In May 2006, the disassembly of a four-inch Service Water flange required a VT-3 visual examination of the flange's eight studs and 16 nuts. Two flange studs when examined were considered rejectable. One stud had a damaged thread outside the zone of thread engagement, and one stud was difficult to reinsert into the flange. Although both of these studs were acceptable per plant procedure and ASME XI requirements, as a good practice and conservative measure, they were replaced.

In October 2006, a VT-3 visual inspection of a Service Water valve's 16 body-to-bonnet valve nuts identified six nuts that appeared to have cracking. All 16 of the nuts were replaced. The six nuts that had been identified to have visual indications were given a magnetic particle examination and a liquid penetrant examination. The indications that were noted visually could not be verified by these subsequent examinations. Upon enhanced visual examination, these indications were judged to be blemishes inherent from the manufacturing process with very little to no depth. There were no cracks present on these nuts.

Conclusion

The *Bolting Integrity* program ensures that the effects of aging associated with the in-scope bolting will be adequately managed so that there is reasonable assurance that their intended functions will be maintained consistent with the current licensing basis throughout the period of extended operation.

B2.1.6 BORIC ACID CORROSION

Program Description

The *Boric Acid Corrosion* program manages the aging effect of loss of material for the aluminum, copper alloys, electrical conductor material, and steel for the in-scope systems, structures, and components that are subject to borated water leakage.

The *Boric Acid Corrosion* program performs visual inspections to identify boric acid leakage. The scope of the program includes those systems and components, which are:

- Potential sources of borated water leakage
- Potential targets of borated water leakage.

The *Boric Acid Corrosion* program includes requirements for ensuring that the in-scope systems, structures, and components susceptible to boric acid corrosion are properly monitored and that loss of material due to boric acid is consistently identified, documented, evaluated, trended, and effectively repaired. This program provides the systematic measures for ensuring that corrosion caused by leaking borated water does not lead to degradation of the systems or components from which the boric acid leaked or the adjacent structures and components.

Generic Letter 88-05, "Boric Acid Corrosion of Carbon Steel Reactor Pressure Boundary Components in PWR Plants" and industry guidance are used as reference documents for providing guidance for evaluating the severity of boric acid leakage and for determining the appropriate corrective actions.

The *Boric Acid Corrosion* program is supported by the inspection opportunities afforded by the External Surfaces Monitoring and ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD programs that perform activities such as inspections performed during plant operator rounds, system engineer walkdowns, inservice inspection pressure tests and inspections, and Reactor Containment Vessel inspections performed during power operation and immediately following a unit shutdown. The *Boric Acid Corrosion* program inspections support the Bolting Integrity program to manage the in-scope bolting for plant systems, structures, and components.

The Alloy 600 Inspections program provides the aging management of the Alloy 600 base metal and Alloy 82/182 dissimilar metal welds, and the Alloy 690 base metal and Alloy 52/152 dissimilar metal welds.

NUREG-1801 Consistency

The *Boric Acid Corrosion* program is an existing program that is consistent with the recommendations of NUREG-1801, Section XI.M10, "Boric Acid Corrosion."

Exceptions to NUREG-1801

The *Boric Acid Corrosion* program takes no exceptions to the recommendations of NUREG-1801, Section XI.M10 "Boric Acid Corrosion."

Enhancements

The *Boric Acid Corrosion* program does not require enhancement to be consistent with the recommendations of NUREG-1801, Section XI.M10 "Boric Acid Corrosion."

Operating Experience

Operating experience indicates that the *Boric Acid Corrosion* program is effective in identifying the presence of boric acid deposits and corrosion, evaluating the degradation, and implementing corrective actions. When degradation has been identified, corrective actions have been implemented to ensure that the intended functions of the affected components and structures are maintained.

The following representative examples of internal operating experience are based on a review of Corrective Action Program items and were considered in evaluating the effectiveness of the program:

In June 2003, as result of a review of the implementing procedures against industry guidance it was determined that an administrative procedure was needed to define the boric acid corrosion control responsibilities and to establish the training and qualification requirements for plant personnel involved with the control of boric acid corrosion. In August 2003, while the administrative procedure was being written, additional industry feedback indicated the need to upgrade the program to adopt the additional industry guidance. The program implementing procedure was subsequently issued and included the recommendations of the applicable industry guidance.

In June 2004, a constant small packing leak was identified on a Chemical and Volume Control System valve. The evaluation of the leak determined the valve body was stainless steel and not susceptible to boric acid corrosion. The packing gland studs were carbon steel and were visually inspected and showed no signs of corrosion. Periodic cleaning of the valve was initiated until the maintenance could be performed. The valve was repacked during the 2004 refueling outage, which corrected the leakage. Additional inspections performed during this maintenance confirmed that there was no degradation of the stainless steel valve body or the carbon steel packing gland bolting.

In November 2005, during a hot shutdown walkdown, a moderate amount of dry boric acid was discovered on the valve body of a Reactor Coolant System instrument isolation valve and the support located below the valve. The subsequent evaluation and inspection determined that the valve was stainless steel and not susceptible to boric acid corrosion and that the carbon steel support was not degraded. The packing of the valve was adjusted. Follow-up inspection of this leak location verified that the packing adjustment was successful.

In January 2006, an inspection of a Residual Heat Removal System pump showed a moderate amount of dry boric acid at the seal area and a small amount of dry boric acid at several of the pump flange studs and nuts. It was determined that this pump leakage had originally been identified two years earlier when boric acid residue was observed at the pump seal and on two of the 24 pump casing studs and nuts. An evaluation was performed to determine why frequent periodic inspections and repairs were not initiated in a timely manner in accordance with the *Boric Acid Corrosion* program. As a result of the evaluation, the implementing procedure was revised to provide enhanced monitoring for increased leakage, to clarify the importance of cleaning and monitoring of boric acid deposits regardless of accessibility problems, and to include a requirement that periodic reports of the status of boric acid leakage be provided to plant management to maintain focus on addressing this leakage.

In June 2007, as a result of a *Boric Acid Corrosion* program self-assessment, it was determined that the station management's expectations for the identification of system leakage, including boric acid leakage, needed to be better defined and communicated to all site personnel. To accomplish this, a Boric Acid Corrosion Control Policy and a Leak Management Expectations document were developed and issued. The Boric Acid Corrosion Control Policy stated that the objective of the policy was to ensure that all leakage from borated water system is promptly identified, documented in a condition report, and effectively addressed in a timely manner. The Leak Management Expectations document stated that all Station Personnel should be sensitive and intolerant to system, component, and/or equipment leakage and should ensure a condition report and work request are submitted.

In October 2007, it was identified that boric acid leaks discovered during a planned outage were not presented to management in a timely manner for determination of when repair is needed. It was several days between the initial Reactor Containment Vessel walkdowns and the presentation of the leak list and recommendations for repair. It was noted that this was not consistent with the established management expectations. The program procedure was revised to include the expectation to provide the list of leaks identified during the Reactor Containment Vessel walkdowns for forced shutdowns and for refueling outages within 24 hours or 72 hours of the walkdown, respectively.

Conclusion

The *Boric Acid Corrosion* program ensures that the effects of aging associated with the in-scope components and structures will be adequately managed so that there is reasonable assurance that their intended functions will be maintained consistent with the current licensing basis throughout the period of extended operation.

B2.1.7 BURIED PIPING AND TANKS INSPECTION

Program Description

The *Buried Piping and Tanks Inspection* program manages the aging effect of loss of material for the buried steel (including cast iron) and stainless steel components such as piping, valves, and tanks in the in-scope buried portions of the Circulating Water System, Emergency Diesel Generators fuel oil system, Technical Support Center Diesel Generator fuel oil system, and Fire Protection System.

The program includes the use of preventive measures, such as coatings and wrappings.

The *Buried Piping and Tanks Inspection* program performs visual inspections of the external surface of a representative sample of the following material/protective measures combinations of the in-scope buried piping and components:

- Steel (including cast iron)/coated,
- Steel/coated and wrapped,
- Steel/uncoated, and
- Stainless steel/coated and wrapped.

The program inspects for evidence of damaged wrapping; coating defects, such as coating perforation, holidays, or other damage; and evidence of loss of material on the external surface of the piping or component.

Opportunistic inspections of the buried material/protective measures combinations are performed using the work management process, which is applicable to all corrective, investigative, and preventive maintenance and modification installation activities. Due to the comprehensive scope of the work management process, the process provides the opportunity to visually inspect the external surface of a representative sample of the buried material/protective measures combinations.

For those in-scope systems where the opportunistic inspections do not provide a representative sample of the material/protective measures combinations, deliberate inspections will be performed. The supplemental deliberate inspections will ensure that a representative sample of the buried material/protective measures combinations is inspected.

The inspections performed by the Open-Cycle Cooling Water System and Selective Leaching of Materials programs provide support for the management of the buried piping and tanks.

NUREG-1801 Consistency

The *Buried Piping and Tanks Inspection* program is an existing program that is consistent with the recommendations of NUREG-1801, Section XI.M34, "Buried Piping and Tanks Inspection."

Exceptions to NUREG-1801

The *Buried Piping and Tanks Inspection* program takes no exceptions to the recommendations of NUREG-1801, Section XI.M34, "Buried Piping and Tanks Inspection."

Enhancements

Enhancement 1: Program Inspection Implementation

The *Buried Piping and Tanks Inspection* program will be enhanced to perform the opportunistic and deliberate inspections of a representative sample of the in-scope buried material/protective measure combinations.

The supplemental deliberate inspections will ensure that a representative sample of the buried material/protective measures combinations will be inspected prior to the period of extended operation. An engineering evaluation will determine whether additional periodic inspections are required during the period of extended operation.

The program will identify the need to perform and document the inspections of the identified buried material/protective measure combinations, when performing maintenance activities on the in-scope systems.

Preventive maintenance activities will be created and implemented in accordance with the work management process to perform the required inspections. These inspections can be performed as opportunistic inspections or as deliberate inspections. If opportunistic inspections do not occur, a deliberate inspection will be performed within ten years after entering the period of extended operation.

This commitment is identified in Appendix A, Table A6.0-1 License Renewal Commitments, Item 4.

Program Elements Affected

- **Element 3: Parameters Monitored or Inspected**

  Implementing the opportunistic and deliberate inspections within the work management process will ensure that in-scope buried components are inspected for loss of material due to corrosion as recommended by NUREG-1801, Section XI.M34.

- **Element 4: Detection of Aging Effects**

  Implementing the opportunistic and deliberate inspections within the work management process will ensure that loss of material of the in-scope buried components is detected prior to a loss of their intended function.

Operating Experience

Though the *Buried Piping and Tanks Inspection* program is an existing program, a limited number of inspections have been performed. This limited operating experience indicates that the *Buried Piping and Tanks Inspection* program is effective in identifying loss of material, evaluating the degradation, and implementing corrective actions.

In August 2005, the System Engineer identified that the external surface of the 12-inch underground firewater header around the perimeter of the plant should be inspected. This inspection was identified as an extent of condition assessment since the underground firewater header is of similar design and construction to the potable water piping. The underground potable water piping had been replaced due to degradation. In July 2007, a section of the underground firewater header was excavated for inspection. The section chosen for the excavation was the oldest piping section and was installed in 1967. As part of the excavation, soil samples were taken to determine if the soils are considered corrosive to ductile iron. The excavated piping was inspected to determine the condition of the pipe coating and wall. The results of the inspection were evaluated, including an evaluation by an expert in ductile iron, and concluded the piping was adequate for continued use.

Conclusion

The *Buried Piping and Tanks Inspection* program ensures that the effects of aging associated with the in-scope buried components will be adequately managed so that there is reasonable assurance that their intended functions will be maintained consistent with the current licensing basis throughout the period of extended operation.

B2.1.8 CLOSED-CYCLE COOLING WATER SYSTEM

Program Description

The *Closed-Cycle Cooling Water System* program manages the aging effects of cracking, loss of material, and reduction of heat transfer for the steel, stainless steel, and copper alloys in the piping, heat exchangers, and other components in the Component Cooling System, Emergency Diesel Generator cooling water subsystems, and Control Room Air Conditioning System. The Component Cooling

System provides cooling water to a number of heat exchangers and other equipment in other systems that are included in the scope of the program.

The *Closed-Cycle Cooling Water System* program manages the in-scope systems with appropriate chemistry control and performance monitoring.

The chemistry controls establish the appropriate corrosion control strategies and chemistry specifications, including the use of inhibitors, for each of the closed-cycle cooling water systems based on EPRI 1007820 "Closed Cooling Water Chemistry Guideline, Revision 1."

The performance of the closed-cycle cooling water systems and components is monitored to verify the effectiveness of the chemistry controls. The performance monitoring includes system operation monitoring, system testing, heat exchanger thermal performance testing, heat exchanger tube eddy current testing, and pump performance testing.

The Work Control Process program provides additional verification of the effectiveness of the *Closed-Cycle Cooling Water System* program chemistry controls.

NUREG-1801 Consistency

The *Closed-Cycle Cooling Water System* program is an existing program that is consistent with the recommendations of NUREG-1801, Section XI.M21, "Closed-Cycle Cooling Water System," with the exceptions described below.

Exceptions to NUREG-1801

Exception 1: Lack of Corrosion Inhibitor in Control Room Air Conditioning System

Corrosion inhibitors are not used in the Control Room Air Conditioning System as recommended in NUREG-1801, Section XI.M21.

Justification

The Control Room Air Conditioning System is filled with softened potable water. No corrosion inhibitors are used in this system because the system interconnects with the Service Water System. As discussed in USAR Section 9.6.4, the Service Water System provides an alternate safety-related cooling mode. This mode is tested periodically and would result in the release of any inhibitors to the environment.

In lieu of the use of corrosion inhibitors, the system is periodically sampled to verify that the chemistry program is maintaining the system integrity.

The *Work Control Process* program performs visual inspections of piping, valve, heat exchanger, and other component internals during preventive and corrective maintenance and whenever the systems are opened for another reason. These inspections will inspect a representative sample of the material/environment combinations, including stagnant locations, in the systems within the scope of the program. For the systems within the scope of the *Closed-Cycle Cooling Water System* program, these inspections provide verification of the adequacy of the chemistry program for the closed-cycle cooling water systems.

Therefore, even though corrosion inhibitors are not used as recommended by NUREG-1801, Section XI.M21, the monitoring and inspections performed for the system and the availability of the safety-related alternate cooling mode do provide assurance that the system will perform its intended function.

Program Elements Affected

- **Element 2: Preventive Actions**

  Corrosion inhibitors are not used in the Control Room Air Conditioning System as recommended in NUREG-1801, Section XI.M21, due to its interconnection with the Service Water System. However, the monitoring and inspections performed for the system and the availability of the safety-related alternate cooling mode do provide assurance that the system will perform its intended function.

Exception 2: Use of a Different Revision of an EPRI Guideline

The *Closed-Cycle Cooling Water System* program is implemented using the guidance of EPRI 1007820 "Closed Cooling Water Chemistry Guideline, Revision 1." NUREG-1801, Section XI.M21 recommends the use of EPRI TR-107396, "Closed Cooling Water Chemistry Guidelines," 1997 Revision. EPRI 1007820 is the 2004 revision to EPRI TR-107396.

Justification

EPRI periodically updates industry water chemistry guidelines, as new information becomes available. The most significant difference between EPRI 1007820 and TR-107396 is that the new revision provides more prescriptive guidance and has a more conservative monitoring approach. EPRI 1007820 meets the same requirements as EPRI TR-107396 to maintain conditions that minimize corrosion and microbiological growth in closed cooling water systems for effectively mitigating many aging effects. Therefore, the use of a different version of the EPRI guideline than recommended in NUREG-1801, Section XI.M21, does provide assurance that the chemistry of the closed-cycle cooling water systems is properly controlled and meets the intent of the NUREG.

Program Elements Affected

- **Element 2: Preventive Actions**

  The implementation of EPRI 1007820 results in specific chemistry action levels that are more restrictive than those allowed in TR-107396.

Exception 3: Thermal Performance Testing Parameters

Differential pressure is not monitored as part of the thermal performance testing of the component cooling heat exchangers as recommended by NUREG-1801, Section XI.M21.

Justification

The use of corrosion inhibitors will prevent gross degradation of the closed-cooling water system side of the heat exchangers to the degree that the system flow rate is adversely affected. The periodic thermal performance and heat exchanger tube eddy current testing and the frequent chemistry sampling of the closed-cycle cooling water systems provide verification that the chemistry controls are preventing such degradation.

The parameters monitored during the thermal performance testing do provide an indirect indication that the heat exchanger differential pressure is not increasing. An increase in differential pressure would result in a decrease in heat exchanger shell side flow and an increase in the differential between shell side inlet and outlet temperature. The monitoring performed would identify these performance changes.

Therefore, even though the parameters monitored during the thermal performance testing do not meet the recommendations of NUREG-1801, Section XI.M21, the testing performed does provide assurance that the heat exchangers are not degrading and will perform their intended function.

Program Elements Affected

- **Element 3: Parameters Monitored or Inspected**

  The parameters monitored during the heat exchanger thermal performance testing are in agreement with the parameters recommended by NUREG-1801, Section XI.M21, except that heat exchanger differential pressure is not monitored.

Exception 4: Heat Exchanger Thermal Performance Testing

Thermal performance testing is not performed for the heat exchangers included in the Component Cooling System cooling loop that are part of other systems or the Emergency Generator cooling water subsystem heat exchangers and lube oil coolers.

Justification

The use of corrosion inhibitors in the Component Cooling System and Emergency Generator cooling water subsystem prevents gross degradation of the heat exchangers to the degree that the system flow rate is adversely affected. The frequent chemistry sampling of the system provides verification that the chemistry controls are preventing such degradation.

The Component Cooling System is in continuous operation and the system performance, including system flow rates and temperatures, is monitored on a continual basis. The flow and temperatures of the heat exchangers in the cooling loop are also monitored.

The Emergency Generator cooling water subsystem heat exchangers and lube oil coolers are not thermal performance tested because previous testing has shown that valid results cannot be obtained due to the configuration of the heat exchangers. In lieu of thermal performance testing, the heat exchangers are periodically inspected and flushed as discussed below.

The performance of the Emergency Diesel Generator cooling water subsystem is monitored during the periodic testing of the associated Emergency Diesel Generator. The monitoring includes recording heat exchanger inlet and outlet temperature, engine water temperature, and cylinder temperatures. This data provides adequate information to monitor changes in the performance of the system that would indicate heat exchanger degradation.

The Emergency Diesel Generator cooling water subsystems are periodically drained and flushed. During this maintenance, the Emergency Diesel Generator cooling water heat exchangers are visually inspected and the heat exchanger tubes are cleaned. If the temperatures monitored during Emergency Diesel Generator operation indicate a need to perform lube oil cooler maintenance, it is also performed.

In addition, the tubes of the Emergency Diesel Generator cooling water heat exchangers are periodically eddy current tested.

The *Work Control Process* program performs visual inspections of piping, valve, heat exchanger, and other component internals during preventive and corrective maintenance and whenever the systems are opened for another reason. These inspections will inspect a representative sample of the material/environment combinations, including stagnant locations, in the systems within the scope of the program. These inspections provide verification of the adequacy of the chemistry program for the closed-cycle cooling water systems.

The combination of chemistry control, visual inspection, cleaning, flushing, and nondestructive examinations, as applicable, applied to these heat exchangers, will provide adequate assurance that the heat transfer capability of the heat exchangers is being maintained consistent with the current licensing basis.

<u>Program Elements Affected</u>

- **Element 3: Parameters Monitored or Inspected**

  Though thermal performance testing is not performed for the heat exchangers in the Component Cooling System cooling loop that are part of other systems or the Emergency Generator cooling water subsystem heat exchangers and lube oil coolers, the thermal performance of the heat exchangers is maintained by chemistry control and maintenance, and is monitored during normal operation and surveillance testing, as applicable. This combination of chemistry, maintenance, and monitoring provides assurance that the heat exchangers will perform their intended function.

Exception 5: Control Room Air Conditioning Chilled Water Performance Monitoring

The air handling units and pumps in the Control Room Air Conditioning System are not performance tested as recommended in NUREG-1801, Section XI.M21.

Justification

The Control Room Air Conditioning System is in continuous operation. The system performance is monitored and alarmed in the control room. The pumps and air handling units are inspected and cleaned on a 12-month frequency.

Additionally, as discussed in USAR Section 9.6.4, an alternate cooling mode using service water is the safety-related cooling mode. This cooling mode does not depend on the functioning of the chilled water pumps.

The *Work Control Process* program performs visual inspections of piping, valve, heat exchanger, and other component internals during preventive and corrective maintenance and whenever the systems are opened for another reason. These inspections will inspect a representative sample of the material/environment combinations, including stagnant locations, in the systems within the scope of the program. For the systems within the scope of the *Closed-Cycle Cooling Water System* program, these inspections provide verification of the adequacy of the chemistry program for the closed-cycle cooling water systems.

Therefore, even though performance testing is not performed as recommended by NUREG-1801, Section XI.M21, the monitoring, maintenance, and inspections performed for the system and the availability of the safety-related alternate cooling mode do provide assurance that the system will perform its intended function.

Program Elements Affected

- **Element 3: Parameters Monitored or Inspected**

  The air handling units and pumps in the Control Room Air Conditioning System are not performance tested as recommended in NUREG-1801, Section XI.M21. However, the monitoring during normal operation, the periodic maintenance on the pumps and air handling units, and the availability of an alternate cooling mode provide assurance that the system will perform its intended function.

Enhancements

The *Closed-Cycle Cooling Water System* program does not require enhancement to be consistent with the recommendations of NUREG-1801, Section XI.M21, "Closed-Cycle Cooling Water System."

Operating Experience

Operating experience indicates that the *Closed-Cycle Cooling Water System* program is effective in identifying when water chemistry parameters are outside the predetermined range, evaluating the condition, and implementing corrective actions.

The following representative examples of internal operating experience are based on a review of Corrective Action Program items and were considered in evaluating the effectiveness of the program:

In May 2003, during an assessment of the Generic Letter 89-13 program, the following observations were made with regards to performance testing of the Emergency Diesel Generator cooling water heat exchangers: 1) insufficient warm up time was specified during heat exchanger performance testing; 2) throttling service water flow would provide more consistent performance test results; and 3) a heat balance check was not available to assess accuracy of measurements. The implementing procedure was revised to incorporate testing program improvements.

In October 2004, the analysis of the iron and copper levels in the Component Cooling System samples indicated a higher than expected concentration. The higher than normal levels resulted from a change in the sample analysis method. The implementing procedure typical values had not been updated when the new method was instituted. A revision to the procedure was issued providing the revised typical values for total iron and copper to account for the new analysis method.

In June 2005, the total iron analysis for the coolant of one Emergency Diesel Generator, sampled during the monthly operational test, showed increasing, though acceptable, concentrations during five of the previous six analyses. In contrast, for the other Emergency Diesel Generator, five of the previous six total iron analyses showed decreasing concentrations. Additional samples were analyzed by independent laboratories to verify the concentration results and to evaluate the potential for microbiologically induced corrosion. These evaluations of the elevated total iron concentration verified that no significant corrosion was occurring. Additionally, though bacteria were identified in the coolant, the low total count and type of bacteria did not indicate the potential for microbiologically induced corrosion.

In October 2006, following refilling and chemical addition of the Component Cooling System, analysis for Adenosine Triphosphate (ATP) indicated possible biological activity. As a result, Gluteraldehyde, an approved biocide, was added to the system. Subsequent, sampling for ATP showed a significant drop in the measured value indicating that the biocide addition had been effective. No additional Gluteraldehyde additions were planned.

Conclusion

The *Closed-Cycle Cooling Water System* program ensures that the effects of aging associated with the in-scope components will be adequately managed so that there is reasonable assurance that their intended functions will be maintained consistent with the current licensing basis throughout the period of extended operation.

B2.1.9 COMPRESSED AIR MONITORING

Program Description

The *Compressed Air Monitoring* program manages the aging effect of loss of material for the steel, stainless steel, and copper alloy components in the Station and Instrument Air System and the air start subsystems for the Emergency Diesel Generators.

The *Compressed Air Monitoring* program performs air quality sampling, visual inspections, and periodic testing to verify the adequacy of the air quality and to detect air leakage. The program addresses the requirements of NRC Generic Letter 88-14, "Instrument Air Supply System Problems Affecting Safety-Related Equipment."

Program implementing procedures establish the air quality and monitoring requirements for the in-scope systems. The program uses ISA-S7.0.01-1996, "Quality Standard for Instrument Air" as the basis for the minimum sample frequency, parameters to be monitored, and limits to ensure adequate air quality necessary for system operation.

Visual inspections are performed as part of the preventive maintenance program for the Station and Instrument Air System and air start subsystems for the Emergency Diesel Generators. The Work Control Process program provides additional opportunities to inspect the internal surfaces of these systems during maintenance activities.

Periodic testing includes leakage monitoring and component performance testing. Leak testing is performed for the Emergency Diesel Generator air start systems and for the air operated valves supplied air by the Station and Instrument Air System. Component performance testing for the Station and Instrument Air focuses on the reliability of the end air operated components. Testing of the Emergency Diesel

Generator air start systems is included in the Emergency Diesel Generator surveillance testing.

NUREG-1801 Consistency

The *Compressed Air Monitoring* program is an existing program that is consistent with the recommendations of NUREG-1801, Section XI.M24, "Compressed Air Monitoring," with the exception noted below.

Exceptions to NUREG-1801

Exception 1: Lack of System Leak Testing for Station and Instrument Air System

Leak testing is not performed for the Station and Instrument Air System distribution network as recommended by NUREG-1801, Section XI.M24.

Justification

The *Compressed Air Monitoring* program manages and monitors the aging of the Station and Instrument Air System with a combination of preventive and monitoring activities:

- The system is maintained free of significant contaminants and water, which limits the potential for loss of material in the system.
- Preventive maintenance provides the opportunity to visually inspect and test air actuated components to detect corrosion products in the system.
- The *Work Control Process* program provides additional opportunities to inspect the internal surfaces of the Station and Instrument Air System.

This combination of preventive and monitoring activities is an effective approach to managing loss of material in the Station and Instrument Air System consistent with the intent of the NUREG-1801, Section XI.M24, recommendations.

<u>Program Elements Affected</u>

- **Element 4: Detection of Aging Effects**

  The combination of preventive and monitoring activities performed for the Station and Instrument Air System limits the potential for loss of material in the system and provides the opportunity to detect the aging effect prior to loss of the system pressure boundary. This approach is consistent with the intent of the NUREG-1801, Section XI.M24, recommendations.

Enhancements

Enhancement 1: Implementation of Industry Guidelines

The *Compressed Air Monitoring* program will be enhanced to incorporate the compressed air system testing and maintenance recommendations from ASME OM-S/G-1998, Part 17 and EPRI TR-108147 and to identify these documents as part of the program basis.

ASME OM-S/G-1998, Part 17, Section 5.3, "Inservice Performance Tests" identifies periodic testing that should be performed for instrument air systems. The testing requirements will be proceduralized for the Instrument and Station Air System.

EPRI TR-108147, Section 8, "Compressed Air System Maintenance" provides preventive maintenance practices to maintain the system "to operate at optimum efficiency." Maintenance practices and procedures will be revised to incorporate these recommendations. NUREG-1801, Section XI.M24, identifies both EPRI NP-7079 and EPRI TR-108147 as bases documents for the *Compressed Air Monitoring* program and recognizes that TR-108147 provides the latest guidance for system maintenance. Therefore, reviewing and incorporating the applicable recommendations from TR-108147 will bring the *Compressed Air Monitoring* program into alignment with the NUREG-1801, Section XI.M24, recommendations.

This commitment is identified in Appendix A, Table A6.0-1 License Renewal Commitments, Item 5.

Program Elements Affected

- **Element 4: Detection of Aging Effects**

  Implementation of the enhanced testing and maintenance practices will ensure that the compressed air systems can perform their intended function.

Operating Experience

Operating experience indicates that the *Compressed Air Monitoring* program is effective in identifying system degradation, including loss of material and degraded air quality, which could lead to loss of material, evaluating the degradation, and implementing corrective actions. When degradation has been identified, corrective actions have been implemented to ensure that the intended functions of the affected components are maintained.

The following representative examples of internal operating experience are based on a review of Corrective Action Program items and were considered in evaluating the effectiveness of the program:

In July 2005, following preventive maintenance, a Station and Instrument Air System air compressor was started and tripped on "HP Air Outlet Temp High Trip." The cause of the elevated temperature was determined to be a leaking "equalizing" line on the high pressure element. The leakage was of sufficient volume that it would cause elevated temperatures. The high pressure element was replaced as a unit.

In January 2007, during a plant tour, it was identified that there was a possibility for both station air compressors to be degraded due to separate deficiencies. For one air compressor, the intercooler pressure was outside the acceptable band. The area cooling fan coil unit providing cooling to the other station air compressor was exhibiting degraded performance. The compressor intercooler and the fan coil unit were cleaned to restore compressor and area cooling system performance.

In July 2007, during the performance of preventive maintenance of the air compressor intercooler and aftercooler, it was identified that the fin sides of the coolers were fouled with dust and dirt. Though not part of the preventive maintenance activity, the air side of the oil cooler was also inspected and was also found to be fouled. It was determined that the method being used to clean the coolers was not effective in removing the debris on the fins. The preventive maintenance procedure has been changed to require removal of the intercooler, aftercooler, and oil cooler for cleaning and the use of pressurized water for rinsing the fins after cleaning. The frequency of the preventive maintenance was also increased.

Conclusion

The *Compressed Air Monitoring* program ensures that the effects of aging associated with the in-scope components will be adequately managed so that there is reasonable assurance that their intended functions will be maintained consistent with the current licensing basis throughout the period of extended operation.

B2.1.10 EXTERNAL SURFACES MONITORING

Program Description

The *External Surfaces Monitoring* program manages the aging effects of change in material properties, cracking, delamination, loss of material, and hardening and loss of strength by visually inspecting the external surfaces of in-scope components, piping, supports, structural members, and structural commodities, whether they are constructed of metal or elastomers.

The program includes components, piping, supports, structural members, and structural commodities fabricated of aluminum, copper alloys, elastomers, stainless steel, and steel. The NUREG-1801, Section XI.M36, program focuses on components fabricated of steel. The aging effect managed by the program for the non-steel metallic materials is loss of material, which is the same aging effect as for steel and can be managed by the program inspections. A limited number of elastomeric component types are included in the program. The Operations and Engineering inspections, discussed below, include specific inspections of the elastomer materials for the managed aging effects.

The program credits the activities of Operations, Engineering and Health Physics to perform the external surface visual inspections.

The *External Surfaces Monitoring* program takes an areas approach for monitoring the condition of plant equipment. In the areas approach, the plant is segregated into areas that contain the equipment or structural commodities being evaluated. These areas can range from a specific area of a room, an entire room, a floor of a building or an entire building. The personnel performing the External Surfaces Monitoring inspections inspect a representative sample of the materials/environment combinations in that area looking for indications of aging, such as loss of material, loss of sealing, or leakage, on the components, structural members, and structural commodities in the area.

Nuclear Auxiliary Operators perform rounds each shift in accessible plant areas to verify acceptable component or system operation. General walkdowns and inspections are performed in addition to those required to meet Technical Specification surveillance requirements. The implementing procedure provides a list of the general inspections performed during rounds, which includes specific inspection details related to monitoring equipment aging.

System Engineers perform comprehensive visual inspections during walkdowns of the systems they are responsible for during both normal operation and refueling outages. The walkdown activities ensure that the System Engineers maintain current awareness of system and plant materiel conditions and allow for the identification and resolution of discrepancies. The implementing procedure provides the guidance for System Engineer walkdowns and provides a walkdown checklist of attributes to be observed, which includes inspection criteria related to aging management. The walkdowns are scheduled based on the system availability and the results of previous inspections, but the walkdowns occur at least once per refueling cycle as recommended in NUREG-1801, Section XI.M36.

Health Physics technicians routinely perform radiological surveys in the radiologically controlled areas of the plant and look for any evidence of boron precipitation and active radioactive system leaks observed while performing these surveys.

The *External Surfaces Monitoring* program inspections provide support to the Bolting Integrity and Boric Acid Corrosion programs.

NUREG-1801 Consistency

The *External Surfaces Monitoring* program is an existing program that is consistent with the recommendations of NUREG-1801, Section XI.M36, "External Surfaces Monitoring."

Exceptions to NUREG-1801

The *External Surfaces Monitoring* program takes no exceptions to the recommendations of NUREG-1801, Section XI.M36, "External Surfaces Monitoring."

Enhancements

Enhancement 1: Infrequently Accessed Areas Inspections

The *External Surfaces Monitoring* program will be enhanced to inspect the accessible external surfaces of in-scope components, piping, supports, structural members, and structural commodities, in the infrequently accessed areas, consistent with the criteria used in other plant areas.

This commitment is identified in Appendix A, Table A6.0-1 License Renewal Commitments, Item 6.

<u>Program Elements Affected</u>

- **Element 1: Scope of Program**

  The program enhancement will ensure that the accessible external surfaces of in-scope components, piping, supports, structural members, and structural commodities, in the infrequently accessed areas are inspected consistent with the NUREG-1801, Section XI.M36 recommendations.

- **Element 3: Parameters Monitored or Inspected**

  The program enhancement will ensure that the *External Surfaces Monitoring* program inspection criteria for the infrequently accessed areas are consistent with the NUREG-1801, Section XI.M36 recommendations.

Enhancement 2: Inspections and Walkdowns Training

The *External Surfaces Monitoring* program will be enhanced to provide training for Operations, Engineering, and Health Physics personnel performing the program inspections and walkdowns. The training will address the requirements of the *External Surfaces Monitoring* program for license renewal, the need to document the identified conditions with sufficient detail to support monitoring and trending the aging effects, and the aging effects monitored by the program and how to identify them.

This commitment is identified in Appendix A, Table A6.0-1 License Renewal Commitments, Item 7.

Program Elements Affected

- **Element 5: Monitoring and Trending**

  The enhanced training for personnel performing *External Surfaces Monitoring* program inspections and walkdowns will make the program consistent with the recommendation of NUREG-1801, Section XI.M36.

Operating Experience

Operating experience indicates that the *External Surfaces Monitoring* program is effective in identifying change in material properties, cracking, delamination, loss of material, and hardening and loss of strength, evaluating the degradation, and implementing corrective actions. When degradation has been identified, corrective actions have been implemented to ensure that the intended functions of the affected supports, piping, and components are maintained.

The following representative examples of internal operating experience are based on a review of Corrective Action Program items and were considered in evaluating the effectiveness of the program:

In December 2001, Health Physics personnel identified a leak on the shaft of the chemical volume control tank recirculation pump. The seal leakage was evaluated and it was determined that the pump remained capable of performing its functions of mixing the contents of the hold up tanks and transferring the contents from one tank to another. The seal was subsequently repaired and the pump was returned to its design configuration.

In January 2002, Operations personnel identified that a penetration located in the wall separating the two component cooling pumps was degraded. This penetration is a fire barrier. The degradation was caused by normal aging of the flamastic material used to cover the outer surface of the penetration. Over extended periods of time aging of this material will often result in minor surface cracking, which will worsen gradually over time. Minor cracks in this material will not impact the functional capability of the penetration seal. The established process for identified penetration seal degradation was followed. The immediate contingency action taken was to establish a fire watch within one hour of identification. Subsequently, the penetration was repaired and returned to its design configuration.

In July 2006, Engineering personnel identified that the feedwater impingement barrier piping sleeve downstream of a feedwater isolation valve was exhibiting signs of external general corrosion. The corrosion appeared to be uniform general oxidation of the external surface. Wall thickness measurements of the sleeve at five separate locations revealed that the sleeve wall thickness was still approximately one inch, as originally designed. Painting of the jet impingement barrier will be performed in accordance with the design requirements to prevent further external general corrosion.

In July 2007, Engineering personnel identified that the rubber connection boot on the discharge side of the TSC HVAC return air fan was degraded. The degradation was minor cracking of the rubber boot. It was determined that the boot remains intact and capable of performing its function. Repair/replacement of the boot is planned.

Conclusion

The *External Surfaces Monitoring* program ensures that the effects of aging associated with the in-scope components, piping, supports, and miscellaneous structural commodities will be adequately managed so that there is reasonable assurance that their intended functions will be maintained consistent with the current licensing basis throughout the period of extended operation.

B2.1.11 FIRE PROTECTION

Program Description

The *Fire Protection* program manages the aging effects of change in material properties, cracking, delamination, increased hardness, loss of material, loss of sealing, loss of strength, shrinkage, and spalling for the fire protection components and features.

The *Fire Protection* program performs chemical treatment and periodic flushing of the water-based fire suppression system and periodic inspection and testing of the water-based, CO_2, and halon fire suppression systems. The program also performs visual inspections of fire barriers, fire barrier penetrations and seals, fire barrier expansion joints, doors,[1] fire wraps, and the reactor coolant pump oil collection system to detect degradation.

The water-based, CO_2, and halon fire suppression systems provide fire protection for both safety-related and non-safety-related plant areas. The chemical treatment and periodic flushing of the water-based fire suppression systems reduce the potential for significant corrosion, microbiologically-influenced corrosion, or biofouling. The periodic inspections and tests of the fire suppression systems verify the functionality of the automatic and manual features of these systems, the ability of the system to maintain operating pressures, provide confirmation of adequate system flow, and provide visual confirmation of flow through the discharge nozzles, as appropriate. The above ground piping in the water-based fire suppression system is inspected, including volumetric testing, to detect pipe wall thinning and internal blockage from silting and corrosion products. The systems are visually inspected upon each entry to the systems for routine or corrective maintenance.

The *Fire Protection* program includes inspection criteria for the visual inspections of the fire barriers, fire barrier penetrations and seals, fire barrier expansion joints, doors, and fire wraps, and the reactor coolant pump oil collection system to verify that the fire protection feature is being adequately maintained. The program provides guidance for inspecting and testing smoke detectors and manual pull stations.

1. The doors included in the *Fire Protection* program inspections serve one or more functions, including fire door, steam exclusion door, special ventilation door, Control Room exclusion zone door, or flood door. Though some of these doors may not be fire doors, they are inspected in accordance with the program implementing procedure.

The Structures Monitoring Program, Work Control Process, Buried Piping and Tanks Inspection, and Selective Leaching of Materials programs perform inspections that provide additional fire protection component and feature aging management.

NUREG-1801 Consistency

The *Fire Protection* program is an existing program that is consistent with the recommendations of NUREG-1801, Sections XI.M26, "Fire Protection" and XI.M27, "Fire Water System," with the exception described below.

Exceptions to NUREG-1801

Exception 1: XI.M26 - Halon and CO_2 Performance Testing Frequencies

The inspections and performance testing for the halon fire suppression system and the CO_2 fire suppression system for the relay room and the turbine bearing are not performed on a frequency consistent with the NUREG-1801, Section XI.M26, recommendations.

Justification

The halon fire suppression system is designed, inspected, and tested in accordance with National Fire Protection Association 12A 1973, which is the code of record for the system. Level measurements of the halon cylinders are performed semi-annually consistent with the recommendations of NUREG-1801, Section XI.M26. The inspection and full testing for the system is performed annually. Based on industry experience, Nuclear Electric Insurance Limited currently permits testing of these systems on an 18-month frequency.

The CO_2 fire suppression system is comprised of a number of subsystems providing protection for various plant areas. All but two of these subsystems are inspected and performance tested semi-annually consistent with the recommendations of NUREG-1801, Section XI.M26.

NFPA 12 includes allowed exceptions for inspection and testing due to the potential to disrupt plant operations. The testing of the two subsystems could disrupt plant operations as follows:

- Relay room CO_2 subsystem -- Testing has the potential to disrupt activities in the control room, which has a common ventilation system with the relay room.

- Turbine bearing CO_2 subsystem -- Due to the design of the subsystem, it is not possible to verify nozzle flow during power operation.

The inspection and testing intervals for halon and the CO_2 fire suppression systems are consistent with NUREG-1801, Section XI.M26, except for the identified exceptions. Where the inspections and testing are not consistent with the NUREG-1801, Section XI.M26, recommendations, the inspections and testing are consistent with the NFPA codes covering these systems and safe operating practices. The inspection intervals provide assurance that the systems are performing as designed consistent with the recommendations of NUREG-1801, Section XI.M26.

Program Elements Affected

- **Element 5: Monitoring and Trending**

  The intervals for performance testing the halon fire suppression system and the CO_2 fire suppression system for the relay room and the turbine exceed the NUREG-1801, Section XI.M26, recommendations. However, the intervals at which the inspections are performed are based on the NFPA codes covering these systems and safe operating practices and provides adequate opportunity to examine the systems for signs of degradation.

Enhancements

Enhancement 1: XI.M27 - Inspect or Replace Fire Sprinklers

The *Fire Protection* program will be enhanced to test a representative sample of sprinkler heads or to replace all affected sprinkler heads in accordance with the requirements of NFPA 25.

This commitment is identified in Appendix A, Table A6.0-1 License Renewal Commitments, Item 8.

Program Elements Affected

- **Element 4: Detection of Aging Effects**

  Testing or repairing the sprinkler heads in accordance with NFPA 25 will align the *Fire Protection* program with the NUREG-1801, Section XI.M27, recommendations.

Enhancement 2: XI.M26 - Shield Building Penetration Inspections

The *Fire Protection* program fire barrier penetration seal inspections will be revised to include the elastomer Shield Building fire boots.

The inspection criteria for these penetrations and seals and fire barriers expansion joints will be:

- Loss of material due to corrosion, and
- Loss of sealing due to degradation of the elastomer boot.

This commitment is identified in Appendix A, Table A6.0-1 License Renewal Commitments, Item 9.

Program Elements Affected

- **Element 3: Parameters Monitored or Inspected**

  The inclusion of loss of material due to corrosion and loss of sealing as inspection criteria will align the *Fire Protection* program inspections with the NUREG-1801, Section XI.M26, program recommendations.

- **Element 4: Detection of Aging Effects**

  The inclusion of loss of material due to corrosion and loss of sealing as inspection criteria will provide adequate opportunity to detect degradation prior to failure and will align the inspections with the NUREG-1801, Section XI.M26, program recommendations.

Enhancement 3: XI.M26 - Reactor Coolant Pumps Oil Collection System Inspections

The *Fire Protection* program inspections of the reactor coolant pump oil collection system will be revised to include additional inspection criteria for the visual inspection of the system and to perform a one-time inspection of the internal surfaces of the reactor coolant pump oil collection tank.

This commitment is identified in Appendix A, Table A6.0-1 License Renewal Commitments, Item 10.

Program Elements Affected

- **Element 3: Parameters Monitored or Inspected**

  Inclusion of corrosion in the inspection criteria will bring the visual inspections in alignment with the NUREG-1801, Section XI.M26, program recommendations.

Operating Experience

Operating experience indicates that the *Fire Protection* program is effective in identifying the aging effects addressed by the program, evaluating the degradation, and implementing corrective actions. When degradation has been identified, corrective actions have been implemented to ensure that the intended functions of the affected components and structural elements are maintained.

The following representative examples of internal operating experience are based on a review of Corrective Action Program items and were considered in evaluating the effectiveness of the program:

In January 2002, during the performance of a preventive maintenance procedure, a degraded penetration seal was identified in the Technical Support Center Diesel Generator room. The penetration seal was placed on an hourly fire watch and a barrier impairment was issued in accordance with the applicable fire protection procedures. A work request was written to repair the penetration. The penetration was subsequently repaired and returned to its original design configuration.

In February 2003, during the performance of a preventive maintenance procedure, it was identified that some of the sprinkler heads being inspected had paint on them and needed to be replaced. Fire Protection Engineering determined that the presence of this paint had negligible or no influence on the operation of the sprinklers. The affected sprinklers were considered operable. A work request was written and the sprinkler heads were subsequently replaced.

In October 2005, during the performance of a surveillance procedure, both fire pumps automatically started unexpectedly. The step being performed tests the auto start setpoint of one of the fire pumps. The other fire pump was not expected to start unless pressure decreased too rapidly. The Fire System header pressure trend on the plant process computer indicated that a sharp drop in system pressure had occurred as the valve for bleeding off system pressure was throttled open. This rapid drop in system pressure was great enough to auto start the second fire pump before the first fire pump could restore system pressure. The system functioned as expected for this rapid drop in pressure. The evaluation of the condition determined the valve that was being used to bleed off system pressure was not a proper valve design for this purpose. The surveillance procedure was changed to bleed off the system pressure using a different valve more suitable for throttling and to provide direction should both fire pumps start during the test.

Conclusion

The *Fire Protection* program ensures that the effects of aging associated with the in-scope components and features will be adequately managed so that there is reasonable assurance that their intended functions will be maintained consistent with the current licensing basis throughout the period of extended operation.

B2.1.12 FLOW-ACCELERATED CORROSION

Program Description

The *Flow-Accelerated Corrosion* program manages the aging effect of wall thinning, thus assuring that the structural integrity of all steel (carbon or low-alloy) piping and components containing high-energy fluids (two phase as well as single phase) is maintained. The program applies to both safety-related and non-safety-related components.

The *Flow-Accelerated Corrosion* program is based on EPRI 1011838, "Recommendations for an Effective Flow-Accelerated Corrosion Program (NSAC-202L-R3)," and predicts, detects, and monitors FAC in plant piping and other pressure retaining components. The program (a) conducts an analysis to determine critical locations (CHECWORKS), (b) performs limited baseline inspections to determine the extent of wall thinning at those locations, and (c) performs follow-up inspections to confirm the predictions, or repairing or replacement of piping and components as necessary. CHECWORKS is a predictive computer program that uses past inspection data to predict wear rates.

NUREG-1801 Consistency

The *Flow-Accelerated Corrosion* program is an existing program that is consistent with the recommendations of NUREG-1801, Section XI.M17, "Flow-Accelerated Corrosion," with the exception described below.

Exceptions to NUREG-1801

Exception 1: Use of a Different Revision of an EPRI Standard

The *Flow-Accelerated Corrosion* program is implemented using the guidance of EPRI NSAC-202L-R3. NUREG-1801, Section XI.M17 recommends the use of EPRI NSAC-202L-R2.

Justification

EPRI NSAC-202L-R3 contains recommendations updated with the worldwide experience of members of the CHECWORKS User's Group (CHUG), plus recent developments in detection, modeling, and mitigation technology. These recommendations are intended to refine and enhance those of earlier versions, without contradictions, so as to ensure the continuity of existing plant FAC programs.

Therefore, the use of EPRI NSAC-202L-R3 is equivalent to NSAC 202L-R2 and meets the intent of NUREG-1801, Section XI.M17.

<u>Program Elements Affected</u>

- **Element 1: Scope of Program**

  NSAC-202L-R3, "Recommendations for an Effective Flow-Accelerated Corrosion Program," provided clarification and more details in selecting inspection locations, and applied safety factors in ranking of wall thinning risks.

- **Element 4: Detection of Aging Effects**

  NSAC-202L-R3, "Recommendations for an Effective Flow-Accelerated Corrosion Program," clarified UT and RT inspection techniques, provided guidance for inspection of vessels and tanks, and enhanced the guidance for inspection of valves, orifices and equipment nozzles.

Enhancements

The *Flow-Accelerated Corrosion* program does not require enhancement to be consistent with the recommendations of NUREG-1801, Section XI.M17, "Flow-Accelerated Corrosion."

Operating Experience

Operating experience indicates that the *Flow-Accelerated Corrosion* program is effective in identifying wall thinning of all steel (carbon or low-alloy) piping and components containing high-energy fluids (two phase as well as single phase).

A self-assessment was performed on the *Flow-Accelerated Corrosion* program during the first quarter of 2006, prior to implementing the fleet program. The self-assessment determined that the *Flow-Accelerated Corrosion* program is operating at a basic level.

A number of improvement areas addressing management support, level of resources, procedural consistency and infrastructure were identified. There were three factors involving infrastructure that significantly impacted the implementation of the *Flow-Accelerated Corrosion* program: 1) lack of an up-to-date FAC susceptibility analysis, 2) lack of comprehensive, accurate, reproducible FAC inspection drawings, and 3) lack of up-to-date CHECWORKS database/modeling. An improvement plan was created to implement the recommendations of the assessment team in a timely manner. The corrective actions have been completed.

The following representative examples of internal operating experience are based on a review of Corrective Action Program items and were considered in evaluating the effectiveness of the program:

In May 2001, a review of the August 1999 Calloway pipe rupture (INPO SEN 203) determined that the drain lines at Kewaunee are configured differently than the lines at Calloway. The level control valves are located much closer to the end of the lines near the feedwater heaters. Additionally, there are no tight double elbow configurations located downstream of long horizontal runs, so the degree of turbulence which occurred at Calloway is not occurring at Kewaunee. Several components have been inspected, from 2000 to 2006, in each of the four drain lines from the MSR drain tanks to the 15A and 15B FW heaters. The results of these inspections confirmed there is little wall thinning due to FAC occurring in the run of piping upstream of the control valves or at the FW heater nozzles located downstream of the control valves. The data obtained from these inspections was used to calibrate the model, which resulted in the predicted wear rates aligning with the actual wear rates. Finally, piping components downstream of the level control valves at Kewaunee have been replaced with stainless steel or stainless steel lined (nozzles) that is not susceptible to flow accelerated corrosion. Inspection of the 15A FW heater nozzle during the fall 2001 outage identified no wall thinning due to FAC. Additionally, both the 15A FW heater and 15B FW heater nozzles were inspected in 2006 and showed minor wall thinning.

In October 2004, based on inspection data taken in 1987 & 1988, wall thinning due to FAC was not recognized in the 20-inch condensate lines. It was believed that reduced wall thickness at a fabricated tee was due to manufacturer tolerance and/or original pipe fit-up activities. Generic Letter 89-08 was issued in 1989. EPRI Report NSAC-202L had not been issued and CHECWORKS computer code was not available. Since the inception of CHECWORKS, recent results of modeled inspections performed to date indicated that there was some minor wall thinning occurring in the monitored portions of the Condensate System. Analysis and evaluations showed that the piping system was adequately designed and met the USAR requirements. Further evaluation indicated that the piping was adequate for nine operating cycles.

Prior to the 2006 refueling outage, UT wall thickness inspections of piping and components in the 16-inch condensate supply to the 14B feedwater heater revealed wall thinning. The wall thickness for the component was projected to go below the 12.5 percent of nominal wall thickness allowance for the manufacturer's tolerance. The data was analyzed using the CHECWORKS computer code, and the projected wall thickness was determined to remain above the minimum required wall thickness over the next operating cycle. Stress analysis was performed to determine predicted life. The evaluation showed that the remaining life was calculated at 33.5 years, and no follow-up inspection was required.

In 2006, based on UT thickness measurements performed as part of the *Flow-Accelerated Corrosion* program, wall thinning was identified in the shells of feedwater heaters 14A and 14B. The CHECWORKS computer code was used to evaluate the wall thickness readings to establish wear rates. Stress calculations were performed that concluded that the wall thinning in the heater shells would be acceptable for the next operating cycle. This condition was entered into the Corrective Action Program and the heater shells were subsequently repaired during the Spring 2008 refueling outage.

Conclusion

The *Flow-Accelerated Corrosion* program ensures that the effects of aging associated with the in-scope components will be adequately managed so that there is reasonable assurance that their intended functions will be maintained consistent with the current licensing basis throughout the period of extended operation.

B2.1.13 FLUX THIMBLE TUBE INSPECTION

Program Description

The *Flux Thimble Tube Inspection* program manages the aging effect of loss of material of the flux thimble tube wall. The flux thimble tubes provide a path for the incore neutron flux monitoring system detectors and form part of the RCS pressure boundary. Flux thimble tubes are subject to loss of material (primarily at the fuel assembly lower nozzle) where flow-induced fretting causes wear at discontinuities in the path from the reactor vessel instrument nozzle to the fuel assembly instrument guide tube.

The eddy current testing inspection method is used to monitor for loss of material of the thirty-six flux thimble tubes. Prior to issuance of Bulletin 88-09, "Thimble Tube Thinning in Westinghouse Reactors," wear of the thimble tubes was noted as an aging concern. The thimble tubes were first eddy current tested in 1985 and again in 1987. Based on the damage noted up to this point in time, a decision was made to replace all of the thimble tubes in 1988.

The response to Bulletin 88-09, "Thimble Tube Thinning in Westinghouse Reactors," established the program requirements, including inspection methodology, tube wear acceptance criterion, inspection frequency, corrective actions, and maintenance of program documents and test results. The NRC reviewed and acknowledged the response to the Bulletin and concluded that inspection method, frequency, and acceptance criteria were adequately addressed. They also requested that the inservice inspection summary, report any deviations in frequency as a result of unexpected thimble tube thinning, with test results and proposed corrective actions.

Subsequent to the thimble tube replacement in 1988, inspections have continued in accordance with the requirements established in the Bulletin response.

Program guidance was also developed from Westinghouse WCAP-12866, "Bottom Mounted Instrumentation Flux Thimble Wear," 1991. Beginning in 2004, a new acceptance/repair criterion was established and the calculation or prediction of future wall loss rates was implemented. Based on the results of the forecasts, a greater degree of certainty is possible for ensuring that the flux thimble tubes pressure boundary function will be maintained until the next scheduled inspection.

NUREG-1801 Consistency

The *Flux Thimble Tube Inspection* program is an existing program that is consistent with the recommendations of NUREG-1801, Section XI.M37, "Flux Thimble Tube Inspection."

Exceptions to NUREG-1801

The *Flux Thimble Tube Inspection* program takes no exceptions to the recommendations of NUREG-1801, Section XI.M37, "Flux Thimble Tube Inspection."

Enhancements

The *Flux Thimble Tube Inspection* program does not require enhancement to be consistent with the recommendations of NUREG-1801, Section XI.M37, "Flux Thimble Tube Inspection."

Operating Experience

Operating experience indicates that the *Flux Thimble Tube Inspection* program is effective in identifying flux thimble tube degradation, evaluating the degradation, and implementing corrective actions. When degradation has been identified, corrective actions have been implemented to ensure that the intended function of the affected flux thimble tube is maintained.

The following representative examples of internal operating experience with Kewaunee are based on a review of Corrective Action Program items and inspection summary reports and were considered in evaluating the effectiveness of the program:

In August 2000, the summary of incore thimble eddy current results was transmitted in the ISI summary report. The number of tubes from the total population falling within a wear-percent category was presented. The inspection performed during the 2000 outage showed a minimal increase in wear from prior years.

In September 2001, scheduling of thimble tubes inspections was controlled by a PM task. The frequency for this PM task had changed based on prior inspection results, i.e., more frequent inspections. As a result of Bulletin 88-09, the planning and scheduling card for the PM task was updated to reflect the frequencies contained in the response to the Bulletin.

In September 2004, it was initially decided that ECT of the thimble tubes would not be performed during the 2004 refueling outage. A condition evaluation was performed that determined ECT testing should remain on the 2004 outage schedule and be performed. Also, the planning and scheduling PM card was reviewed and the frequency updated.

In November 2004, a CAP was created to document the 2004 (R27) inspection results and ensure that thimble tube re-inspection would be scheduled and performed in 2009. Once again, the planning and scheduling PM card was reviewed/updated for this purpose.

Conclusion

The *Flux Thimble Tube Inspection* program ensures that the effects of aging associated with the in-scope components will be adequately managed so that there is reasonable assurance that their intended functions will be maintained consistent with the current licensing basis throughout the period of extended operation.

B2.1.14 FUEL OIL CHEMISTRY

Program Description

The *Fuel Oil Chemistry* program manages the aging effect of loss of material on piping and components in the systems that supply fuel oil from the storage tanks to the Emergency Diesel Generators and the Technical Support Center Diesel Generator by providing reasonable assurance that potentially harmful contaminants are maintained at low concentrations.

The *Fuel Oil Chemistry* program samples the fuel oil for the existence of contaminants such as water and microbiological organisms, and verifies the quality of new oil before its introduction into the diesel generator fuel oil storage tanks. Fuel oil quality is maintained by monitoring and controlling fuel oil contamination in accordance with the guidelines of ASTM Standards D 975, D 4057, D 2709, and D 6217. The program defines specific acceptance criteria for contaminant concentrations, which reflect ASTM guidelines for parameters that maintain contaminant concentrations below unacceptable levels. Should unacceptable indications be observed, the condition is documented and evaluated using the Corrective Action Program.

The effectiveness of the *Fuel Oil Chemistry* program is verified by the Fuel Oil Tank Inspections program and the Work Control Process program for the in-scope tanks and other components in the fuel oil environment.

NUREG-1801 Consistency

The *Fuel Oil Chemistry* program is an existing program that is consistent with the recommendations of NUREG-1801, Section XI.M30, "Fuel Oil Chemistry," with the exceptions described below.

Exceptions to NUREG-1801

Exception 1: Technical Specifications Testing Requirements

The Technical Specifications do not include requirements for fuel purity as noted in NUREG-1801, Section XI.M30. The fuel oil purity and testing requirements are included in the applicable plant procedures.

Justification

NUREG-1801, Section XI.M30, states that the fuel oil aging management program is in part based on the fuel oil purity and testing requirements of the plant's Technical Specifications that are based on the Standard Technical Specifications of NUREG-1430 through NUREG-1433. Kewaunee is a Westinghouse plant and has not adopted the Standard Technical Specification as described in NUREG-1431.

Although the Technical Specifications do not include requirements for fuel purity as noted in NUREG-1801, Section XI.M30, the plant fuel oil specifications and procedures invoke requirements that are similar to the Standard Technical Specifications for fuel oil purity and fuel oil testing. These include testing requirements for new fuel oil (flash point, API Gravity, and water and sediment) prior to adding the new fuel to the diesel generator fuel oil storage tank to ensure that the oil has not been contaminated with substances that would have an immediate detrimental impact on diesel engine combustion, and testing of new fuel after adding it to the storage tank to confirm that the remaining fuel oil properties are within specification requirements. Fuel oil sampling and testing activities also provide for the trending of particulate contamination in new and stored fuel oil. Once the oil is in the storage tanks, testing for water and sediment is performed periodically (quarterly), with the fuel oil monitored according to procedure specifications and parameters. Also, a sample of fuel oil is drained from the diesel generator fuel oil day tanks and visually inspected every four weeks.

In addition, fuel oil purity is maintained through the implementation of guidelines from applicable ASTM standards to ensure the acceptability of fuel oil quality. Consequently, the Fuel Oil Chemistry sampling and testing activities serve to identify the potential for exposure of the tank internal surface to fuel oil contaminated with water, sediment, and particulates.

Though the Kewaunee Technical Specifications do not include requirements for fuel oil testing, ASTM standards for fuel oil purity and testing are implemented through approved plant procedures, consistent with the intent of the NUREG-1801, Section XI.M30 recommendations.

Program Elements Affected

- **Element 1: Scope of Program**

  The plant fuel oil specifications and procedures are aligned with the guidelines of applicable ASTM standards. In addition, a commitment was made to perform fuel oil quality monitoring using established purity requirements. Based on plant historical fuel oil sample analysis results, the impurity level for new and stored fuel is consistent with the requirements of the referenced standard technical specifications.

Exception 2: Fuel Oil Additives

The *Fuel Oil Chemistry* program does not include the use of biocides to minimize biological activity, stabilizers to prevent biological breakdown of the diesel fuel, or corrosion inhibitors to mitigate corrosion.

Justification

Biocides are not added to the diesel fuel oil because high quality fuel oil has been used since 1986. The new oil is sampled before it is introduced to the diesel generator fuel oil storage tanks, along with ensuring that the new fuel oil and the delivery trucks do not contain excessive contaminants. Periodic analyses of diesel fuel oil from the top, middle and bottom of the storage tanks have not produced any indications of fuel oil deterioration or the presence of water or sediment. Additionally, since mold and bacteria grow in the water/fuel oil interface, and operating experience has not indicated a positive test for microbiological growth, there has been no need for biocides.

Stabilizers are not added to the diesel fuel oil. The diesel generators are run on a frequent basis, which results in the consumption of fuel oil replaced with the mixing of the new fuel. The diesel generator fuel oil day tanks are supplied directly from the diesel generator fuel oil storage tanks, which are periodically sampled and analyzed. The day tanks are small in size and experience a higher turnover rate than the stored fuel as a result of the routine engine operations. Due to this high turnover rate, stratification of the fuel is not likely to occur.

Corrosion inhibitors are not added to the diesel fuel oil. The fuel oil is procured to meet ASTM D 975 standards, which include specifications and acceptance criteria for a copper strip corrosion test. The fuel is tested (copper strip corrosion test) as part of new fuel procurement specifications, and then a receipt acceptance test is performed on a fuel oil sample with an outside laboratory. Operational experience to date supports effectiveness of this test with all copper strip corrosion tests in the last ten years returning results that meet the ASTM standard. Since fuel contaminants and degradation products will normally settle to the bottom of the diesel generator fuel oil storage tank, they would be detected by routine analysis or by periodic draining and inspection of the diesel generator day tank fuel oil.

Though the *Fuel Oil Chemistry* program does not use additives, the fuel oil testing methods and visual inspections of day tank fuel oil provide the measures necessary to prevent or mitigate corrosion and maintain fuel oil quality, as indicated by plant operating experience showing no significant corrosion or biological fouling of components due to fuel oil conditions. Should the fuel oil monitoring indicate fuel oil degradation or corrosion, the use of additives would be considered as a possible corrective action. Therefore, the *Fuel Oil Chemistry* program meets the intent of the NUREG-1801, Section XI.M30 program.

<u>Program Elements Affected</u>

- **Element 2: Preventive Actions**

Based on operating experience, fuel oil quality is being adequately maintained consistent with the NUREG-1801, Section XI.M30 recommendations without the use of additives. The periodic cleaning of the diesel generator fuel oil storage tanks also allows removal of sediments to effectively mitigate corrosion inside the storage tanks. NUREG-1801, Section XI.M30 recommends additions of biocides, stabilizers, and corrosion inhibitors to maintain the quality of the diesel fuel.

Through the use of a vendor recommended premium grade fuel, sampling and testing to minimize water and sediments, and considering the favorable operating experience associated with fuel oil storage tank sample analysis and visual inspections of day tank fuel oil, the *Fuel Oil Chemistry* program meets the intent of NUREG-1801, Section XI.M30.

Exception 3: Use of ASTM D 975 in Lieu of ASTM Standard D 1796

The *Fuel Oil Chemistry* program utilizes ASTM D 975, "Standard Specification for Diesel Fuel Oils," for determination of water and sediment levels in fuel oil in lieu of ASTM D 1796, which is recommended by NUREG-1801, Section XI.M30.

Justification

The *Fuel Oil Chemistry* program specifies ASTM D 975, which includes Test Method D-2709, the method that is appropriate for Grade 2D fuel oil. The Grade 2D fuel oil falls in the viscosity and API Gravity range covered by the D 2709 test method, whereas Test Method D 1796 is intended for higher viscosity fuel oils. Therefore, the *Fuel Oil Chemistry* program uses the guidelines from ASTM D 2709 to measure water and sediment, in lieu of ASTM D 1796. This meets the intent of NUREG-1801, Section XI.M30, which identifies ASTM D 2709 as an acceptable standard.

<u>Program Elements Affected</u>

- **Element 3: Parameters Monitored or Inspected**

  The *Fuel Oil Chemistry* program uses ASTM D 2709, which is a standard that NUREG-1801, Section XI.M30 recommends to use as guidance for determination of water and sediment contamination in diesel fuel.

Exception 4: Use of ASTM D 6217 In Lieu of ASTM Standard D 2276

The *Fuel Oil Chemistry* program utilizes ASTM D 6217, "Standard Test Method for Particulate Contamination in Middle Distillate Fuels by Laboratory Filtration," for the determination of particulates in lieu of ASTM D 2276, which is recommended by NUREG-1801, Section XI.M30.

Justification

The ASTM D 6217 test method is a test specifically for diesel fuel, while the ASTM D 2276 method is for aviation fuel. Therefore, the *Fuel Oil Chemistry* program uses the guidelines from ASTM D 6217, which are appropriate for determination of particulates in diesel fuel oil.

ASTM Standard D 6217 is used which provides a laboratory filtration method using a 0.8-micron filter. This standard is considered to be more conservative, since a smaller pore size of 0.8 microns instead of 3.0 microns is used. Use of a filter with a smaller pore size results in a larger sample of particulates because smaller particles are retained. Therefore, even though the program uses a different standard than recommended in NUREG-1801, Section XI.M30, it does provide effective diesel generator fuel oil storage tank sampling for determination of particulates.

Since the NUREG identifies ASTM D 6217 as an acceptable standard for diesel fuel oil and the standard provides a more conservative method for determining particulates, the use of the D 6217 method meets the intent of NUREG-1801, Section XI.M30.

Program Elements Affected

- **Element 3: Parameters Monitored or Inspected**

  This program element recommends the use of modified ASTM Standard D 2276, Method A, for determination of particulates. The standard ASTM D 6217 is used, which consists of a smaller filter pore size. The D 6217 method is more conservative than that described in NUREG-1801, Section XI.M30. This meets the intent of NUREG-1801, Section XI.M30.

- **Element 6: Acceptance Criteria**

  NUREG-1801, Section XI.M30 identifies several standards that can be used for the determination of particulate. The *Fuel Oil Chemistry* program uses ASTM D 6217, which is consistent with diesel fuel oil. Use of this standard meets the intent of NUREG-1801, Section XI.M30.

Exception 5: Diesel Generator Day Tank Fuel Oil Sampling

The *Fuel Oil Chemistry* program drains and visually inspects a sample of the fuel oil obtained from the bottom of the day tanks on a monthly basis in lieu of taking multilevel samples of the day tanks, as recommended by NUREG-1801, Section XI.M30.

Justification

The Emergency Diesel Generators Fuel Oil Day Tanks and the Technical Support Center Diesel Generator Fuel Oil Day Tank are supplied by the diesel generator fuel oil storage tanks. Each day tank has an approximate one-gallon sample of fuel removed from the tank bottom each month to allow for visual inspection for the presence of water and sediment. Sampling at this location, where water and sediment would accumulate, provides for effective removal of contaminants from the day tank contents and ensures the quality of the fuel oil being supplied to the diesel generators. In addition, multi-level samples are obtained from the fuel oil storage tanks and analyzed quarterly such that ingress of contaminants to the day tanks is not expected.

Therefore, the intent of NUREG-1801, Section XI.M30, that the quality of the fuel oil be monitored and maintained is met for the day tanks.

Program Elements Affected

- **Element 4: Detection of Aging Effects**

  The frequent sampling of the fuel oil day tanks, combined with the multi-level sampling of the diesel generator fuel oil storage tanks, ensures that water and sediment will not accumulate to a significant extent in the day tanks. Along with visual inspection of the fuel oil for contaminants, the one-gallon sample of fuel that is drained each month from the day tank effectively removes contaminants that may result in aging effects of concern, therefore meeting the intent of NUREG-1801, Section XI.M30.

Enhancements

The *Fuel Oil Chemistry* program does not require enhancement to be consistent with the recommendations of NUREG-1801, Section XI.M30, "Fuel Oil Chemistry."

Operating Experience

Operating experience indicates that the *Fuel Oil Chemistry* program is effective in identifying water in the fuel and particulate contamination, evaluating any associated degradation, and implementing corrective actions. When degradation has been identified, corrective actions have been implemented to ensure that the intended functions of the affected components exposed to fuel oil are maintained.

The following representative examples of internal operating experience are based on a review of Corrective Action Program items and were considered in evaluating the effectiveness of the program:

In December 2001, it was identified that the TSC Diesel Generator Fuel Oil Day Tank was not included in the scope of the preventive maintenance procedure for inspection of the day tank fuel oil. Corrective action to include the TSC Diesel Generator Fuel Oil Day Tank was implemented on February 21, 2002.

In November 2006, an unusual amount of particulate matter was found in the 1B Emergency Diesel Generator fuel oil storage tank during the tank sampling. Although the level of particulate observed was well below acceptable limits, the condition was evaluated. The evaluation concluded the apparent cause of the particulates was from maintenance work performed during the refueling outage to replace four flexible hoses. Two of the hoses were reoriented in order to provide optimum flow in the siphon line to return the siphon line to its full design capability and thus flushed any corrosion products from the associated piping into the 1B fuel oil storage tank during the first EDG surveillance test. The source of the particulate was from carbon steel piping in the siphon line and not from contaminants leaking into the tank.

A follow-up sample to support evaluation of the sediment issue determined that corrosion had accumulated on the inlet (filling) flange used for fuel oil filling and that it presented a potential source of particulate entry into the tank. Sampling of the 1B EDG fuel oil storage tank revealed no additional sediment or particulate concerns. Further evaluation noted that the condition, in which an unusual amount of particulate was found in the 1B tank, did not extend to the 1A tank.

In addition, planning has been arranged for corrosion product removal from the fill flange for the 1B EDG fuel oil storage tank and to use a cleaning method that minimizes or eliminates the potential for the corrosion products from falling into the tank during the cleaning.

In December 2006, the Chemistry department performed a review of ASTM D 4057 and the plant surveillance procedure. The primary method for obtaining Emergency Diesel Generator Fuel Oil Storage Tank samples is to use a peristaltic pump. Although this method is not specifically addressed by D 4057-95, Section 12.1 states that alternate sampling procedures may be used if a mutually satisfactory agreement has been reached by the parties involved. The acceptance criteria for diesel fuel oil properties are established by reference to ASTM D 975 and are implemented in accordance with an approved and controlled surveillance procedure. Therefore, the use of a peristaltic pump for samples is consistent with ASTM D 4057 methodology.

In February 2007, an evaluation of the use of ultra low sulfur diesel (ULSD) fuel oil was performed in response to NRC Information Notice 2006-022, "New Ultra-Low-Sulfur Diesel Fuel Oil Could Adversely Impact Diesel Engine Performance."

An investigation into the acceptability of the ULSD fuel was performed to determine both the short-term and long-term effects from the fuel on EDG reliability. Review of the ULSD fuel was completed in June 2007 and concluded that there were no operability concerns regarding acceptance of ULSD fuel, and that the fuel may be used for the Kewaunee EDGs. A subsequent evaluation for the use of ULSD fuel in the TSC diesel generator was performed and determined that ULSD is appropriate for use with the TSC diesel generator.

Conclusion

The *Fuel Oil Chemistry* program ensures that the effects of aging associated with the in-scope components will be adequately managed so that there is reasonable assurance that their intended functions will be maintained consistent with the current licensing basis throughout the period of extended operation.

B2.1.15 FUEL OIL TANK INSPECTIONS

Program Description

The *Fuel Oil Tank Inspections* program manages the aging effect of loss of material internal to the underground diesel generator fuel oil storage tanks. The program periodically drains, cleans, and inspects the internal surfaces of the fuel oil storage tanks to ensure that there is no loss of intended function. The program's schedule for cleaning and inspection is aligned with the recommendations of Regulatory Guide 1.137, "Fuel-Oil Systems for Standby Diesel Generators," Revision 1.

The *Fuel Oil Tank Inspections* program performs visual inspections of the bottom of the fuel oil storage tanks for oil or scale buildup and the tank internal surfaces for structural and mechanical integrity. The Technical Support Center (TSC) diesel generator fuel oil storage tank coatings are monitored to assess their condition. In addition, the program provides for ultrasonic testing of the fuel oil storage tanks bottom plate to ensure that minimum wall thickness requirements are met and degradation is not occurring.

The *Fuel Oil Tank Inspections* program verifies the effectiveness of the Fuel Oil Chemistry program, which samples and tests the fuel oil in the in-scope tanks to mitigate the effects of corrosion on the internal surfaces of the tanks.

NUREG-1801 Consistency

The *Fuel Oil Tank Inspections* program is an existing program that is consistent with the recommendations of NUREG-1801, Section XI.M30, "Fuel Oil Chemistry."

Exceptions to NUREG-1801

The *Fuel Oil Tank Inspections* program takes no exceptions to the tank inspection recommendations of NUREG-1801, Section XI.M30, "Fuel Oil Chemistry."

Enhancements

Enhancement 1: Fuel Oil Storage Tanks Inspection and Cleaning

The *Fuel Oil Tank Inspections* program will be enhanced to provide guidance for the periodic draining, cleaning and inspection activities.

The enhancement for the *Fuel Oil Tank Inspections* program will include visual inspection of the in-scope tanks for loss of material or other signs of degradation, such as coating degradation, abnormal rust, sludge, biological growth, metal damage, etc. Thickness measurements for the 1A and 1B emergency diesel generators fuel oil storage tanks bottoms and the TSC diesel generator fuel oil storage tank bottom will also be performed.

The visual inspections and volumetric examinations of the 1A and 1B emergency diesel generators fuel oil storage tanks and the TSC diesel generator fuel oil storage tank will be performed prior to entering the period of extended operation. Subsequent visual inspections and volumetric examinations will be performed on a frequency consistent with scheduled tank internals inspection activities.

This commitment is identified in Appendix A, Table A6.0-1 License Renewal Commitments, Item 11.

Program Elements Affected

- **Element 2: Preventive Actions**

  This enhancement will proceduralize the requirements to drain, clean, and inspect the 1A and 1B emergency diesel generators fuel oil storage tanks and the TSC diesel generator fuel oil storage tank.

- **Element 4: Detection of Aging Effects**

  This enhancement will proceduralize the requirement to visually inspect the fuel oil storage tanks internal surfaces and to measure the thickness of tank bottom surfaces of the 1A and 1B emergency diesel generators fuel oil storage tanks and the TSC diesel generator fuel oil storage tank.

Operating Experience

Operating experience indicates that the *Fuel Oil Tank Inspections* program is effective in identifying loss of material caused by corrosion, rust, sludge, biological growth, and other degradation on the internal surfaces of the storage tanks, evaluating the degradation, and implementing corrective actions. When degradation has been identified, corrective actions have been implemented to ensure that the intended function of the tank is maintained.

The following examples present the history of fuel oil storage tanks inspection results:

1A and 1B Emergency Diesel Generators Fuel Oil Storage Tanks

In 1987, the diesel generators fuel oil storage tanks were emptied, cleaned and visually inspected. The inspector noted that the tanks were in excellent shape, the inside surfaces were clean and free from pitting, and there was very little sediment on the tank bottoms.

In October 2001, the diesel generators fuel oil storage tanks were cleaned and visually inspected. At that time, the tanks were found to be in overall good material condition and the inspection results were within the code requirements. Ultrasonic testing revealed thickness of bottom plate as acceptable, with no damage or failure noted. All portions of both tanks were found to be in excellent condition, apart from several gouges in the tank wall, which did not exceed the allowable stress limits.

TSC Diesel Generator Fuel Oil Storage Tank

In July 2002, the TSC diesel generator fuel oil storage tank was cleaned and visually inspected for coating degradation, abnormal rust, sludge, biological growth, metal damage, etc. No slime, solids or abnormalities were found during the visual inspection. The internal coating was found to be in excellent condition; only one minor area of coating discoloration was noted, but the base metal was still protected.

Conclusion

The *Fuel Oil Tank Inspections* program ensures that the effects of aging associated with the in-scope components will be adequately managed so that there is reasonable assurance that their intended function will be maintained consistent with the current licensing basis throughout the period of extended operation.

B2.1.16 INSPECTION OF OVERHEAD HEAVY LOAD AND REFUELING HANDLING SYSTEMS

Program Description

The *Inspection of Overhead Heavy Load and Refueling Handling Systems* program manages the aging effect of loss of material due to general corrosion and rail wear for the in-scope steel heavy load and refueling handling cranes, trolleys, bridges and rails. The program is implemented through periodic visual inspections of the heavy load and refueling handling crane, trolley, bridge and rail structural members.

Additionally, this program visually inspects the structural bolting associated with the structural members for general corrosion and tightness.

Overhead heavy load cranes are controlled in accordance with the guidance provided in NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants."

NUREG-1801 Consistency

The *Inspection of Overhead Heavy Load and Refueling Handling Systems* program is an existing program that is consistent with the recommendations of NUREG-1801, Section XI.M23, "Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems."

Exceptions to NUREG-1801

The *Inspection of Overhead Heavy Load and Refueling Handling Systems* program takes no exceptions to the recommendations of NUREG-1801, Section XI.M23, "Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems."

Enhancements

Enhancement 1: Inspection Criteria

The *Inspection of Overhead Heavy Load and Refueling Handling Systems* program will be enhanced to clarify the requirements of visual inspection of structural members, including structural bolting, of the in-scope heavy load and refueling handling cranes and associated equipment.

This commitment is identified in Appendix A, Table A6.0-1 License Renewal Commitments, Item 12.

Program Elements Affected

- **Element 3: Parameters Monitored or Inspected**

  The enhancement will ensure that the specific attributes associated with visual inspections will be consistent with the recommendations of NUREG-1801, Section XI.M23, "Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems."

Operating Experience

While the operating experience review showed degradation had occurred with the electrical operation of the cranes, including limit switch inoperability, control problems, motor oil leaks, and worn motor brushes, etc., there were no loss of material due to general corrosion or rail wear issues identified.

The following representative examples of internal operating experience are based on a review of Corrective Action Program items and were considered in evaluating the effectiveness of the program:

In June 2001, it was observed that the I-beam that supports the trolley drive system for the auxiliary building crane was flexing excessively. There was a concern that the flexing, over time, could result in failure due to weld fatigue. An inspection of the beam support system discovered that the bolts in the cross-plate support at the center of the I-beam had loosened. The bolts were inspected and retorqued. The connections and welds at the ends of the I-beam were inspected, and found to be satisfactory. The crane manufacturer performed a follow-up inspection, and the support plate bolts and connections were found to be acceptable. To prevent reoccurrence, corrective action was initiated to periodically inspect bolts for all structural members of the crane.

In August 2002, a loose bolted connection was identified on a cross plate connection for the trolley drive system for the auxiliary building crane. This issue had been identified previously. The fastener was replaced and retorqued. Corrective actions were taken to revise procedures to include cross-plate bolt inspections, and the frequency of the inspections was increased.

Conclusion

The *Inspection of Overhead Heavy Load and Refueling Handling Systems* program ensures that the effects of aging associated with the in-scope cranes will be adequately managed so that there is reasonable assurance that their intended functions will be maintained consistent with the current licensing basis throughout the period of extended operation.

B2.1.17 LUBRICATING OIL ANALYSIS

Program Description

The *Lubricating Oil Analysis* program manages the aging effects of loss of material and reduction of heat transfer for aluminum, copper alloys, stainless steel and steel mechanical system components within the scope of license renewal.

The *Lubricating Oil Analysis* program maintains oil systems contaminants (primarily water and particulates) within acceptable limits, thereby preserving an environment that is not conducive to loss of material or reduction of heat transfer. Lubricating oil testing activities include sampling and analysis of lubricating oil for detrimental contaminants, such as water, particulates, and metals.

The effectiveness of the *Lubricating Oil Analysis* program is verified by the Work Control Process program.

NUREG-1801 Consistency

The *Lubricating Oil Analysis* program is an existing program that is consistent with the recommendations of NUREG-1801, Section XI.M39, "Lubricating Oil Analysis Program."

Exceptions to NUREG-1801

The *Lubricating Oil Analysis* program takes no exceptions to the recommendations of NUREG-1801, Section XI.M39, "Lubricating Oil Analysis Program."

Enhancements

The *Lubricating Oil Analysis* program requires no enhancement to be consistent with the recommendations of NUREG-1801, XI.M39, "Lubricating Oil Analysis Program."

Operating Experience

Operating experience indicates that the *Lubricating Oil Analysis* program is effective in identifying out-of-specification lubricating oil, evaluating the out-of-specification condition, and implementing corrective actions. When out-of-specification values have been identified, corrective actions have been implemented to ensure that the intended functions of the affected components are maintained.

The following representative examples of internal operating experience are based on a review of the Corrective Action Program items and were considered in evaluating the effectiveness of the program:

In February 2003, the Technical Support Center diesel generator lube oil had an increase in the percent of fuel oil contamination and silica as compared to a previous sample. A resample was performed and the results confirmed an adverse trend in fuel oil contamination and silica. The silica increase was attributed to sealant material and not silica, and is not detrimental to the operation of the diesel generator. A change was made to the frequency of lube oil changes from quarterly to monthly to allow better trending of the lube oil contamination. The data collected to date (2008) shows no adverse trends. Oil samples remain tested on a monthly basis.

In August 2003, lubricating oil analysis of the 1B diesel generator showed an elevated zinc concentration. This elevated concentration was initially determined to be from a wrist pin bearing degradation problem which would also be confirmed with increasing silver content. Review of the trend data showed that the silver concentration for the previous six months was minimum detectable. A confirmatory lube oil analysis was performed and shown to have an acceptable zinc concentration. The lube oil drum used to add oil to the diesel generator was tested and shown to also have an acceptable zinc level. It was determined that the initial reading was invalid and no further action needed to be taken.

In June 2004, lubricating oil analysis of the turbine driven auxiliary feedwater pump showed signs of a high concentration of particulates. At that time there were no clear acceptance criteria for operability purposes. The pump was declared inoperable, bearings were inspected and subsequently replaced, and the pump declared operable.

As a result of a post job critique, clear limits were defined for determining acceptance criteria for lubricating oil analysis results. These limits were based on historical equipment performance, manufacturer's limits, and industry developed limitations. These limits are included in the *Lubricating Oil Analysis* program.

In November 2004, oil analysis of the samples from the 1A and 1B condensate pump motor lower bearings indicated degradation. The oil was changed and samples were tested in-house as well as sent to an outside laboratory for analysis. The results of both the in-house and outside analysis identified a higher than normal level of phosphorus and an increase in the oxidation levels. Based on discussions with the outside oil analyst and the O-ring manufacturer, it was concluded that the oil (a synthetic oil) was not compatible with the O-ring material. Corrective actions included ordering a replacement O-ring compatible with the synthetic oil, and continuing oil changes at the current frequency of 12 months.

In January 2005, the oil sample for the B circulating water pump collected and analyzed by the in-house lab showed increasing levels of contamination. Analytic ferrography indicated moderately high concentrations of small steel rubbing wear particulates. Brass/copper alloy particles were also present, and there was indication of an increase in the chemistry index. No water was found to be present, and the viscosity was within specifications. A visual inspection of the bearing was attempted, but due to the orientation of the bearing, the inspection was inconclusive. The outer race and roller that were visible looked to be in good shape, but consistent with the oil analysis there was presence of small brass particles on the rollers and cage. An apparent cause evaluation was performed and it was determined that the only source of brass/copper was in the bearing cage. Since replacement of the bearings is a large activity, and it was determined that the concentration of particulate contamination was within allowable acceptable limits, the system was flushed and the oil was changed. Spare parts were purchased for the potential of future repair/replacement, and the frequency of oil analysis was increased.

Conclusion

The *Lubricating Oil Analysis* program ensures that the effects of aging associated with the in-scope components will be adequately managed so that there is reasonable assurance that their intended functions will be maintained consistent with the current licensing basis throughout the period of extended operation.

B2.1.18 METAL ENCLOSED BUS

Program Description

The *Metal Enclosed Bus* program manages the aging effects of reduced insulation resistance, electrical failure and loosening of bolted connections for non-segregated MEB and internal components within the scope of license renewal.

The program performs visual inspections, using a sampling methodology, of sections of the in-scope MEB looking for cracks, corrosion, foreign debris, excessive dust buildup, evidence of water intrusion, and performs visual inspection of component insulation for surface anomalies, such as discoloration, cracking, chipping or surface contamination. These samples represent, with reasonable assurance, other areas of the MEB.

Should visual inspection of the MEB indicate aging degradation of the internal components, or debris or moisture intrusion, the program allows for the cleaning and drying of the metal enclosed bus, inspection of the bus joints including checking bus joint resistance, and corrective action as required, such as repair or replacement of the affected MEB components.

The *Metal Enclosed Bus* program is supported by the Structures Monitoring Program, which performs visual inspection of portions of the MEB enclosure assemblies.

The inspection of the MEB will be completed prior to the period of extended operation and will be repeated every five years thereafter.

NUREG-1801 Consistency

The *Metal Enclosed Bus* program is an existing program that is consistent with the recommendations of NUREG-1801, Section XI.E4, "Metal Enclosed Bus."

Exceptions to NUREG-1801

The *Metal Enclosed Bus* program takes no exceptions to the aging management program described in NUREG-1801, Section X1.E4, "Metal Enclosed Bus."

Enhancements

Enhancement 1: Additional Visual Inspections and Corrective Actions

The *Metal Enclosed Bus* program will be enhanced to include augmented periodical visual inspections of the MEB internal surfaces, bus supports, bus insulation, taped joints and boots for signs of degradation or aging.

The *Metal Enclosed Bus* program will visually inspect the MEB internal surfaces for cracks, corrosion, aging degradation of insulating material, foreign debris, excessive dust buildup, and evidence of moisture intrusion. The bus insulation, taped joints, and boots will be visually inspected for signs of embrittlement, chipping, cracking, melting, swelling, surface contamination, or discoloration, which may indicate overheating or aging degradation. The internal bus supports will be visually inspected for structural integrity and signs of cracks. Corrective actions will be initiated for any observed aging degradation.

This commitment is identified in Appendix A, Table A6.0-1 License Renewal Commitments, Item 13.

<u>Program Elements Affected</u>

- **Element 3: Parameters Monitored or Inspected**

  This enhancement will specify the use of visual inspection of the internal portions of the MEB for cracks, corrosion, foreign debris, excessive dust buildup, and evidence of moisture intrusion. The bus insulation will be visually inspected for signs of embrittlement, cracking, melting, swelling, or discoloration, which may indicate overheating or aging degradation. The internal bus supports will be visually inspected for structural integrity and signs of cracks.

- **Element 4: Detection of Aging Effects**

  This enhancement will require the inspection of the MEB internal surfaces for aging degradation of insulating material, foreign debris, excessive dust buildup, and evidence of moisture intrusion. Accessible bolted connections that are covered with heat shrink tape, sleeving, insulated boots, etc., will be visually inspected to detect surface anomalies, such as discoloration, cracking, chipping or surface contamination. Bus insulation will be visually inspected for signs of embrittlement, cracking, melting, swelling, or discoloration, which may indicate overheating or aging degradation. Internal bus supports will be visually inspected for structural integrity and signs of cracks.

- **Element 6: Acceptance Criteria**

  This enhancement will require further investigation and evaluation should unacceptable visual observations of the MEB internal surfaces, bus supports, or MEB internal component insulation be observed, which suggest that MEB internal surfaces, bus supports, or conductor insulation degradation exists.

- **Element 7: Corrective Actions**

  This enhancement will require corrective actions that may include but are not limited to cleaning, drying, increased inspection frequency, replacement, or repair of the affected MEB components. Aging degradation observed during visual inspections, including those that require corrective action, will be entered into the Corrective Action Program.

Operating Experience

Operating experience indicates that the *Metal Enclosed Bus* program is effective in identifying degradation, evaluating the degradation, and implementing corrective actions. When degradation has been identified, corrective actions have been implemented to ensure that the intended functions of the affected metal enclosed bus components are maintained.

The following representative examples of internal operating experience are based on a review of Corrective Action Program items and were considered in evaluating the effectiveness of the program:

The existing MEB inspection program was created for the purpose of providing a method for maintaining the tightness of the MEB non-segregated bus joints. Joints were torque checked for proper tightness as well as visually inspected for broken or damaged parts for evidence of overheating, such as deformed insulation and discoloration.

Instances of MEB failures due to degradation of bus insulation, and accumulation of dust and debris occurred in the late 1980's. As a result of these failures, the program inspection requirements were enhanced to perform bus cleaning and visual inspections of the bus insulation as well as the bus joints. Resistance measurements of the bus joints were also measured.

In response to SOER 90-01, the program inspection requirements were enhanced to inspect the MEB enclosures for foreign objects, such as tools and equipment used during the performance of maintenance, prior to closure of the MEB covers to ensure these items were removed.

The inspection program recognized the discussions in NRC Inspection Notices 89-64, 98-36 and 2000-14 for failures of MEB due to age degradation of bus insulation and accumulation of moisture and debris, and has included these items as part of the inspection program.

No age-related MEB faults have occurred since the program was revised to include bus cleaning and enhanced visual inspections.

Conclusion

The *Metal Enclosed Bus* program ensures that the effects of aging associated with the in-scope components will be adequately managed so that there is reasonable assurance that their intended functions will be maintained consistent with the current licensing basis throughout the period of extended operation.

B2.1.19 NON-EQ ELECTRICAL CABLES AND CONNECTIONS

Program Description

The *Non-EQ Electrical Cables and Connections* program will manage the aging effects of reduced insulation resistance and electrical failure of accessible non-EQ electrical cables and connections within the scope of license renewal that are subject to an adverse localized environment. An adverse localized environment is a condition in a limited plant area that is significantly more severe than the specified service environment for the electrical cables (power, control, and instrumentation) and connections. The environment may be caused by heat, radiation, or moisture in the presence of oxygen. An adverse localized environment is significant if it could appreciably increase the rate of aging of a component or have an immediate adverse effect on operability.

The program will perform a plant walkdown to visually inspect for accessible electrical cables and connections installed in an adverse localized environment. Should an adverse localized environment be observed, a representative sample of electrical cables and connections installed within that environment will be visually inspected for the aging mechanisms associated with jacket surface anomalies, such as embrittlement, discoloration, cracking, or surface contamination. The technical basis for the sample selected will be provided.

The first inspection will be completed prior to the period of extended operation, and will be repeated every ten years thereafter.

NUREG-1801 Consistency

The *Non-EQ Electrical Cables and Connections* program is a new program that will be consistent with the recommendations of NUREG-1801, Section XI.E1, "Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements."

Exceptions to NUREG-1801

The *Non-EQ Electrical Cables and Connections* program takes no exceptions to the aging management program described in NUREG-1801, Section XI.E1, "Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements."

Enhancements

The *Non-EQ Electrical Cables and Connections* program is a new program that will be consistent with the recommendations of NUREG-1801, Section XI.E1, "Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements."

This commitment is identified in Appendix A, Table A6.0-1 License Renewal Commitments, Item 14.

Operating Experience

Industry Operating experience has shown that adverse localized environments caused by heat or radiation for electrical cables and connections may exist next to or above (within three feet of) steam generators, pressurizers or hot process pipes, such as feedwater lines. These adverse localized environments have been found to cause degradation of the insulating materials on electrical cables and connections that is visually observable, such as color changes or surface cracking. These visual indications can be used as indicators of degradation.

The *Non-EQ Electrical Cables and Connections* program is a new program. A review of the Corrective Action Program for representative examples of internal operating experience related to this program was performed. No cases of reduced insulation resistance and electrical failure of accessible non-EQ electrical cables and connections within the scope of license renewal that are subject to an adverse localized environment were identified.

As operating experience is obtained, lessons learned will be used to adjust this program as needed.

The Operating Experience Program ensures that additional operating experience is factored into the aging management programs to ensure program effectiveness.

Conclusion

The *Non-EQ Electrical Cables and Connections* program ensures that the effects of aging associated with the in-scope components will be adequately managed so that there is reasonable assurance that their intended functions will be maintained consistent with the current licensing basis throughout the period of extended operation.

B2.1.20 NON-EQ ELECTRICAL CABLE CONNECTIONS

Program Description

The *Non-EQ Electrical Cable Connections* program will manage the aging effect of loosening of bolted connections for non-EQ electrical cable connections within the scope of license renewal.

The *Non-EQ Electrical Cable Connections* program will perform a one-time inspection, on a sampling basis, to confirm the absence of loosening of bolted connections due to thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion and oxidation.

A representative sample of non-EQ electrical cable connections (metallic parts) associated with cables within the scope of license renewal will be tested at least once prior to the period of extended operation to provide an indication of the integrity of the cables connections. The specific type of test to be performed will be determined based on the type of connection and will be a proven method for detecting loose connections, such as thermography, contact resistance testing, or other appropriate testing method without removing the connection insulation such as heat shrink tape, sleeving or insulating boot.

A representative sample of non-EQ bolted electrical cable connections will be identified for testing based on voltage level (medium and low voltage), circuit loading (high loading), and location (high temperature, high humidity, vibration, etc.). The technical basis for the sample selections will be documented as part of the program.

NUREG-1801 Consistency

The *Non-EQ Electrical Cable Connections* program is a new program that will be consistent with the recommendations of NUREG-1801, Section XI.E6, "Electrical Cable Connections Not Subject To 10 CFR 50.49 Environmental Qualification Requirements (Revised)."

Exceptions to NUREG-1801

The *Non-EQ Electrical Cable Connections* program takes no exceptions to the recommendations of NUREG-1801, Section XI.E6, "Electrical Cable Connections Not Subject To 10 CFR 50.49 Environmental Qualification Requirements (Revised)."

Enhancements

The *Non-EQ Electrical Cable Connections* program is a new program that will be consistent with the recommendations of NUREG-1801, Section XI.E6, "Electrical Cable Connections Not Subject To 10 CFR 50.49 Environmental Qualification Requirements (Revised)."

This commitment is identified in Appendix A, Table A6.0-1 License Renewal Commitments, Item 15.

Operating Experience

Electrical cable connections exposed to appreciable ohmic heating or ambient heating during operation may experience loosening caused by repeated cycling of connected loads or of the ambient temperature environment. There have been a limited number of industry age-related failures of cable connections reported.

The *Non-EQ Electrical Cable Connections* program is a new program. A review of the Corrective Action Program for representative examples of internal operating experience related to this program was performed. Although cases of loosening of bolted connections were identified, there were no conclusive examples that the loosening of bolted connections were due to the aging mechanisms of thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion and oxidation.

As operating experience is obtained, lessons learned will be used to adjust this program as needed.

The Operating Experience Program ensures that additional operating experience is factored into the aging management programs to ensure program effectiveness.

Conclusion

The *Non-EQ Electrical Cable Connections* program ensures that the effects of aging associated with the in-scope components will be adequately managed so that there is reasonable assurance that their intended functions will be maintained consistent with the current licensing basis throughout the period of extended operation.

B2.1.21 NON-EQ INACCESSIBLE MEDIUM-VOLTAGE CABLES

Program Description

The *Non-EQ Inaccessible Medium-Voltage Cables* program will manage the aging effects of localized damage and breakdown of insulation leading to electrical failure for non-EQ, inaccessible, medium-voltage cables within the scope of license renewal that are subject to an adverse localized environment caused by exposure to significant moisture simultaneously with significant voltage.

Significant moisture is defined as periodic exposures to moisture that last more than a few days (e.g., cable in standing water). Periodic exposures to moisture that last less than a few days (i.e., normal rain and drain) are not significant. Significant voltage exposure is defined as being subjected to system voltage for more than twenty-five percent of the time. An adverse localized environment is a condition in a limited plant area that is significantly more severe than the specified service environment for the cables (power, control, and instrumentation) and connections. An adverse localized environment is significant if it could appreciably increase the rate of aging of a component, or has an immediate adverse effect on operability.

The program will inspect the in-scope manhole east of the tertiary auxiliary transformer for water collection that could cause the in-scope cables to be exposed to significant moisture and will remove water, if required. The program will perform a test on the in-scope non-EQ inaccessible medium-voltage cables to provide an indication of the condition of the conductor insulation. The specific type of test performed will be determined prior to the initial test, and will be a proven test for detecting deterioration of the insulation system due to wetting, such as power factor, partial discharge, or polarization index, as described in EPRI TR-103834-P1-2, "Effects of Moisture on the Life of Power Plant Cables, Part 1, Medium-Voltage Cables, Part 2, Low-Voltage Cables, Electric Power Research Institute," or other testing that is state-of-the-art at the time the test is performed.

Inspection of the in-scope manhole east of the tertiary auxiliary transformer for water collection will be performed prior to the period of extended operation, and the inspection will be repeated every two years thereafter.

Testing of the in-scope inaccessible medium-voltage cables exposed to significant moisture and significant voltage will be performed prior to the period of extended operation, and the tests will be repeated every ten years thereafter.

NUREG-1801 Consistency

The *Non-EQ Inaccessible Medium-Voltage Cables* program is a new program that will be consistent with the recommendations of NUREG-1801, Section XI.E3, "Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements."

Exceptions to NUREG-1801

The *Non-EQ Inaccessible Medium-Voltage Cables* program takes no exceptions to the recommendations of NUREG-1801, Section XI.E3, "Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements."

Enhancements

The *Non-EQ Inaccessible Medium-Voltage Cables* program is a new program that will be consistent with the recommendations of NUREG-1801, Section XI.E3, "Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements."

This commitment is identified in Appendix A, Table A6.0-1 License Renewal Commitments, Item 16.

Operating Experience

Industry operating experience has shown that cross linked polyethylene or high molecular weight polyethylene insulation materials are most susceptible to water tree formation. The formation and growth of water trees varies directly with operating voltage. Water treeing is much less prevalent in 4kV cables than those operated at 13 or 35kV. Also, minimizing exposure to moisture minimizes the potential for the development of water treeing.

Although the *Non-EQ Inaccessible Medium-Voltage Cables* program is a new program, the following representative example of internal operating experience is based on a review of Corrective Action Program and was considered in evaluating the future effectiveness of the program:

In February 2007, in response to NRC GL-2007-01, a review was performed of the Corrective Action Program for replacement of power cables (120 VAC - 4160 Volts) due to failure. No failures of the in-scope cables were identified.

Additionally, based on inspections and interviews, no water accumulation in the in-scope manhole east of the tertiary auxiliary transformer that may have caused the in-scope cables to be exposed to significant moisture was identified.

As operating experience is obtained, lessons learned will be used to adjust this program as needed.

The Operating Experience Program ensures that additional operating experience is factored into the aging management programs to ensure program effectiveness.

Conclusion

The *Non-EQ Inaccessible Medium-Voltage Cables* program ensures that the effects of aging associated with the in-scope components will be adequately managed so that there is reasonable assurance that their intended functions will be maintained consistent with the current licensing basis throughout the period of extended operation.

B2.1.22 NON-EQ INSTRUMENTATION CIRCUITS SUBJECT TO SENSITIVE, HIGH-VOLTAGE, LOW-LEVEL SIGNALS

Program Description

The *Non-EQ Instrumentation Circuits Subject to Sensitive, High-Voltage, Low-Level Signals* program will manage the aging effects of reduced insulation resistance and electrical failure for electrical cables and connections subject to sensitive, high-voltage, low-level signals installed in nuclear instrumentation and radiation monitoring circuits within the scope of license renewal that are subject to an adverse localized environment. An adverse localized environment is a condition in a limited plant area that is significantly more severe than the specified service environment for the cables (power, control, and instrumentation) and connections. The environment may be caused by heat, radiation, or moisture in the presence of oxygen. An adverse localized environment is significant if it could appreciably increase the rate of aging of a component or have an immediate adverse effect on operability.

The program will perform a proven cable system test for detecting deterioration of the insulation system (such as insulation resistance tests, time domain reflectometry tests, or other testing judged to be effective in determining cable insulation condition) for those electrical cables and connections disconnected during calibration, or will review the results and findings of calibrations for those electrical cables that remain connected during the calibration process.

The first tests and calibration reviews will be completed prior to the period of extended operation and will be repeated every ten years thereafter.

NUREG-1801 Consistency

The *Non-EQ Instrumentation Circuits Subject to Sensitive, High-Voltage, Low-Level Signals* program is a new program that will be consistent with the recommendations of 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

The *Non-EQ Instrumentation Circuits Subject to Sensitive, High-Voltage, Low-Level Signals* program takes no exceptions to the recommendations of NUREG-1801, Section XI.E2, "Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits."

Enhancements

The *Non-EQ Instrumentation Circuits Subject to Sensitive, High-Voltage, Low-Level Signals* program is a new program that will be consistent with the recommendations of NUREG-1801, Section XI.E2, "Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits."

This commitment is identified in Appendix A, Table A6.0-1 License Renewal Commitments, Item 17.

Operating Experience

Industry operating experience has identified a case where a change in temperature across a high range radiation monitor cable resulted in substantial change in 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 *Non-EQ Instrumentation Circuits Subject to Sensitive, High-Voltage, Low-Level Signals* program is a new program. A review of the Corrective Action Program for representative examples of internal operating experience related to this program was performed. No cases of reduced insulation resistance and electrical failure for electrical cables and connections subject to sensitive, high-voltage, low-level signals installed in nuclear instrumentation and radiation monitoring circuits within the scope of license renewal that are subject to an adverse localized environment were identified.

As operating experience is obtained, lessons learned will be used to adjust this program as needed.

The Operating Experience Program ensures that additional operating experience is factored into the aging management programs to ensure program effectiveness.

Conclusion

The *Non-EQ Instrumentation Circuits Subject to Sensitive, High-Voltage, Low-Level Signals* program ensures that the effects of aging associated with the in-scope components will be adequately managed so that there is reasonable assurance that their intended functions will be maintained consistent with the current licensing basis throughout the period of extended operation.

B2.1.23 OPEN-CYCLE COOLING WATER SYSTEM

Program Description

The *Open-Cycle Cooling Water System* program manages the aging effects of loss of material and reduction in heat transfer of open-cycle cooling water systems components.

The scope of the program includes the components fabricated of copper alloys, stainless steel, and steel in the Service Water System and the portions of the Circulating Water System, which interface with and support the operation of the Service Water System, including the alternate source of service water via an interconnecting 30-inch pipe between the circulating water discharge structure and the Screenhouse forebay. The *Open-Cycle Cooling Water System* program performs chemical treatment, visual inspections, nondestructive examinations, heat exchanger thermal performance testing, and maintenance, which includes flushing and cleaning, to manage aging of the open-cycle cooling water systems.

The Service Water and Circulating Water Systems are periodically treated with sodium hypochlorite to reduce mussel growth and biological fouling. The Service Water System dead legs requiring treatment are periodically treated with a non-oxidizing biocide, which specifically targets zebra mussels and other organic biofouling.

The main flow path of the Service Water and Circulating Water Systems are flushed as part of normal system operation. Additional flushing of the Service Water System flow paths is routinely performed to ensure that any sand, silt, or corrosion product accumulations do not interfere with the intended function of the associated components. The Service Water System components, including the heat exchangers, are visually inspected, cleaned, and flushed. Circulating Water System maintenance activities include visual inspections and cleaning. Additional internal inspections of the Service Water and Circulating Water Systems are performed during preventive and corrective maintenance in accordance with the *Work Control Process* program.

Heat exchanger thermal performance testing is performed for the component cooling heat exchangers and the safety-related ventilation fan coil units. In addition to this testing, the tubes for the component cooling heat exchangers and Emergency Diesel Generator cooling water subsystem heat exchangers are eddy current tested.

Nondestructive examinations are performed on safety-related and non-safety related Service Water System piping to detect pipe wall thinning and internal blockage resulting from silting and corrosion products.

The *Open-Cycle Cooling Water System* program inspections of the underground Circulating Water System piping support the Buried Piping and Tanks Inspection program. The Work Control Process program performs internal inspections that support the *Open-Cycle Cooling Water System* program.

NUREG-1801 Consistency

The *Open-Cycle Cooling Water System* program is an existing program that is consistent with the recommendations of NUREG-1801, Section XI.M20, "Open-Cycle Cooling Water System," with the exception noted below.

Exceptions to NUREG-1801

Exception 1: Heat Exchanger Thermal Performance Testing

The following heat exchangers are not thermal performance tested as recommended in NUREG-1801, Section XI.M20:

- Containment fan coil units
- Emergency Diesel Generator cooling water subsystems heat exchangers

Justification

The identified heat exchangers are not thermal performance tested because previous testing has shown that valid results cannot be obtained due to the configuration of the heat exchangers. In lieu of thermal performance testing, the heat exchangers are periodically inspected and flushed as discussed below.

For the Containment fan coil units, periodic maintenance performs limited visual inspections, flushes, and flow tests of the service water side of the fan coil units and cleans and inspects the air side of the coils.

For the Emergency Diesel Generator cooling water subsystems heat exchangers, the service water side of the heat exchangers are periodically cleaned and flushed. In addition, the heat exchanger tubes are periodically inspected using eddy current examinations.

The combination of flow testing, visual inspection, cleaning, flushing, or nondestructive examinations applied to each of these heat exchangers, as discussed above, will provide adequate assurance that the heat transfer capability of the heat exchangers is being maintained consistent with the current licensing basis.

Program Elements Affected

- **Element 4: Detection of Aging Effects**

  NUREG-1801, Section XI.M20, recommends that thermal performance testing be performed for the open-cycle cooling water system heat exchangers to verify that their heat transfer capability is being maintained. Thermal performance testing for the Containment fan coil units and Emergency Diesel Generator cooling water subsystems heat exchangers cannot be effectively performed. In lieu of thermal performance testing a combination of flow testing, visual inspection, cleaning, flushing, or nondestructive examinations applied to each of these heat exchangers, as discussed above, will provide adequate assurance that the heat transfer capability of the heat exchangers is being maintained consistent with the current licensing basis.

Enhancements

Enhancement 1: Additional Circulating Water System Inspection Criteria

The *Open-Cycle Cooling Water System* program will be enhanced to add the applicable aging effects as inspection criteria for the Circulating Water System underwater visual inspections.

The inspection criteria for the Circulating Water System intake include buildup of silt and zebra mussels. Piping corrosion and erosion will be added to the inspection criteria to be consistent with the aging effects managed by the program.

This commitment is identified in Appendix A, Table A6.0-1 License Renewal Commitments, Item 18.

<u>Program Elements Affected</u>

- **Element 3: Parameters Monitored or Inspected**

  To be consistent with the identified aging effects managed by the program, piping corrosion and erosion will be added to the Circulating Water System inspection criteria.

Operating Experience

Operating experience indicates that the *Open-Cycle Cooling Water System* program is effective in identifying loss of material or reduction of heat transfer, evaluating the degradation, and implementing corrective actions. When degradation has been identified, corrective actions have been implemented to ensure that the intended functions of the affected components are maintained.

The following representative examples of internal operating experience are based on a review of Corrective Action Program items and were considered in evaluating the effectiveness of the program:

In November 2003, radiography identified silting at the elbow and continuous hard scale buildup with some nodules along the pipe inner diameter on a header branch connection on the service water supply to one auxiliary feedwater pump. To minimize silt buildup, the service water supply piping from both service water headers to the affected auxiliary feedwater pump suction is flushed every six months. Additionally, to resolve the concern with pitting and scale buildup, the affected service water emergency supply to the auxiliary feedwater pumps was replaced during the 2004 refueling outage.

In November 2004, evaluation of the inspection results from eddy current examination (ET) of the tubing in one component cooling heat exchanger revealed several unexpected flaw indications. The degradation was unexpected because the component cooling heat exchangers had been replaced during the 2003 refueling outage. A visual inspection of both component cooling heat exchangers revealed a heavy silt/mud buildup on the tubesheet. The evaluation of the condition determined that the cause was low flow through the heat exchangers during normal plant operation. As a result, the periodicity of flushing the service water side of the component cooling heat exchangers was increased to a 12-week schedule and the flushing time was extended to at least 30 minutes.

In June 2006, the condition description identified that there is no highly reliable or cost effective NDE method that can adequately inspect the piping in the portions of the Service Water System with low, intermittent and/or stagnant flow conditions to ensure the worst case locations for expected system problems are identified. As a result, the implementing procedure was revised to establish a cross-departmental, multi-discipline task team to determine preventive strategies to maintain the integrity of the Service Water System. Based on the strategies developed, a new method for monitoring the integrity of the Service Water System was developed.

Conclusion

The *Open-Cycle Cooling Water System* program ensures that the effects of aging associated with the in-scope components will be adequately managed so that there is reasonable assurance that their intended functions will be maintained consistent with the current licensing basis throughout the period of extended operation.

B2.1.24 PRIMARY WATER CHEMISTRY

Program Description

The *Primary Water Chemistry* program manages the aging effects of cracking, loss of material, and reduction of heat transfer for nickel alloys, stainless steel and steel components.

The intent of the *Primary Water Chemistry* program is to minimize corrosion in order to maintain the primary system pressure boundary integrity.

The *Primary Water Chemistry* program relies on the periodic monitoring and control of known detrimental contaminants such as chloride, fluoride, dissolved oxygen and sulfate concentrations below the levels known to result in cracking, loss of material, and reduction of heat transfer. Primary water chemistry control is based on the industry guidelines for primary water chemistry, EPRI 1002884 (formerly TR-105714), "Pressurized Water Reactor Primary Water Chemistry Guidelines," Revision 6. The program includes specifications for chemical species, sampling and analysis frequencies, and corrective actions for control of the environment to which internal surfaces of systems and components are exposed. Additionally, the program maintains water quality (pH and conductivity) in accordance with EPRI guidance.

The effectiveness of the *Primary Water Chemistry* program is verified by the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program, Alloy 600 Inspections program, Steam Generator Tube Integrity program, and Work Control Process program.

NUREG-1801 Consistency

The *Primary Water Chemistry* program is an existing program that is consistent with the recommendations of NUREG 1801, XI.M2 "Water Chemistry."

Exceptions to NUREG-1801

The *Primary Water Chemistry* program takes no exceptions to the recommendations of NUREG-1801, Section XI.M2, "Water Chemistry."

Enhancements

The *Primary Water Chemistry* program does not require enhancement to be consistent with the recommendations of NUREG-1801, Section XI.M2, "Water Chemistry."

Operating Experience

Operating experience indicates that the *Primary Water Chemistry* program is effective in identifying out-of-specification water chemistry, evaluating the unacceptable parameters, and implementing corrective actions. When out-of-specification concentrations have been identified, corrective actions have been implemented to ensure that the water chemistry out-of-specification concentrations have been returned to the prescribed limits, thus ensuring that the intended functions of the affected components are maintained.

The following representative examples of internal operating experience are based on a review of Corrective Action Program items and were considered in evaluating the effectiveness of the program:

In May 2001, during a forced shutdown to repair a leaking valve, a continuous dissolution of Reactor Coolant System corrosion products (crud) occurred. The cause was attributed to an inadequate chemistry program to address the specific problems of primary water chemistry during mid-cycle shutdowns. Plant chemistry procedures were revised to include a new section to help make decisions regarding primary chemical control during mid-cycle outages and other various shutdown conditions.

In January 2003, normal sampling of the boric acid storage tanks discovered increasing quantities of unidentified contaminants. The evaluation traced the issue back to degraded "rubber" diaphragms. Maintenance procedures were reviewed to determine the appropriate frequency of diaphragm replacement, and a list of valves was created to state the frequency of diaphragm replacement.

In November 2004, based on Westinghouse recommendations for monitoring zeolite forming elements (magnesium, calcium, and aluminum), silica and suspended solids levels, the need for aluminum monitoring in the Reactor Coolant System was evaluated. Subsequently, Chemistry procedures were revised to require the performance of aluminum, calcium, magnesium, silica and total suspended solids analysis of the Reactor Coolant System.

In February 2005, based on lessons learned from the 2004 outage, a temporary change was initiated to allow for lithium additions (to the Reactor Coolant System) while still on Residual Heat Removal. This process reduced the time required to achieve appropriate lithium concentrations and is believed to have had a net positive affect on dose rates. The existing procedure for hydrazine addition allowed lithium addition, if required, to mitigate increasing activity in the Residual Heat Removal System. The EPRI Primary Water Guidelines allows for lithium addition and alternate measures to address acid and caustic conditions in the Residual Heat Removal System. Quarterly operation of the Residual Heat Removal System removes residual lithium from the Residual Heat Removal System during the operating cycle.

In February 2006, a review of the Primary Chemistry Sample Specifications against new EPRI Guidelines requirements was performed. The results of the review showed that the monitored parameters within the procedures were more limiting than those indicated in the EPRI Guidelines. Compliance with the EPRI Guidelines was verified.

Conclusion

The *Primary Water Chemistry* program ensures that the effects of aging associated with the in-scope structures and components will be adequately managed so that there is reasonable assurance that their intended functions will be maintained consistent with the current licensing basis throughout the period of extended operation.

B2.1.25 REACTOR CONTAINMENT LEAKAGE TESTING 10 CFR 50, APPENDIX J

Program Description

The *Reactor Containment Leakage Testing 10 CFR 50, Appendix J* program manages the aging effects of cracking, loss of leak tightness, loss of material, loss of sealing and leakage through the Reactor Containment Vessel, including the systems penetrating the Reactor Containment Vessel, penetrations, isolation valves, fittings and access openings made of elastomers, stainless steel, and steel to detect degradation of the pressure boundary.

The *Reactor Containment Leakage Testing 10 CFR 50, Appendix J* program is implemented using Option B, which is a performance-based approach. The regulatory basis for the program includes NRC Regulatory Guide 1.163, "Performance-Based Containment Leak-Test Program," September 1995, and NEI 94-01, "Industry Guideline for Implementing Performance-Based Option of 10 CFR 50, Appendix J," Revision 0.

Two types of leakage tests, integrated and local, are implemented.

Type A tests are conducted to measure the Reactor Containment Vessel overall integrated leakage rate. Procedures require a general visual inspection of the accessible interior and exterior surfaces of the Reactor Containment Vessel and components prior to each integrated leak rate test pressurization. This visual inspection is performed by the ASME Section XI, Subsection IWE program.

Type B local leak rate tests are performed to measure local leakage rates across each in-scope boundary penetration at frequencies that comply with the requirements of 10 CFR 50 Appendix J, Option B. The Type B test is 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 in-scope isolation valves at frequencies that comply with the requirements of 10 CFR 50 Appendix J, Option B.

NUREG-1801 Consistency

The *Reactor Containment Leakage Testing 10 CFR 50, Appendix J* program is an existing program that is consistent with the recommendations of NUREG-1801, Section XI.S4, "10 CFR Part 50, Appendix J."

Exceptions to NUREG-1801

The *Reactor Containment Leakage Testing 10 CFR 50, Appendix J* program takes no exceptions to the recommendations of NUREG-1801, Section XI.S4, 10 CFR 50, Appendix J."

Enhancements

The *Reactor Containment Leakage Testing 10 CFR 50, Appendix J* program does not require enhancement to be consistent with the recommendations of NUREG-1801, Section XI.S4, 10 CFR 50, Appendix J."

Operating Experience

Operating experience indicates that the *Reactor Containment Leakage Testing 10 CFR 50, Appendix J* program is effective in identifying aging effects of cracking, loss of leak tightness, loss of material, loss of sealing and leakage through the Reactor Containment Vessel, including systems penetrating the Reactor Containment Vessel, penetrations, isolation valves, fittings and access openings to detect degradation of the pressure boundary, evaluating the degradation, and implementing corrective actions. When degradation has been identified, corrective actions have been implemented to ensure that the intended functions of the affected components are maintained.

The following representative examples of internal operating experience are based on a review of Corrective Action Program items and were considered in evaluating the effectiveness of the program:

In April 1994, the Reactor Containment Vessel integrated leak rate test was performed. No measurable leaks were observed from the penetration vents outside the Reactor Containment Vessel, and the total calculated leakage rate was less that the maximum leakage rate allowed.

In April 2003, several valves failed during the performance of "Containment Local Leak Rate Type B & C Test." A review of historical work orders found that these valves had a history of exceeding the administrative leak rate limits. Debris and moisture in the piping system was the cause of the valves to not properly seat. A double O-ring spectacle flange was installed, removing these valves from the penetration boundary.

In April 2003, the check valve for the seal injection line to the B reactor coolant pump, CVC-206B, failed its local leak rate test. An evaluation concluded that this same valve had failed a previous local leak rate test. During the repair of the valve, it was noted that the disc insert was slightly off center. This out-of-round condition had been found in the past when similar valves failed their local leak rate tests. The program was revised to require machining of the disc insert, replacement and machining of a new insert, or replacement of the disc assembly every time the valve is inspected or worked on unless the run-out can be verified to be acceptable.

Conclusion

The *Reactor Containment Leakage Testing 10 CFR 50, Appendix J* program ensures that the effects of aging associated with the in-scope components will be adequately managed so that there is reasonable assurance that their intended functions will be maintained consistent with the current licensing basis throughout the period of extended operation.

B2.1.26 REACTOR HEAD CLOSURE STUDS

Program Description

The *Reactor Head Closure Studs* program manages the aging effects of cracking and loss of material for the reactor head closure stud assembly including nuts and washers and for the threads in the reactor vessel flange.

The program includes preventive measures to mitigate cracking and loss of material and visual or volumetric examinations to monitor this degradation.

The preventive measures implemented by the program are consistent with the measures identified in NRC Regulatory Guide 1.65, "Material and Inspection for Reactor Vessel Closure Studs," October 1973. These measures include the use of appropriate fabrication materials, coatings, and lubricants and operating practices to reduce the potential for corrosion and contamination of the reactor head closure stud assembly including nuts and washers and of the threads in the reactor vessel flange.

The *Reactor Head Closure Studs* program complies with the ASME Section XI 1998 Code Edition through 2000 Addenda, Examination Category B-G-1. The visual and volumetric examinations are performed in accordance with the general requirements of Subsection IWA-2000 to indicate the presence of discontinuities and flaws. Examination of the reactor vessel closure studs, nuts, washers, and threads in the reactor vessel flange are in accordance with Table IWB-2500-1, Examination Category B-G-1. Indications identified by these examinations are evaluated in accordance with IWB-3000 for the reactor head closure studs. Examination results are evaluated in accordance with IWB-3100 by comparing the results with the acceptance standards of IWB-3400 and IWB-3500.

The ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program performs inspections that support the *Reactor Head Closure Studs* program.

NUREG-1801 Consistency

The *Reactor Head Closure Studs* program is an existing program that is consistent with the recommendations of NUREG-1801, Section XI.M3, "Reactor Head Closure Studs," with the exception noted below.

Exceptions to NUREG-1801

Exception 1: Use of a Different Edition/Addenda of ASME Section XI

The *Reactor Head Closure Studs* program is implemented using the guidance of ASME Section XI 1998 Code Edition through 2000 Addenda. NUREG-1801, Section XI.M3, recommends the use of ASME Section XI 2001 Code Edition through 2003 Addenda.

Justification

Use of the ASME Section XI 1998 Code Edition through 2000 Addenda is consistent with provisions in 10 CFR 50.55a to use the ASME Section XI Code in effect 12 months prior to the start of the inspection interval.

With regards to reactor head closure stud examinations, the ASME Section XI 1998 Code Edition through 2000 Addenda allowed licensees the ability to perform surface or volumetric examinations of the reactor head closure studs when the studs were removed. The ASME Section XI 2001 Code Edition through 2003 Addenda provided for a volumetric examination when the studs are in place or removed. This change in examination provisions had no impact on the *Reactor Head Closure Studs* program because a volumetric examination of the studs is performed when they are removed during refueling outages. The *Reactor Head Closure Studs* program is consistent with the requirements of the ASME Section

XI 2001 Code Edition through 2003 Addenda for extent, schedule, and examination methods.

The *Reactor Head Closure Studs* program is consistent with the intent of NUREG-1801, Section XI.M3.

Program Elements Affected

- **Element 1: Scope of Program**

  Though the program is based on a different ASME Section XI Code Edition than recommended by NUREG-1801, Section XI.M3, the program inspections and evaluations are consistent with the intent of NUREG-1801, Section XI.M3.

Enhancements

The *Reactor Head Closure Studs* program does not require enhancement to be consistent with the recommendations of NUREG-1801, Section XI.M3, "Reactor Head Closure Studs."

Operating Experience

Operating experience indicates that the *Reactor Head Closure Studs* program is effective in identifying closure stud degradation, evaluating the degradation, and implementing corrective actions. When degradation has been identified, corrective actions have been implemented to ensure that the intended functions of the affected studs, bolts, nuts, and threads in flanges are maintained.

Although industry operating experience confirms that stress corrosion cracking has occurred in BWR pressure vessel head studs, the Kewaunee operating experience does not indicate the reactor head closure studs have experienced stress corrosion cracking. A review of condition reports did not identify any reported cracking or loss of material for the closure studs.

The following representative examples of internal operating experience are based on a review of Corrective Action Program items and were considered in evaluating the effectiveness of the program:

In April 2003, following reactor pressure vessel stud tensioning, a review of the stud elongation paperwork identified that the elongation of one stud was 0.001 inch greater than the maximum elongation permitted by the reactor vessel stud tensioning procedure. The elongation was determined to be acceptable per an engineering review, which included concurrence by the stud supplier. The reactor vessel, vessel head, and stud were determined to be operable and the components were returned to service.

In September 2006, a ¼-inch blemish was identified on a reactor head closure stud during stud cleaning. The stud was evaluated as acceptable in accordance with the inservice inspection procedures. The blemish was removed by filing and the stud was approved for continued service.

Conclusion

The *Reactor Head Closure Studs* program ensures that the effects of aging associated with the in-scope components will be adequately managed so that there is reasonable assurance that their intended functions will be maintained consistent with the current licensing basis throughout the period of extended operation.

B2.1.27 REACTOR VESSEL SURVEILLANCE

Program Description

The *Reactor Vessel Surveillance* program manages the aging effect of loss of fracture toughness due to irradiation embrittlement of the reactor pressure vessel low alloy steel material.

Monitoring methods are in accordance with 10 CFR 50, Appendix H. This program includes surveillance capsule removal and specimen mechanical testing/evaluation, radiation analysis, development of pressure-temperature limits, and determination of low-temperature overpressure protection (LTOP) set points. The program ensures the reactor vessel materials meet the fracture toughness requirements of 10 CFR 50, Appendix G, and meet the requirements of pressurized thermal shock (PTS) and upper shelf energy in 10 CFR 50.60 and 10 CFR 50.61, as modified by the exemption granted to utilize Master Curve methodology.

NUREG-1801 Consistency

The *Reactor Vessel Surveillance* program is an existing program that is consistent with the recommendations of NUREG-1801, Section XI.M31, "Reactor Vessel Surveillance," with the exception described below.

Exceptions to NUREG-1801

Exception 1: Capsule Withdrawal Recommendation

The Kewaunee reactor vessel surveillance capsule withdrawal schedule does not follow the capsule withdrawal schedule recommendations of program description part 6 of NUREG-1801, Section XI.M31, which states that surveillance capsules with a fluence greater than that projected for 60 equivalent years of operation should be removed from the reactor vessel and placed in storage. The sixth and last remaining surveillance capsule, capsule N, will remain as a standby capsule in the reactor vessel and may be removed after it has accumulated sufficient fluence to bound potential future license renewal periods beyond 60 year operation, e.g., 80 or 100 equivalent years of fluence.

Justification

The fifth surveillance capsule, Capsule T, has been removed after accumulating greater than 60 equivalent years of fluence and has been tested with the results reported in Section 4.2, Reactor Vessel Neutron Embrittlement. Capsule N, the last remaining surveillance capsule, has currently accumulated a neutron fluence greater than that projected for 60 years of operation. Withdrawal of Capsule N after 80 or 100 equivalent years of neutron irradiation will provide meaningful metallurgical data, if it is withdrawn to support future license renewals. It is estimated that Capsule N will receive an 80 year equivalent irradiation in approximately 2015, and a 100 year equivalent irradiation in approximately 2025. In addition, delaying the withdrawal will allow for the establishment of alternative means of monitoring fluence, such as the use of ex-vessel dosimetry or reinsertion of archival material. Test results of the fifth capsule (capsule T), summarized in Section 4.2, document that the reactor vessel parameters will remain within acceptance criteria throughout the period of extended operation.

Enhancements

Enhancement 1: Operating Restrictions

The *Reactor Vessel Surveillance* program will be enhanced to include the applicable limitations on operating conditions to which the surveillance capsules were exposed (e.g. neutron flux, spectrum, irradiation temperature, etc.). This enhancement is required to ensure that any future changes in operating parameters or neutron flux due to power uprates or other conditions continue to be consistent with those used to project the effects of embrittlement to the end of the period of extended operation. With this enhancement, the *Reactor Vessel Surveillance* program will meet the program description parts 2, 3, and 6 of NUREG-1801, Section XI.M31.

This commitment is identified in Appendix A, Table A6.0-1 License Renewal Commitments, Item 19.

Enhancement 2: Storage of Pulled and Tested Surveillance Capsules

The *Reactor Vessel Surveillance* program will be enhanced to include requirements for storing, and possible recovery, of tested and untested capsules (removed from the Reactor Vessel after August 31, 2000). Although capsule specimens that have been withdrawn from the reactor vessel have been placed in storage, there are no programmatic requirements for capsule retention. The storage of capsules allows possible reinsertion of archival specimens if additional surveillance capsules are required in accordance with program description part 4 of NUREG-1801, Section XI.M31.

This commitment is identified in Appendix A, Table A6.0-1 License Renewal Commitments, Item 20.

Operating Experience

Operating experience indicates that the *Reactor Vessel Surveillance* program is effective in identifying loss of fracture toughness, evaluating the degradation, and implementing corrective actions.

The *Reactor Vessel Surveillance* program, described in USAR Section 4.4, has provided material embrittlement and dosimetry data since plant startup. The test results have been reviewed and approved by the NRC for use in the current operating term. Five surveillance capsules have been removed and tested to determine performance of reactor vessel materials with regard to neutron embrittlement.

The test results from latest surveillance capsule, capsule T, were submitted to the NRC and are documented in WCAP-16641-NP. This report confirms that the reactor vessel welds and forgings will remain within acceptance criteria throughout the period of extended operation.

The following representative examples of internal operating experience are based on a review of Corrective Action Program items and were considered in evaluating the effectiveness of the program:

In October 2004, it was identified that the surveillance capsule withdrawal procedure did not match USAR Table 4.4-2. The USAR table had incorrectly labeled capsule "T" as the standby capsule. During the investigation, inconsistencies in the listed fluence and effective full power years were also discovered. The table was updated to indicate that capsule "N" is the standby capsule and the fluence and effective full power years were corrected.

In December 2006, a self-assessment of the Reactor Vessel Integrity Program was performed, which identified several sections of the USAR that had not been updated after removal of the fifth surveillance capsule and implementation of the Master Curve exemption. In addition, it was also identified that alternate means of fluence monitoring will be required when the final surveillance capsule is removed. Action items have been generated to ensure that the USAR will be updated and to determine an alternate method for monitoring fluence.

Conclusion

The *Reactor Vessel Surveillance* program ensures that the effects of aging associated with the in-scope components will be adequately managed so that there is reasonable assurance that their intended functions will be maintained consistent with the current licensing basis throughout the period of extended operation.

B2.1.28 SECONDARY WATER CHEMISTRY

Program Description

The *Secondary Water Chemistry* program manages the aging effects of cracking, loss of material, and reduction of heat transfer for copper alloys, nickel alloys, stainless steel and steel components.

The intent of the *Secondary Water Chemistry* program is to minimize the corrosion of all secondary components to attain their maximum useful life and minimize the fouling of all heat transfer surfaces to achieve maximum plant efficiency.

The *Secondary Water Chemistry* program relies on the periodic monitoring and control of known detrimental contaminants such as chloride, dissolved oxygen and sulfate concentrations below the levels known to result in cracking, loss of material, or reduction of heat transfer. Secondary water chemistry control is based on the industry guidelines for secondary water chemistry, EPRI 1008224 (formerly TR-102134), "Pressurized Water Reactor Secondary Water Chemistry Guidelines," Revision 6. The program includes specifications for chemical species, sampling and analysis frequencies, and corrective actions for control of the environment to which internal surfaces of systems and components are exposed. Additionally, the program maintains water quality (pH and conductivity) in accordance with EPRI guidance.

The effectiveness of the *Secondary Water Chemistry* program is verified by the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program, Steam Generator Tube Integrity program, and Work Control Process program.

NUREG-1801 Consistency

The *Secondary Water Chemistry* program is an existing program that is consistent with the recommendations of NUREG-1801, Sections XI.M2, "Water Chemistry."

Exceptions to NUREG-1801

The *Secondary Water Chemistry* program takes no exceptions to the recommendations of NUREG-1801, Section XI.M2, "Water Chemistry."

Enhancements

The *Secondary Water Chemistry* program does not require enhancement to be consistent with the recommendations of NUREG-1801, Section XI.M2, "Water Chemistry."

Operating Experience

Operating experience indicates that the *Secondary Water Chemistry* program is effective in identifying out-of-specification water chemistry, evaluating the out-of-specification condition, and implementing corrective actions. When out-of-specification values have been identified, corrective actions have been implemented to ensure that the water chemistry out-of-specification values have been returned to the prescribed limits, thus ensuring that the intended functions of the affected components are maintained.

The following representative examples of internal operating experience are based on a review of Corrective Action Program items and were considered in evaluating the effectiveness of the program:

In September 1998, changes were made to the equipment operator logs for the secondary analytical panel and water treatment. The new logs establish high and low specifications, when applicable, for chemistry parameters and normal operating bands/ranges for equipment. The specifications were established from EPRI Guidelines and chemistry procedures.

In May 2002, while the RCS was at 330 degrees, a high level of dissolved oxygen was measured in the condensate and the feedwater system. This increased oxygen level corresponded to a reduction in condenser vacuum. Chemistry management decided that the high dissolved oxygen level was not acceptable and recommended that the plant change to the auxiliary feedwater pump suction from the condensate storage tank and go to mode I blowdown. It was concluded that operation at an RCS temperature of 330 degrees does not allow steam flow to provide a high condenser vacuum, thereby not removing enough oxygen by the air ejectors to reach the dissolved oxygen limit in the feedwater. Appropriate procedures were revised to allow this change in system line-up.

In February 2003, the feedwater hydrazine concentration was less than eight times the condensate dissolved oxygen concentration and caused entry into Action Level 1. Operations increased the hydrazine feed stroke and a follow-up sample was taken to ensure that sufficient hydrazine had been added to correct the situation.

In April 2003, the increase of condensate dissolved oxygen caused entry into Action Level 2. Concurrent with the increase in condensate dissolved oxygen, the steam generator inlet (feedwater) hydrazine concentrations did not comply with the procedure requirements. Although this was an expected parameter change due to the change in plant power, hydrazine concentration was increased. The Action Level was exited upon return to proper values.

In October 2005, enhancement opportunities from the Steam Generator Self Assessment were addressed. These enhancements included various procedure improvements such as the inclusion of make-up water control parameters, providing guidance on sampling for or limit of pH on the source of water to the steam generator while operating between 200 degrees and 5 percent power when the plant is using auxiliary feedwater, and establishing specific plant goals for chloride, fluoride and sulfate concentrations.

Conclusion

The *Secondary Water Chemistry* program ensures that the effects of aging associated with the in-scope structures and components will be adequately managed so that there is reasonable assurance that their intended functions will be maintained consistent with the current licensing basis throughout the period of extended operation.

B2.1.29 SELECTIVE LEACHING OF MATERIALS

Program Description

The *Selective Leaching of Materials* program will manage the aging effects of loss of material on internal and external surfaces of in-scope components such as piping, pumps, valves, and heat exchanger components made of steel (cast iron), and copper alloys (brass, bronze, or aluminum-bronze).

The program will perform a one-time visual inspection, and hardness measurement or qualitative examination such as resonance when struck by another object, scraping, or chipping, as appropriate, of selected components within the scope of license renewal for loss of material due to selective leaching. The program will define a one-time examination methodology and acceptance criteria, and will inspect a representative sample of selected components that may be susceptible to selective leaching. If selective leaching is found, the program will provide for evaluation as to the effect it will have on the ability of the affected components to perform their intended function for the period of extended operation, and the need to expand the number and location of components in the inspection sample.

The *Selective Leaching of Materials* program supports the Fire Protection and Buried Piping and Tanks Inspection programs.

The inspection and hardness measurement or qualitative examination, as appropriate, will be performed prior to the period of extended operation.

NUREG-1801 Consistency

The *Selective Leaching of Materials* program is a new program that will be consistent with the recommendations of NUREG-1801, XI.M33, "Selective Leaching of Materials."

Exceptions to NUREG-1801

The *Selective Leaching of Materials* program takes no exceptions to the recommendations of NUREG-1801, Section XI.M33, "Selective Leaching of Materials."

Enhancements

The *Selective Leaching of Materials* program is a new program that will be consistent with the recommendations of NUREG-1801, Section XI.M33, "Selective Leaching of Materials."

This commitment is identified in Appendix A, Table A6.0-1 License Renewal Commitments, Item 21.

Operating Experience

The *Selective Leaching of Materials* program is a new program. A review of the Corrective Action Program for representative examples of internal operating experience related to this program was performed. No cases of selective leaching causing loss of material were identified. Affected components and their materials include internal and external surfaces of in-scope components such as piping, pumps, valves, and heat exchanger components made of steel (cast iron), and copper alloys (brass, bronze, or aluminum bronze).

As operating experience is obtained, lessons learned will be used to adjust this program as needed.

The Operating Experience Program ensures that additional operating experience is factored into the aging management programs to ensure program effectiveness.

Conclusion

The *Selective Leaching of Materials* program ensures that the effects of aging associated with the in-scope components will be adequately managed so that there is reasonable assurance that their intended functions will be maintained consistent with the current licensing basis throughout the period of extended operation.

B2.1.30 STEAM GENERATOR TUBE INTEGRITY

Program Description

The *Steam Generator Tube Integrity* program manages the aging effects of cracking and loss of material for the primary and secondary-side steam generator components fabricated of nickel alloys, stainless steel, and steel. The program is based on Technical Specification requirements, meets the intent of NEI 97-06, "Steam Generator Program Guidelines," and is credited for aging management of the tubes, tube plugs, tube sleeves, tube supports, and secondary-side components whose failure could prevent the steam generator from fulfilling its intended safety function.

The *Steam Generator Tube Integrity* program manages aging effects by providing a balance of prevention, inspection, evaluation, repair, and leakage monitoring.

The Primary Water Chemistry and Secondary Water Chemistry programs provide preventive measures whose effectiveness is verified by the *Steam Generator Tube Integrity* program. Foreign material exclusion requirements are preventive measures intended to inhibit wear degradation. The *Steam Generator Tube Integrity* program provides secondary-side visual inspections for loose parts or foreign objects and actions to be taken in response to finding loose parts or foreign objects, which include evaluation and/or repair.

The *Steam Generator Tube Integrity* program provides the requirements for inspection activities for the detection of flaws in tubes, tube plugs, tube sleeves, tube supports, and secondary-side components needed to maintain tube integrity. Degradation assessments identify both potential and existing degradation mechanisms. Eddy current testing and visual inspections are used for the detection of flaws. Condition monitoring compares the inspection results against performance criteria, and an operational assessment provides a prediction of tube conditions to ensure that the performance criteria will not be exceeded during the next operating cycle. Primary-to-secondary leakage is continually monitored during operation.

NUREG-1801 Consistency

The *Steam Generator Tube Integrity* program is an existing program that is consistent with the recommendations of NUREG-1801, Section XI.M19, "Steam Generator Tube Integrity," with the exception described below.

Exceptions to NUREG-1801

Exception 1: Use of a Different Revision of an NEI Guideline

The *Steam Generator Tube Integrity* program is implemented using the guidance of NEI 97-06, Revision 2, "Steam Generator Program Guidelines." NUREG-1801, Section XI.M19 recommends the use of NEI 97-06, Revision 1, "Steam Generator Program Guidelines."

Justification

Justification for use of NEI 97-06 Revision 2 is based on staff approval of the Kewaunee Power Station Technical Specification Amendment that incorporated Technical Specification Task Force Traveler 449 Revision 4, "Steam Generator Tube Integrity." As described in Generic Letter 2006-01, the NRC staff reviewed and approved TSTF-449 Revision 4. In NEI correspondence with the NRC dated September 9, 2005, NEI states that Revision 2 of NEI 97-06 is consistent with TSTF-449 Revision 4.

Enhancements

The *Steam Generator Tube Integrity* program does not require enhancement to be consistent with the recommendations of NUREG-1801, Section XI.M19, "Steam Generator Tube Integrity."

Operating Experience

Operating experience indicates that the *Steam Generator Tube Integrity* program is effective in identifying Steam Generator internals degradation, evaluating the degradation, and implementing corrective actions. When degradation has been identified, corrective actions have been implemented to ensure that the intended functions of the affected tubes, tube plugs, tube supports, and secondary-side components are maintained.

In 2001, due to tube degradation, the original Westinghouse Model 51 steam generators were replaced with Westinghouse Model 54Fs. Although similar in general design concept and capacity, the replacement Model 54F steam generators incorporated a number of design improvements in response to operating experience with recirculating-type steam generators. The replacement steam generators utilize materials (alloy 690 tubes and stainless steel support plates) that have improved resistance to known corrosion issues affecting pressurized-water reactor steam generators. The upper steam generator modifications included installation of a nickel alloy steam flow limiter inside the steam nozzle, replacement feedwater inlet ring assembly with FAC resistant materials, feedwater nozzle improvements that included a welded nickel alloy thermal sleeve, and modifications to the moisture separation equipment.

The following representative examples of internal operating experience are based on a review of Corrective Action Program items and were considered in evaluating the effectiveness of the program:

In 2006, during implementation of a work order to visually inspect the annulus, tube lane, and a sample of in-bundle columns of the "A" Steam Generator, five foreign objects were located. The retrieval efforts were 100 percent successful and all five objects were removed from the Steam Generator. Eddy current inspection concluded that there were no repairable indications.

In 2006, during implementation of a work order to visually inspect the annulus, tube lane, and a sample of in-bundle columns of the "B" Steam Generator, nine foreign objects were located. The retrieval efforts were 100 percent successful and all nine objects were removed from the Steam Generator. Eddy current inspection concluded that there were no repairable indications.

Through the 2008 refueling outage, there are zero tubes plugged and zero sleeves installed in both steam generators.

Conclusion

The *Steam Generator Tube Integrity* program ensures that the effects of aging associated with the in-scope components will be adequately managed so that there is reasonable assurance that their intended functions will be maintained consistent with the current licensing basis throughout the period of extended operation.

B2.1.31 STRUCTURES MONITORING PROGRAM

Program Description

The *Structures Monitoring Program* manages the aging effects of: (1) cracking, loss of bond, loss of material (spalling, scaling), cracks and distortion, increase in porosity and permeability, loss of strength, and reduction in concrete anchor capacity due to local concrete degradation for concrete, (2) loss of material and loss of mechanical function for steel, (3) loss of material for stainless steel and aluminum, and (4) change in material properties, cracking, increased hardness, shrinkage and loss of strength, loss of sealing, and reduction or loss of isolation function for elastomers.

The program performs periodic visual inspections to monitor the condition of structures, structural elements, miscellaneous structural commodities, and masonry walls. Structural elements include such items as platforms, gratings, and component supports (supports for piping, cable trays, and mechanical and electrical components, etc.). Miscellaneous structural commodities consist of flood barriers, electrical panels, sealants, etc. Bolting and fasteners are included in the inspections. The program performs opportunistic visual inspections of normally inaccessible below grade concrete when it is exposed.

The *Structures Monitoring Program* implements the requirements of 10 CFR 50.65, "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," 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* supports the Metal Enclosed Bus program and the Fire Protection program by providing visual inspections.

NUREG-1801 Consistency

The *Structures Monitoring Program* is an existing program that is consistent with the recommendations of NUREG-1801, Sections XI.S5, "Masonry Wall Program," XI.S6, "Structures Monitoring Program." and XI.S7, "RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants."

Exceptions to NUREG-1801

The *Structures Monitoring Program* takes no exceptions to the recommendations of NUREG-1801, Sections XI.S5, "Masonry Wall Program," XI.S6, "Structures Monitoring Program." and XI.S7, "RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants."

Enhancements

Enhancement 1: Define In-Scope Structural Elements

The *Structures Monitoring Program* will be enhanced to clearly define structures, structural elements, and miscellaneous structural commodities that are in scope.

This commitment is identified in Appendix A, Table A6.0-1 License Renewal Commitments, Item 22.

Program Elements Affected

- **Element 1: Scope of Program**

  This enhancement will clearly define structures, structural elements, and miscellaneous structural commodities that are in scope. Structural elements include platforms, gratings and components supports (including non-metallic items), while miscellaneous structural commodities include flood barriers, electrical panels and sealants, etc.

Enhancement 2: Groundwater Monitoring

The *Structures Monitoring Program* will be enhanced to monitor groundwater quality and verify that it remains non-aggressive to below-grade concrete.

This commitment is identified in Appendix A, Table A6.0-1 License Renewal Commitments, Item 23.

Program Elements Affected

- **Element 1: Scope of Program**

  This enhancement will implement periodic groundwater monitoring. Groundwater quality impacts the potential for below-grade concrete degradation. It will ensure timely detection and assessment for a groundwater change to an aggressive state.

Enhancement 3: Underwater Inspections

The *Structures Monitoring Program* will be enhanced to improve criteria for detection of aging effects for the underwater visual inspections of the in-scope structures.

This commitment is identified in Appendix A, Table A6.0-1 License Renewal Commitments, Item 24.

<u>Program Elements Affected</u>

- **Element 3: Parameters Monitored or Inspected**
- **Element 5: Monitoring and Trending**
- **Element 6: Acceptance Criteria**

This enhancement will make the underwater (circulating water intake crib/discharge pipe and Screenhouse forebay/pumpbay) visual inspections for aging effects consistent with the affected program elements.

Operating Experience

Operating experience indicates that the *Structures Monitoring Program* is effective in identifying structural degradation, evaluating the degradation, and implementing corrective actions. When degradation has been identified, corrective actions have been implemented to ensure that the intended functions of the affected structure or component support are maintained.

The following representative examples of internal operating experience are based on a review of Corrective Action Program items and were considered in evaluating the effectiveness of the program:

In March 2003, during the periodic structure monitoring inspections of the Screen House & Tunnel, multiple concrete degradation mechanisms were observed on a wall. The noted deficiencies/aging effects are localized and include cracking, leaching, patterned cracking, and a slight surface offset. The wall surface appeared dry during the inspection. Cracking with leaching was observed previously during the 1997 inspection; surface offset and localized pattern crack formations were not. Follow-up inspections in December 2004 revealed the condition of the affected area and overall wall appeared stable, with no changes observed since the last inspection. No moisture, new cracking and/or leaching was observed or apparent. In addition, no other new surface condition attributes were observed during the subsequent inspection, which suggests that the cracking is passive. The area was reexamined in April 2008 and will be included in the long-range rehabilitation plan. The structure status summary continues as "acceptable with deficiencies."

In March 2003, during the periodic structure monitoring inspections of the Turbine Building, corrosion and chemical residue were observed at the base of building column 1-A. There was some localized material loss observed at the outer flange, anchor bolts, and gussets; however, there did not appear to be any sign of distress.

The immediate area around the column base appeared clean and maintained. The degradation was inspected again approximately two years later and appeared the same as previously noted in 2003. Increased inspection frequency was suspended and the normal monitoring frequency was reinstated since the degradation had not progressed and the condition of the column appeared stable.

In March 2003, during the periodic structure monitoring inspections of the Turbine Building, deteriorating sealant (cracking and separation from adjoining concrete surfaces) was observed in three vertical fire protection wall joints. The inspection noted that there was no active leakage observed or detected in the joints and the filler material appeared intact. Repairs were made to the vertical wall joints to restore functionality.

In April 2003, leaching and cracking was observed on the outer concrete surface of the reactor refueling pool, south side. The noted indications were localized and the overall structural integrity of the wall appeared sound. The reactor refueling pool was flooded at the time of the observation. The hairline cracking was considered passive and did not affect the structural integrity of the concrete wall. Based on inspection and chemistry sampling, a small amount of borated water found its way down the wall, followed the lip of the narrow crack, and deposited boric acid when it dried. The accessible wall area was cleaned. During a subsequent inspection in October 2004, there was no change in appearance from 2003 or any indication of an active leak or the presence of moisture.

Conclusion

The *Structures Monitoring Program* ensures that the effects of aging associated with the in-scope components, component supports, and structures will be adequately managed so that there is reasonable assurance that their intended functions will be maintained consistent with the current licensing basis throughout the period of extended operation.

B2.1.32 WORK CONTROL PROCESS

Program Description

The *Work Control Process* program is an existing plant-specific program that manages the aging effects of change in material properties, cracking, hardening and loss of strength, loss of material, loss of sealing, loss of strength, and reduction of heat transfer for various component types and structural elements fabricated of aluminum, copper alloys, elastomers, non-metallics, stainless steel, and steel, as applicable.

The *Work Control Process* program inspections are implemented in accordance with the work management process. The work management process includes all surveillance procedures, preventive and corrective maintenance procedures, or other routinely scheduled tasks. Due to the comprehensive scope of the work management process, the process provides the opportunity to visually inspect the internal surfaces of components constructed of typical system materials and exposed to typical system environments, including stagnant locations, on an ongoing basis. A review of the inspection opportunities afforded by program for the systems in the scope of license renewal has been performed. The results of the review documented that the *Work Control Process* program provides the opportunity to inspect a representative sample of the systems, material/environment combinations, and component types.

Personnel performing maintenance activities on a component inspect the internal surfaces of the component and adjacent components and piping to identify component and commodity aging. The program requires that these "As Found" conditions be documented. The "As Found" descriptions detail the inspection extent and results even when no signs of aging degradation are found in order to allow meaningful trending of aging effects.

The *Work Control Process* program verifies the effectiveness of the Fuel Oil Chemistry, Lubricating Oil Analysis, Primary Water Chemistry, and Secondary Water Chemistry programs. The program inspections also verify the effectiveness of the Closed-Cycle Cooling Water System program, in conjunction with the inspections performed by the *Closed-Cycle Cooling Water System* program.

The *Work Control Process* program inspections provide support for the Bolting Integrity, Compressed Air Monitoring, Fire Protection, and Open-Cycle Cooling Water System programs for managing the components and supports within the scope of those programs.

Aging Management Program Elements

A comparison of the *Work Control Process* program to ten elements described in Appendix A of NUREG-1800 is provided below.

- **Element 1: Scope of Program**

  The *Work Control Process* program performs visual inspections of a representative sample of various component types and structural elements fabricated of aluminum, copper alloys, elastomers, nickel alloys, non-metallics, stainless steel, and steel, as applicable, during maintenance or surveillance activities The program inspections are performed on components such as accumulators, air handling units, housings, chillers, compressors, coolers, heat exchangers, expansion joints, filters, flexible connections, regulators, pipe, strainers, tanks, traps, pumps, tubing, and valves. Additionally, the program inspects the fuel transfer equipment, electrical box gaskets, the Spent Fuel Pool gate seals, and the reactor cavity seal ring elastomer seal.

  The *Work Control Process* program inspections are implemented in accordance with the work management process. The work management process includes all surveillance procedures, preventive and corrective maintenance procedures, or other routinely scheduled tasks.

- **Element 2: Preventive Actions**

  The *Work Control Process* program verifies the effectiveness of the *Fuel Oil Chemistry, Lubricating Oil Analysis, Primary Water Chemistry*, and *Secondary Water Chemistry* programs. The program inspections also verify the effectiveness of the *Closed-Cycle Cooling Water System* program, in conjunction with the inspections performed by the *Closed-Cycle Cooling Water System* program.

- **Element 3: Parameters Monitored or Inspected**

  The aging effects monitored by the Work Control Process are consistent with the materials of fabrication as listed below:

  - Aluminum -- Loss of material and reduction of heat transfer
  - Copper Alloys -- Cracking, loss of material, and reduction of heat transfer
  - Elastomers -- Change in material properties, cracking, hardening and loss of strength, loss of material, and loss of sealing
  - Nickel Alloys -- Loss of material
  - Non-Metallic -- Loss of strength·
  - Stainless steel -- Cracking, loss of material, and reduction of heat transfer·

- Steel -- Loss of material and reduction of heat transfer

- **Element 4: Detection of Aging Effects**

The *Work Control Process* program performs visual inspections on a representative sample of various component types and structural elements during scheduled maintenance or surveillance activities. The inspections are implemented in accordance with the work management process, which includes all surveillance procedures, preventive and corrective maintenance procedures, or other routinely scheduled tasks.

Due to the comprehensive scope of the work management process, the process provides the opportunity to visually inspect the internal surfaces of components constructed of typical system materials and exposed to typical system environments, including stagnant locations, during preventive and corrective maintenance activities on an ongoing basis.

To verify that the inspection opportunities provide a representative sample of the material and environment combinations found in the plant, a review of the inspection opportunities afforded by the *Work Control Process* program for the systems in the scope of license renewal has been performed. The review identified the number of inspection opportunities for the systems, material/environment combinations, and component types in the scope of the program. The results of the review documented that the *Work Control Process* program provides the opportunity to inspect a representative sample of the systems, material/environment combinations, and component types.

Personnel performing maintenance activities on a component inspect the internal surfaces of the component and adjacent components and piping to identify component and commodity aging. The maintenance procedures require that these "As Found" conditions be documented. The "As Found" descriptions detail the inspection extent and results even when no signs of aging degradation are found in order to allow meaningful trending of aging effects.

The *Work Control Process* program inspections provide support for the *Bolting Integrity, Compressed Air Monitoring*, *Fire Protection*, and *Open-Cycle Cooling Water System* programs for managing the components and supports within the scope of those programs.

- **Element 5: Monitoring and Trending**

  The frequencies of maintenance activities vary based on the preventive maintenance determinations made in accordance with the implementing procedures. These procedures establish the requirements and guidelines for development, implementation, and maintenance of the preventive maintenance program to ensure plant equipment is maintained at a quality level to perform its intended function and provide guidance for performing reviews and evaluations of the preventive maintenance activities.

  The "As Found" descriptions detail the inspection extent and results even when no signs of aging degradation are found in order to allow meaningful trending of aging effects.

  If the *Work Control Process* program inspections identify degradation of the components, a Corrective Action Program condition report will be initiated to determine the cause of the degradation, including aging, and to identify the appropriate corrective actions. Additional monitoring of the system, structure, or component during the Period of Extended Operation is a possible corrective action and would be performed by the *Work Control Process* program. This additional condition monitoring would be implemented with the work management process.

  The Systems Engineers monitor the performance of their systems including reviewing the Corrective Action Program items, maintaining overall cognizance of long term effects on their systems, monitoring the effects of continued use of aging equipment for system performance degradation, monitoring the availability of parts on aging and obsolete plant equipment and changes in technology.

- **Element 6: Acceptance Criteria**

  The *Work Control Process* program inspections are implemented in accordance with the work management process. The work management process includes all surveillance procedures, preventive and corrective maintenance procedures, or other routinely scheduled tasks. The program inspections provide the opportunity to detect the effect of aging prior to the loss of component intended function. The implementing procedures have establish the acceptance criteria and require that the "As Found" condition descriptions should detail the extent of the inspection and results to allow meaningful trending of aging effects.

The personnel performing the inspections will be trained to perform these activities in accordance with the qualification program.

- **Element 7: Corrective Actions**

  The Corrective Actions Program is discussed in Section B1.3.

- **Element 8: Confirmation Process**

  The confirmation process is discussed in Section B1.3.

- **Element 9: Administrative Controls**

  The administrative controls are discussed in Section B1.3.

- **Element 10: Operating Experience**

  Operating experience indicates that the *Work Control Process* program is effective in identifying the monitored aging effects, evaluating the degradation, and implementing corrective actions. When degradation has been identified, corrective actions have been implemented to ensure that the intended functions of the affected components are maintained.

  The following representative examples of internal operating experience are based on a review of Corrective Action Program items and were considered in evaluating the effectiveness of the program:

  In April 2002, maintenance personnel were replacing the fire protection jockey pump discharge relief valve and identified the adjacent piping was approximately 90 percent blocked with rust-like debris. Additionally, it was identified that a nearby pipe nipple was corroded and required replacement. The work order instructions were revised, the piping was cleaned, and the welded nipple was replaced.

  In July 2006, after completing a surveillance test, an I&C technician identified that the 3/8-inch copper process tubing connected to the 3/8-inch brass Swagelok cross fitting for a differential pressure indicator was loose, even though the Swagelok nut was tight. The I&C technician noted that the copper tubing might be cracked next to the ferrules, causing inaccurate indication. The surveillance test results were acceptable and did not indicate any abnormalities. The tubing was replaced restoring the design configuration.

  In April 2008, a detailed inspection of a service water valve revealed that disc guides in the valve body were eroded. The inspection was performed in response to a work order written in 2006 when poor valve seat contact was visually noted during service water pipe replacement. It was noted in 2006 that the seat conditions would probably cause the valve to weep. Visual inspection of the valve at that time indicated the valve would continue to perform its isolation function. As a result of the 2008 inspection, it was determined that the guides could not be repaired and the valve was replaced.

Enhancements

Enhancement 1: Documenting “As Found” Equipment Condition

The *Work Control Process* program will be enhanced to provide additional guidance for documenting the "As Found" equipment conditions with sufficient detail to support monitoring and trending of aging effects.

Additional guidance will be provided for the in-scope materials for detecting the managed aging effects:

- For metallic materials aging effects, such as the loss of material due to general corrosion, pitting corrosion, microbiologically-influenced corrosion, or erosion; cracking; and the buildup of deposits due to silting, fouling, or microbiologically-influenced corrosion that could effect heat transfer.
- For elastomers aging effects, such as evidence of cracking and crazing, discoloration, distortion, evidence of swelling, tackiness; and evaluation of resilience and indentation recovery.
- For non-metallics aging effects, such as loss of strength resulting in filter breakdown.

This commitment is identified in Appendix A, Table A6.0-1 License Renewal Commitments, Item 25.

Program Elements Affected

- **Element 3: Parameters Monitored or Inspected**

  The enhancement will ensure that the applicable aging effects will be inspected and documented during the "As Found" inspections.

- **Element 5: Monitoring and Trending**

  The enhancement will ensure that the applicable aging effects will be documented as "As Found" conditions when the program inspections are performed to allow monitoring potential degrading conditions during the program inspections.

Enhancement 2: Supplemental Work Control Process Inspections

The *Work Control Process* program will be enhanced to perform visual inspections to assess the aging of the items that require supplemental inspections.

The review of the inspection opportunities afforded by the *Work Control Process* program identified the following specific material/environment combination and component types that require supplemental inspections.

Material/Environment Combination:

- Elastomers/Raw Water

Component Types:

- Accumulators
- Flame Arrestors
- Hoses

The *Work Control Process* program will perform both opportunistic and deliberate inspections. It is anticipated that opportunistic inspections will occur for the component types and material/environment combinations prior to entering the period of extended operation. Deliberate inspections will supplement the opportunistic inspections to provide the component internal surfaces inspections for a representative sample of the identified material/environment combinations and component types.

This commitment is identified in Appendix A, Table A6.0-1 License Renewal Commitments, Item 26.

Program Elements Affected

- **Element 4: Detection of Aging Effects**

  The enhancement will ensure that a representative sample of the material/environment combinations, systems, and component types in the scope of the *Work Control Process* program will be inspected.

Enhancement 3: Additional Training for Inspection Personnel

The *Work Control Process* program will be enhanced to provide additional focused training for the personnel performing the program inspections. The training will address the program requirements; the need to document "As Found" equipment conditions with sufficient detail to support monitoring and trending the aging effects; and the aging effects monitored by the program and how to identify them.

This commitment is identified in Appendix A, Table A6.0-1 License Renewal Commitments, Item 27.

Program Elements Affected

- **Element 6: Acceptance Criteria**

  The enhancement will provide the focused training needed to successfully qualify personnel to ensure that the program inspections are performed consistent with the program acceptance criteria.

Conclusion

The *Work Control Process* program ensures that the effects of aging associated with the in-scope components will be adequately managed so that there is reasonable assurance that their intended functions will be maintained consistent with the current licensing basis throughout the period of extended operation.

B3.0 TLAA SUPPORT PROGRAMS

B3.1 ENVIRONMENTAL QUALIFICATION (EQ) OF ELECTRIC COMPONENTS

Program Description

The *Environmental Qualification (EQ) of Electric 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 for license renewal.

The program ensures the qualification of electrical equipment that must function during and following a design basis accident. Implementation of program requirements provides the basis for demonstrating that the licensing basis for environmental qualification of electrical equipment in accordance with 10 CFR 50.49 will be maintained for the period of extended operation. The methodology for qualifying electrical equipment is as specified within the Division of Operating Reactors Guidelines or IEEE Standard 323-1974 Standard for Qualifying Class 1E Equipment for Nuclear Power Generation Stations. Replacement parts and components are qualified in accordance with 10 CFR 50.49(l), unless there are sound reasons to the contrary.

The design control program includes specific interface requirements related to the *Environmental Qualification (EQ) of Electric Components* program to ensure that existing, or any new, environmental qualification requirements are maintained. Plant modifications, such as the installation or removal of equipment or non-identical replacement of existing components, are evaluated to ensure compliance with 10 CFR 50.49. Changes or modifications to system geometry (e.g., piping addition or rerouting), system and equipment operational changes, environmental changes (e.g., baseline changes in temperature or radiation levels), and setpoint changes are evaluated for potential effects on the continued acceptability of existing aging evaluations.

The qualified life of electrical equipment is the period of time the equipment can be installed in the plant such that it will retain sufficient capacity to perform its safety function during design basis accident conditions. The qualified life is a function of the aging mechanisms and limitations identified with respect to thermal, radiation, cycle, and mechanical aging.

For the period of extended operation, the necessary qualified life for equipment is an additional 20 years at the maximum normal plant service conditions to which the equipment will be exposed. However, the component lifespan necessary to reach the end of the period of extended operation (or the current operating term) may not always be achieved due to aging limitations and the variations in degradation rates of the materials used in equipment construction. In these cases, it is acceptable to determine a qualified life of less than the length necessary to envelop the period of extended operation, as long as the equipment is replaced, refurbished, or requalified prior to end of that qualified life.

EQ Component Re-analysis Attributes

The re-analysis of an aging evaluation is normally performed to extend the qualification by reducing excess conservatism incorporated in the prior evaluation. Re-analysis of an aging evaluation to extend the qualification of a component is performed on a routine basis pursuant to 10 CFR 50.49(e) as part of the program. While a component life-limiting condition may be due to thermal, radiation or cyclical aging, the vast majority of component aging limits are based on thermal conditions. Conservatism may exist in aging evaluation parameters, such as the assumed ambient temperature of the component, an unrealistically low activation energy, or in the application of a component (de-energized versus energized). The re-analysis of an aging evaluation is documented according to quality assurance program requirements, which require the verification of assumptions and conclusions. As already noted, important attributes of a re-analysis include analytical methods, data collection and reduction methods, underlying assumptions, acceptance criteria, and corrective actions (if acceptance criteria are not met). These attributes are discussed below.

Analytical Methods - The program uses the same analytical models in the re-analysis of an aging evaluation as those applied during the prior evaluation. The Arrhenius methodology is an acceptable thermal model for performing a thermal aging evaluation. The analytical method used for a radiation aging evaluation is to demonstrate qualification for the total integrated dose (that is, normal radiation dose for the projected installed life plus accident radiation dose). For license renewal, one acceptable method of establishing the 60-year normal radiation dose is to multiply the 40-year normal radiation dose by 1.5 (that is, 60 years/40 years). The result is added to the accident radiation dose to obtain the total integrated dose for the component. For cyclical aging a similar approach may be used. Other models may be justified on a case-by-case basis.

Data Collection & Reduction Methods - Reducing excess conservatism in the component service conditions (for example, temperature, radiation, cycles) used in the prior aging evaluation is the chief method used for a re-analysis per the *Environmental Qualification (EQ) of Electric Components* program. Temperature data used in an aging evaluation should be conservative and based on plant design temperatures or on actual plant temperature data. When used, plant temperature data can be obtained in several ways including monitors used for technical specification compliance, other installed monitors, measurements made by plant operators during rounds, and temperature sensors on large motors. A representative number of temperature measurements are conservatively evaluated to establish the temperatures used in an aging evaluation. Plant temperature data may be used in an aging evaluation in different ways, such as: (a) directly applying the plant temperature data in the evaluation or (b) using the plant temperature data to demonstrate conservatism when using plant design temperatures for an evaluation. Any changes to material activation energy values as part of a re-analysis must be justified. Similar methods of reducing excess conservatism in the component service conditions used in prior aging evaluations can be used for radiation and cyclical aging.

Underlying Assumptions - The 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, which may include changes to the qualification bases and conclusions, are taken.

Acceptance Criteria and Corrective Action - Under the program, the re-analysis of an aging evaluation could extend the qualification of the component. If the qualification cannot be extended by re-analysis, the component must be refurbished, replaced, or requalified prior to exceeding the period for which the current qualification remains valid. A re-analysis is to be performed in a timely manner such that sufficient time is available to refurbish, replace, or re-qualify the component if the re-analysis is unsuccessful.

NUREG-1801 Consistency

The *Environmental Qualification (EQ) of Electric Components* program is an existing program that is consistent with the recommendations of NUREG-1801, X.E1 "Environmental Qualification (EQ) of Electric Components."

Exceptions to NUREG-1801

The *Environmental Qualification (EQ) of Electric Components* program takes no exceptions to the recommendations of NUREG-1801, Section X.E1, "Environmental Qualification (EQ) of Electric Components."

Enhancements

The *Environmental Qualification (EQ) of Electric Components* program does not require enhancement to be consistent with the recommendations of NUREG-1801, Section X.E1, "Environmental Qualification (EQ) of Electric Components."

Operating Experience

Operating experience indicates that the *Environmental Qualification (EQ) of Electric Components* program is effectively implemented at Kewaunee and that, where appropriate, corrective actions are identified and implemented to ensure program effectiveness.

The following representative examples of internal operating experience are based on a review of Corrective Action Program items and were considered in evaluating the effectiveness of the program:

During an extent of condition review related to a high-energy line break (HELB) concern, it was identified that potentially adverse environmental conditions resulting from a letdown line break outside of containment were not properly considered in the *Environmental Qualification (EQ) of Electric Components* program. Corrective actions, including verification of qualification of additional electrical equipment and appropriate program updates, were accomplished to resolve this condition.

In another instance, it was identified that the basis for the Shield Building filter assembly inlet damper solenoid valves EQ classification was not in compliance with *Environmental Qualification (EQ) of Electric Components* program classification criteria. Upon review, it was determined that the solenoid valves were procured in accordance with the requirements for the appropriate classification. The resolution of this issue included upgrade of the solenoid valve EQ classification and revision of the basis documentation for the valves.

An assessment of implementation and effectiveness of the *Environmental Qualification (EQ) of Electric Components* program was conducted in 2004. The general conclusion of the assessment was that the performance of the program was satisfactory with opportunity for improvement. It was concluded that the program provides adequate assurance that the electrical equipment important to safety within the scope of 10 CFR 50.49, IEEE-323-1974, and Reg. Guide 1.97 will function as designed. It was also identified that opportunities existed to improve EQ awareness and to remove administrative backlogs that presented a challenge to program health. The assessment identified that corrective action was necessary to reduce the extensive backlog of required EQ documentation updates as a result of the plant operating environment changes associated with the steam generator replacement project and the power uprate project. In response to this assessment and the actions identified during an EQ peer assessment in 2004, the EQ program improvement plan was developed. The purpose of the EQ program improvement plan was to complete the qualification package updates that constituted the significant work backlog for the program. A schedule was established to complete the updates.

A formal self-assessment was performed in 2006 to conduct a validation assessment of a sample of completed program documents to verify the following:

1. Design basis and current licensing basis information is incorporated and appropriately referenced.
2. Adequacy of the EQ program improvement plan
3. Adequacy and quality of program documents
4. Compliance to 10 CFR 50.49

The assessment was to be based on a sample of completed program documents from implementation of the ongoing EQ program improvement plan. However, there were no completed program documents available (with the exception of the EQ Plan) at the time of the assessment, and the Assessment Team reviewed draft documents. The Assessment Team found that the licensing and design basis of the program is adequately provided in the EQ Plan and that design information was adequately incorporated in the draft documentation reviewed by the Team. Draft documentation was detailed and of excellent quality and when completed as outlined in the improvement plan, will be in compliance with 10 CFR 50.49. The Assessment Team identified ten "Areas for Improvement" along with four Strengths. The recommended actions from the assessment were entered into the corrective action program and resolutions are in progress. An additional recommendation was made to perform a follow-up review of a sample of completed documents to verify the conclusions reached based on draft document reviews. An informal self-assessment was performed in April, 2007 in response to this recommendation and concluded that the assessed documents were complete and in compliance with 10 CFR 50.49. No technical issues, margin concerns, or open items were identified that required resolution.

Conclusion

The *Environmental Qualification (EQ) of Electric Components* program ensures that the effects of aging associated with the in-scope components will be adequately managed so that there is reasonable assurance that their intended functions will be maintained consistent with the current licensing basis throughout the period of extended operation.

B3.2 METAL FATIGUE OF REACTOR COOLANT PRESSURE BOUNDARY

Program Description

The *Metal Fatigue of Reactor Coolant Pressure Boundary* program manages the effects of fatigue for ASME Code Class 1 components. The *Metal Fatigue of Reactor Coolant Pressure Boundary* program monitors and tracks the critical thermal and pressure transients listed in USAR Table 4.1-8 to ensure that cycle occurrence limits are not exceeded such that the ASME Class 1 vessels and pressurizer surge line fatigue analyses assumptions are maintained. Maintaining cycle limits assumed in the analyses provides assurance that the probability of fatigue cracking of ASME Class 1 components is minimized.

For license renewal, the effects of the reactor coolant environment on component fatigue life have been addressed by assessing the impact of the environment on a sample of critical components as identified in NUREG/CR-6260 for an older vintage Westinghouse plant. The methods used for this assessment, and the results, are provided in Section 4.3.1, Fatigue of ASME Class 1 Components. Management of the fatigue effects is required for the hot leg surge line nozzle and the charging nozzle locations when environmental life correction factors are applied. The *Metal Fatigue of Reactor Coolant Pressure Boundary* program provides fatigue monitoring for these locations to ensure adequate margin against fatigue cracking due to anticipated cyclic strains and the effects of the reactor coolant environment.

In addition, the program monitors thermal cycles associated with selected auxiliary heat exchangers in order to ensure that original equipment specification cycle limits are not exceeded.

The *Metal Fatigue of Reactor Coolant Pressure Boundary* program utilizes fatigue monitoring software (EPRI FatiguePro™) to monitor plant transient cycles (in addition to using plant surveillance procedures) and to monitor fatigue usage for selected ASME Class 1 components. The fatigue monitoring software includes three different modules: cycle counting, cycle-based fatigue (CBF) monitoring, and stress-based fatigue (SBF) monitoring.

Cycle Counting - The cycle counting module counts and tracks the number of selected operating transients that have occurred. Counting these cycles and demonstrating that current and projected cycles are less than were assumed in design fatigue calculations, demonstrates that those calculations are still valid and therefore the fatigue usage can be expected to remain below the ASME Section III design limit.

Cycle-Based Fatigue (CBF) Monitoring - The CBF monitoring module computes fatigue usage on a per event basis for each event that actually occurs using the maximum severity for each event specific to the monitored location.

Stress-Based Fatigue (SBF) Monitoring - The SBF monitoring module is the most precise means of the three modules for monitoring fatigue usage. This module uses the actual temperature, pressure, and flow measurement data to calculate stress ranges and the resulting fatigue usage at a given location.

For locations monitored using the CBF or SBF methods, current and projected fatigue usage is calculated to demonstrate that the fatigue usage remains below the design limit.

The *Metal Fatigue of Reactor Coolant Pressure Boundary* program uses a combination of cycle counting, cycle-based fatigue monitoring, and stress-based fatigue monitoring to monitor and track fatigue usage. The software counts cycles and calculates fatigue usage for selected high usage components. The fatigue monitoring software counts most of the transient cycles that are required to be tracked by monitoring changes in plant instrument readings. Cycles that cannot be counted based on installed instrumentation are counted manually (and then incorporated into the fatigue monitoring software database).

The *Metal Fatigue of Reactor Coolant Pressure Boundary* program provides for corrective actions in response to approaching an “Action Limit” on cycle counts or fatigue usage. When monitored transients or fatigue usage exceeds 80 percent of the design limit, the condition is evaluated and appropriate corrective action is initiated to ensure the design limit is not exceeded. Limits are established based on equipment specification or fatigue evaluation assumptions for cycle counts, ASME Code CUF limit of 1.0, or the CUF limit considering environmental effects, whichever is limiting.

NUREG-1801 Consistency

The *Metal Fatigue of Reactor Coolant Pressure Boundary* program is an existing program that is consistent with the recommendations of NUREG-1801, Section X.M1, "Metal Fatigue of Reactor Coolant Pressure Boundary."

Exceptions to NUREG-1801

The *Metal Fatigue of Reactor Coolant Pressure Boundary* program takes no exceptions to the recommendations of NUREG-1801, Section X.M1, "Metal Fatigue of Reactor Coolant Pressure Boundary."

Enhancements

Enhancement 1: Routine Update of Cycle Count and Fatigue Usage Status

The *Metal Fatigue of Reactor Coolant Pressure Boundary* program will be enhanced to include a routine assessment of the transient cycle count totals and fatigue usage status for monitored locations, including an action limit for the initiation of corrective action.

The total cycles and fatigue usage will be compared to an “Action Limit” and allowable design limits. If the current cycle counts or fatigue usage values exceed 80 percent of the design limit, the condition will be evaluated and corrective actions will be initiated to ensure that no design limit is exceeded. In addition, the current totals will be compared to the 60-year projections to confirm that the projections are accurate. If short term trends are not consistent with the 60-year projections, the 60-year projection will be reevaluated and adjusted as necessary.

This commitment is identified in Appendix A, Table A6.0-1 License Renewal Commitments, Item 28.

Program Elements Affected

- **Element 2: Preventive Actions**

  The enhancement will provide adequate margin to cycle count or fatigue usage limits by evaluating the cumulative results routinely and comparing the results to conservative acceptance criteria.

- **Element 4: Detection of Aging Effects**

  The enhancement will require routine assessments of cycle count and fatigue usage status for monitored locations. If limits are approached, corrective action will be initiated, including updates to fatigue evaluations, as required, to prevent exceeding limits.

- **Element 6: Acceptance Criteria**

  The enhancement will require evaluation of current cycle counts and fatigue usage against conservative acceptance criteria routinely to ensure design limits are not exceeded.

- **Element 7: Corrective Actions**

  The enhancement will require the initiation of corrective action to prevent exceeding design limits on cycle counts or fatigue usage if acceptance criteria are not met.

Operating Experience

Operating experience indicates that the *Metal Fatigue of Reactor Coolant Pressure Boundary* program is effective in monitoring and evaluating fatigue, and implementing corrective actions, when necessary. The program ensures that the intended functions of ASME Class 1 components are maintained.

The following representative examples of internal operating experience are based on a review of Corrective Action Program items and were considered in evaluating the effectiveness of the program:

In June 2001, engineering personnel identified that a potential challenge to charging line and reactor coolant loop piping nozzle fatigue limits may have occurred due to a letdown line isolation during a reactor trip recovery operation with high initial charging flow. The event was documented in the Corrective Action Program and an evaluation of the transient was performed. The engineering evaluation determined that no fatigue limits were exceeded based on a review of the USAS B31.1 design code requirements for the charging and reactor coolant loop piping.

The charging nozzle is a monitored location within the *Metal Fatigue of Reactor Coolant Pressure Boundary* program for the period of extended operation. The program tracks fatigue usage at this location based on actual plant data to ensure limits are not exceeded.

In August 2006, during a review of historical heat-up and cooldown transient data recorded in the transient cycle counting surveillance procedure, it was noted that unusually high differential temperatures across the pressurizer surge line (i.e., pressurizer-to-hot leg) were logged. Surge line differential temperature monitoring was initiated in response to IEB 88-11 in order to characterize the magnitude and frequency of occurrence of pressurizer surge line thermal stratification. The recorded differential temperature was based on calculated 'subcooling' data points, which indicated the margin to boiling in the core based on the Reactor Coolant System pressure and the maximum incore thermocouple reading. When the plant operates with a steam bubble in the pressurizer, this 'subcooling' data point is a relatively accurate approximation of the temperature differential between the 'B' hot leg and the pressurizer. However, when the pressurizer is in a water solid (i.e., not saturated) condition while heating up or cooling down, as was the case when the abnormally high differential temperature data was recorded, the 'subcooling' data point is not an accurate indication of pressurizer-to-hot leg differential temperature.

The identified condition was documented in the Corrective Action Program, and the differential temperature data source was changed to provide a more accurate indication during all plant modes. The erroneous data was evaluated to ensure that no pressurizer surge line thermal cycling or fatigue limits were exceeded.

Conclusion

The *Metal Fatigue of Reactor Coolant Pressure Boundary* program ensures that the effects of aging associated with the in-scope components will be adequately managed so that there is reasonable assurance that their intended functions will be maintained consistent with the current licensing basis throughout the period of extended operation.

APPENDIX C

Not Used

APPENDIX D

Technical Specification Changes

10 CFR 54.22, requires that an application for license renewal include any Technical Specification changes, or additions that are necessary to manage the effects of aging during the period of extended operation. A review of the information provided in this License Renewal Application and the unit's Technical Specifications confirms that no changes to the Technical Specifications are necessary.